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THE ROLE OF CLIMATE CHANGE GOVERNANCE IN COMMUNITY ADAPTATION IN KWAZULU-NATAL: A STUDY OF UMKHANYAKUDE DISTRICT MUNICIPALITY

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Submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

GEOGRAPHY AND ENVIRONMENTAL STUDIES

Supervisor: Professor Mulala Danny Simatele

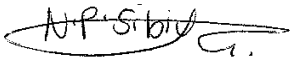
29 January 2024

DECLARATION

I, Nomfundo Patricia Sibiya, declare that this thesis, including the data, figures, tables, and any other information, is my original work. I have, where necessary, acknowledged the source of the material that has been used.

This thesis contains my own writing; in areas where I have used other people's ideas, I have duly acknowledged the sources. I have paraphrased ideas that have been borrowed from other authors, and in instances where their ideas have been used word for word, I have duly enclosed these ideas in quotation marks and referenced them accordingly.

Furthermore, this thesis is being submitted for the award of the degree of Doctor of Philosophy to the Faculty of Science at the University of the Witwatersrand, in Johannesburg, South Africa. This is the first time I am submitting this thesis for examination and the award of the degree thereafter. It has never been submitted to any other university before for a similar purpose.

Signed: 

Nomfundo Sibiya

29 January 2024

DEDICATION

I dedicate this thesis to my family for their endless love, support, and encouragement throughout my academic journey.

EXECUTIVE SUMMARY

Climate change is a real phenomenon that has profound global implications. Its effects are felt across various sectors of the economy, potentially posing significant risks to both society and the environment. Consequently, there is a pressing need to prioritise climate change adaptation efforts. The objective of this study was to examine the role of governmental institutions at different levels (national, provincial, and local) in facilitating or impeding the development and implementation of comprehensive policies and strategies for climate change adaptation in South Africa. To gather the necessary data, the study employed participatory research methods, including online surveys, to gather insights from key stakeholders in uMkhanyakude District Municipality. Moreover, semi-structured interviews were conducted with government officials from the uMkhanyakude District Municipality, the KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs, as well as the Department of Forestry, Fisheries, and the Environment. These interviews aimed to investigate the institutional structures and policy frameworks that shape climate change governance in South Africa. The study assessed the organisation of existing climate change adaptation policy frameworks and identified the key actors involved in their development and implementation. It also examined whether these frameworks effectively enable or hinder community adaptation to climate change. Lastly, the study identified the barriers that hinder climate change adaptation in South Africa.

The findings of this research reveal the severe impacts that climate change has on both social and economic aspects. Within the uMkhanyakude District Municipality, it appears that women are particularly unaware of community initiatives, policies, and strategies for climate change adaptation. The National Climate Change Response White Paper and the National Climate Change Adaptation Strategy are the two primary policies driving the climate change adaptation agenda in South Africa. The formulation of these policies is based on identified climate change risks. However, while the process of formulating climate adaptation policies and strategies in South Africa may seem theoretically sound and have achieved some degree of success, it fails to incorporate the perspectives of those most affected by climate change. These findings suggest that the current mechanisms for involving marginalised groups in climate change decision-making are ineffective.

It can be argued that, although South Africa has developed good climate change initiatives, policies, and strategies, the implementation of these policies seems to present difficulties, as those for whom they have been developed do not seem to have any knowledge of their effectiveness in helping them build resilience against extreme weather events. Additionally, the findings demonstrate the existence of structures tasked with coordinating climate change matters across all government sectors affected, comprising inter-departmental arrangements, departmental arrangements, other institutions, and stakeholders. The inter-departmental arrangements consist of forums whose purpose is to ensure inter-sectoral coordination of climate change matters. The national Department of Forestry, Fisheries and the Environment assumes leadership and coordination responsibilities in developing and implementing responses to climate change adaptation in South Africa. The findings also revealed that government officials employed at the Department of Forestry, Fisheries and the Environment unanimously believe that the institutional arrangement of climate change at the national level effectively drives the climate change agenda. Conversely, government officials at the provincial and local levels exhibit diverse perspectives regarding the effectiveness of the institutional arrangements. Consequently, one can posit that there is inadequate coordination of climate change adaptation horizontally among national government departments and sectors affected by climate change impacts, as well as vertically between national, provincial, and municipal governments. This study divulged various barriers to climate change adaptation in South Africa, including insufficient financial resources, inadequate human capacity at provincial and local levels, limited political resolve at the local level, deficient comprehension of climate change adaptation issues among communities, insufficient coordination across government levels and sectors, absence of legal mandate at the local level, absence of climate change units at the district and local levels, lack of knowledge among certain staff members entrusted with environmental responsibilities at the local level, inadequate climate change plans in place at the local level, and utilisation of outdated climate change information in the Integrated Development Plans (IDPs).

This study proposes that policies should be jointly designed and implemented with vulnerable groups, based on local knowledge, and tailored to the specific needs of those most affected by climate change (e.g., women, the impoverished). There is a necessity to establish operational institutions that are dedicated to fulfilling their mandate, supporting communities, and fostering robust partnerships among civil society, the public sector, and the private sector.

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I would like to express my sincere gratitude to the following individuals and institutions: Firstly, I would like to thank God, the great "I AM" for giving me the strength and resilience to persevere and complete this degree. *"Now to him who is able to do immeasurably more than all we ask or imagine, according to his power that is at work within us"* (Ephesians 3:20). To my supervisor, Professor Mulala Danny Simatele, for his patience, guidance, and immeasurable support. Thank you for always keeping me accountable, pushing me to reach my full potential, and being equally invested in my success as I am. Thank you to the National Research Foundation (NRF) and the University of the Witwatersrand (funded through the Postgraduate PhD Merit Award) for the financial assistance. To all the research participants from uMkhanyakude District Municipality, KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs, and the Department of Forestry, Fisheries and the Environment, I thank you for participating in this study and providing invaluable insights.

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May the Lord be gracious to all of you!

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LIST OF ABBREVIATION AND ACRONYMS

CBO	Community-Based Organisation
CC	Climate Change
CCA	Climate Change Adaptation
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DFFE	Department of Environment, Forestry, and Fisheries
EDTEA	Economic Development and Environmental Affairs
FBO	Faith-Based Organisation
FOSAD	South African Directors General
ICCCG	Intergovernmental Committee on Climate Change
IDP	Integrated Development Plan
IPCC	Intergovernmental Panel on Climate Change
KZN	KwaZulu-Natal
MINMEC	Ministers and Members of Executive Council
MINTECH	Technical Intergovernmental Forum
NCCAS	National Climate Change Adaptation Strategy
NCCR-WP	National Climate Change Response (NCCR-WP) White Paper
NDP	National Development Plan
NGO	Non-Government Organisation
PCCCC	Presidential Climate Change Coordinating Commission
SA	South Africa
SALGA	South African Local Government Association
SSA	Sub-Saharan Africa
SAWS	South African Weather Service
UKDM	uMkhanyakude District Municipality
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

CHAPTER ONE

FRAMES OF REFERENCE

1.1 Background of the Study

It is widely acknowledged that climate change is a global concern that poses significant social, economic, and environmental risks (IPCC, 2023; Cook *et al*., 2016). Climate change impacts have significant implications for the lives and livelihoods of millions of poor people globally because the slightest change in precipitation amount or temporal distribution, short periods of extreme temperatures, or localised strong winds can harm livelihoods (Bele *et al*., 2013; Bryan and Behrman, 2013). As a result, adapting to the impacts of climate change has become an increasingly important issue around the world (IPCC, 2022), particularly because climate change is much more challenging to manage and the gap between what has been done and what needs to be done continues to widen. Research shows that, in the past few decades, the need for adapting to climate change and its impact has become a subject of many climate-related discussions globally, with a particular emphasis on strengthening resilience and adaptive capacity to climate risks and natural disasters (Holzkämper, 2017). The UNFCCC (2013) is of the view that, because the effects of climate change cannot be avoided, policies and practices focused on combating their impacts should be developed and adopted.

While it is recognised that climate change has devastating impacts globally, it is argued that it affects developing countries the most (Tol, 2018; Madzwamuse, 2010). Furthermore, the Intergovernmental Panel on Climate Change recognises that developing countries, especially those in sub-Saharan Africa, are extremely susceptible to climate change impacts as they lack the resources to adapt (IPCC, 2022). It is argued that several factors aggravate the susceptibility of poor people in sub-Saharan Africa to climate change. These factors include rapid population growth, high rates of poverty, low levels of education, weak institutions and policy frameworks, a lack of social safety nets, and limited technological advancement (Perez *et al*., 2015; IPCC, 2014). According to Tol (2018), the susceptibility of developing nations to the repercussions of climate change can be attributed to three factors. Initially, economically disadvantaged countries face greater exposure to weather conditions due to the significant involvement of agriculture and water

resources in their economies. Conversely, wealthier nations allocate a larger portion of their economic activities towards manufacturing and services, which typically offer a certain degree of protection against the unpredictable nature of weather and, consequently, climate change. Secondly, less affluent nations tend to be in regions with higher temperatures. This implies that ecosystems are in closer proximity to their biophysical thresholds and that there are no comparable instances of human conduct and technological advancements. In other words, if the most scorching areas on the globe experience even more extreme temperatures, no existing precedents can be used for guidance; instead, innovative technologies must be developed, and behavioural adaptations must be made through experimentation. Thirdly, developing nations have restricted adaptability potential, contingent upon a multitude of factors encompassing the availability of technology and the capability to finance said technologies. Impoverished nations commonly lack the privilege of contemporary technology and establishments that can aid in shielding against adverse climatic conditions. Moreover, they may also lack the capability, and occasionally the political determination, to assemble the resources for expansive-scale infrastructure projects such as irrigation and coastal protection.

A study by Ateeq-Ur-Rehman *et al*. (2018) found that, in rural areas of developing countries, livelihoods are most affected because of low agricultural productivity, decreasing natural resources, and ignorance of climate change, which leads to increased poverty. Therefore, although climate change adaptation is a global concern, the need for adaptation is considered higher among developing countries, where vulnerability is undoubtedly higher (Tol, 2018). It is estimated that, without adaptation, in the next decade alone, climate change will drive approximately 132 million people into extreme poverty (IPCC, 2022). Niang *et al*. (2014) argue that often the world's poor are considered the most vulnerable to climate change and thus most in need of adaptation to reduce the harm and risks climate change poses to their lives and livelihoods. This is supported by Cabral *et al*. (2017) and Nkhonjera (2017), who are of the view that African cities are underrepresented in climate change research and assessments of successful adaptation initiatives. Averchenkova *et al*. (2019) argue that the capacity of civil society to engage in climate change and influence decisions seems to be generally weak in developing countries. This is particularly true for rural poor communities, as they have limited resources and limited capacity to restrain their ability to engage.

South Africa, as a country, has had its share of climate change. Ziervogel (2018) found that southern Africa is observed as a particularly vulnerable region to the impacts of climate change. This is because of its high levels of poverty and inequality, as well as its heavy reliance on natural resources. It is evident that South Africa is in dire need of effective climate change adaptation policies, strategies, and governance. According to the 2011 National Climate Change Response Policy, the National Department of Environment, Forestry, and Fisheries is the lead department for climate change adaptation efforts in South Africa. However, an earlier study by Ziervogel *et al*. (2014) found that there is a gap in the mainstreaming, execution, and governance of climate change adaptation in South Africa. Belynda *et al*. (2018) argue that in South Africa, there is a lack of clarity regarding the roles and responsibilities of sub-national governments in response to climate change. There are several factors that influence effective climate change adaptation, such as the ability of national and local government institutions to lead successfully and to implement climate change adaptation policies (Rogers *et al*., 2023). Climate change governance in South Africa integrates the three levels of government, namely national, provincial, and local/municipal, all of which are expected to coordinate in the implementation of responses to climate change (Segal and Cloete, 2012). Given this, climate change impacts all spheres of the South African government, national, provincial, and local. However, the local sphere is at the forefront of vulnerability to climate change and is, therefore, better positioned to effectively design and implement climate change response strategies (Pasquini *et al*., 2015; Mukonza and Mukonza, 2014). Roberts (2010), however, found that, in South Africa, there are limited financial resources available locally to fund climate change adaptation initiatives at the national, provincial, and municipal levels. This view was supported by several studies that argue that at the national, provincial, and municipal government levels, lack of financial resources and knowledge prevents people and institutions from solving problems and managing change (Ngwenya and Simatele, 2020; Serdeczny *et al*., 2017; Moser and Ekstrom, 2010).

Wise *et al*. (2014) and Kates *et al*. (2012) recognised that most of the current adaptation strategies used by communities fall into the category of "incremental adaptation strategies." Incremental adaptation represents familiar strategies of small changes to existing practices to sustain the functioning of existing socio-ecological systems under climate change (Wise *et al*., 2014). However, in some instances, the rate or extent of predicted climate change may cause this type of adaptation to be insufficient (Kates *et al*., 2012). The limits of incremental adaptation have

motivated the scientific debates on transformational change as a necessary societal response to current and projected climate change (Olsson *et al*., 2014; Pelling *et al*., 2014; Ferguson *et al*., 2013; Westley *et al*., 2013; Rickards and Howden, 2012). Transformational change is increasingly being discussed as a necessary societal response option to manage current and projected climate risks (Olsson *et al*., 2014; Pelling *et al*., 2014; Ferguson *et al*., 2013; Westley *et al*., 2013; Rickards and Howden, 2012). Termeer *et al*. (2017) introduced the conceptualization of continuous transformational change, which focuses on empowering and accelerating small, in-depth changes. Westphal and Thwaites (2016) define transformational change as a long-term, fundamental shift in a system, whether political, economic, social, or biological. UNDP (2011: 9) defines it as "the process whereby positive development results are achieved and sustained over time by institutionalising policies, programmes, and projects within national strategies." In the context of governing institutions, governing continuous transformational change requires the transformation of the governance systems themselves.

However, Wise *et al*. (2014) recognise that it requires innovative governing strategies and the development of new FC intervention strategies. These scholars recognise the importance of government interventions that encourage learning, questioning of mindsets, leadership, and co-production. According to McCarney *et al*. (2011), there is no blueprint or agreed-upon "best practice" for climate change governance; however, there are some core ingredients that can aid successful climate response action at the local level. Whereas Craige *et al*. (2009a: 41) state that "governance and regulation are largely meaningless without compliance." Therefore, it is important to note that a committed local government can play an important role in supporting behaviour change among its citizens.

Duit and Galaz (2008) are of the view that any governance system must be balanced between "explorations," for instance, seeking new information or seeking new solutions, and "exploitation," for example, allowing time for existing measures to become effective or relying on what works. Therefore, scholars stress that effective climate governance will encourage synergies, learning, innovation, and multi-level cooperation (Termeer *et al*., 2017; Bulkeley, 2015). In addition, Moser and Boykoff (2013) challenge adaptation scientists and practitioners to undertake an "honest, critical, and sustained self-reflection and outward-facing examination" of our roles, behaviours, and decision-making structures in climate adaptation for poor people.

In view of the above assertions, it is undeniable that the sub-Saharan African region is more susceptible and vulnerable to the impacts of climate change than anywhere else in the world (Hummel, 2016). These impacts have been observed in all sectors of the economy, environment, and society (Skogen *et al*., 2018). A myriad of studies have addressed the impacts of climate change on poor communities in developing countries (Conway and Schipper, 2011; Yilmaz and Yazicigil, 2011). However, Biesbroek *et al*. (2010) and Keskitalo (2010) are of the view that the number of studies on climate change adaptation and the forms it takes is so far restricted, and much remains to be understood about the governance of adaptation and how this may affect its success or failure.

1.2 Thematic Considerations

Climate change impacts are already being felt in South Africa. According to the South African National Water Resource Strategy (2013), South Africa is classified as a water-scarce country with a highly variable climate and one of the lowest run-offs globally. These conditions are likely to be further exacerbated by the impacts of climate change. This is reiterated by Botai *et al.* (2018), who argue that South Africa faces heightened vulnerability to the impacts of climate change due to its semi-arid conditions and water scarcity. Several scholars have also argued that climate change poses environmental, social, and economic challenges for South African societies, particularly rural communities with high dependence on natural resources (Abrams *et al*., 2021; Rankoana, 2020; Masipa, 2017; Ofoegbu *et al*., 2017). Additionally, a study conducted by Serdeczny *et al*. (2017) posits that South Africa experiences the most significant decline in precipitation, accompanied by simultaneous drought risks. According to Kruger and Nxumalo (2017), drought and heatwaves, along with associated hydro-meteorological extremes, represent some of the most prevalent natural occurrences encountered in South Africa. The occurrence of these natural phenomena is becoming more frequent and intense, exacerbating the challenges faced in terms of water and food security within the nation (Kruger and Nxumalo, 2017).

The DEA (2013) observed that the country's mean annual temperatures have increased by more than 1.5 times, with the observed global average of 0.65 °C, with this trend expected to continue along with reduced rainfall, increased rainfall variability, drier winters, and a greater risk of severe droughts and extreme weather events in the southwestern regions of Africa (Niang *et al.*, 2014;

Davis-Reddy and Vincent, 2017; Nhemachena *et al*., 2014). It is advised that in the short term, South Africa should prepare for a temperature increase between 1 °C and 2 °C, while in the long term, there is a potential for an increase of 4 °C if current emission patterns persist (Carabine *et al*., 2014). Consequently, the annual temperature in South Africa has increased at a faster pace compared to the global average during the same period (Ziervogel *et al*., 2014). Schewe *et al*. (2014), for example, discovered that, in the context of South Africa, a decrease of 30–50% in annual runoff is expected under a projected warming scenario of 2.7°C by the close of the current century.

It has additionally been documented that in South Africa, there are notable rises in the maximum and minimum temperatures observed across nearly all seasons. These increases are particularly pronounced in the realm of hot extremes, while cold extremes have exhibited a decrease in both the western and northern interiors of South Africa (Mbokodo *et al*., 2020; Kruger and Nxumalo, 2017; DEA, 2013). The changes in both surface temperatures and precipitation are projected to have devastating impacts on marginalised groups, particularly women and children (Amoah and Simatele, 2021). These projected changes, coupled with water scarcity, will exacerbate existing stresses, leading to adverse effects on agriculture, water and food security, ecosystem services, and the South African economy (Archer *et al.*, 2019; Nhemachena *et al*., 2014; Ziervogel *et al*., 2014; Hannah *et al*., 2013). As a result, South Africa is expected to experience a decrease in total rainfall throughout the country, accompanied by an increase in the intensity of rainfall storms (Rogerson, 2016). Masipa (2017) asserts that the increasing temperatures, scarce rainfall, and their consequences on food security are increasingly recognised as significant health concerns in various regions of South Africa. This is in line with Strydom *et al.* (2019), who found that climate change is having a devastating impact on the South African economy, inevitably increasing the country's pressure on its scarce water resources. This, in turn, impacts the country's agricultural sector, which plays a crucial role in addressing the key challenges of food security, employment, and poverty (Strydom *et al*., 2019). Around 8.5 million individuals depend on agriculture for employment and income, with approximately half of them engaged in small-scale farming (Government of South Africa, 2013: 44).

According to Mthembu and Hlophe (2020), the adaptive capacity of South Africa towards the impacts of climate change is predisposed by social factors such as unemployment and poverty as

well as housing typologies such as informal settlements, which are highly susceptible to extreme weather events. In view of this, if climate change is not given full attention, water scarcity for agriculture and human use will increase, particularly in the semi-arid areas of South Africa (Chimonyo *et al*., 2019).

The province of KwaZulu-Natal is known for its warm to intense summers, heat waves, forest fires, and mild winters (Ndlovu *et al*., 2021). It has been documented that KwaZulu-Natal houses the majority of the impoverished districts in South Africa, specifically six out of ten. According to Ngobese and Msweli (2013: 226), the province of KZN "is the largest province in South Africa with the highest proportion of poverty-stricken households. The prevalence of poverty in the province provides a close-up view of the bottlenecks and challenges faced by the South African government in addressing poverty." In this province, extreme weather events have mainly manifested as droughts and flooding (David *et al*., 2018; Schreiner *et al*., 2018). Thornhill *et al*. (2009) found that the province of KwaZulu-Natal has the highest flood risk in South Africa. Pinto *et al*. (2022) reported on the devastating impacts of exceptionally heavy rainfall of more than 300 mm in the KwaZulu-Natal and Eastern Cape provinces in 2022. Over 40,000 people were impacted by the rainfall and subsequent floods. In the affected areas, 435 people were reported dead, 55 injured, and 54 missing (Government of South Africa, 2022). In light of the fact that climate change is likely to make agricultural challenges worse, KwaZulu-Natal province is currently one of the most vulnerable provinces (Zwane, 2019). Evidently, climate change in KwaZulu-Natal will have severe and unequal impacts on poor rural communities that base their livelihoods on rain-fed agriculture and are socially vulnerable to climate change (Pickson and Boateng, 2022). Despite these impacts, it is important to note that poor rural people are not passive actors; they are actively involved in protecting and modifying their asset portfolios against the impacts of extreme weather events (Moser and Satterthwaite, 2008). Engle (2011) found that the adaptive capacity and resource base for adaptation are influenced by human and social assets. However, those with fewer assets are less likely to cope with or adapt to the impacts of climate change and must make difficult decisions, which include sacrificing food consumption, opting for quantity rather than nutrition, selling productive assets, or reducing costs such as their children's education (Kristjanson *et al.*, 2017).

uMkhanyakude District Municipality is the second poorest district municipality in the province and the fifth poorest municipality in South Africa (Sartorius and Sartorius, 2016). In addition, according to Statistics South Africa (2011), uMkhanyakude District Municipality has high levels of poverty, inequality, and unemployment. Furthermore, in uMkhanyakude District Municipality, most of the population relies on government provisions (David *et al*., 2018). Mthembu and Hlophe (2020) found that the uMkhanyakude District Municipality has a low adaptive capacity for the implications of climate change.

1.3 Rationale of the study

If the issue of climate change is not adequately addressed, it will persistently result in severe consequences for a significant number of individuals on a global scale, as well as for various sectors of the economy (Angelsen and Dokken, 2018). According to Kristjanson *et al.* (2017) as the intensity, frequency, and duration of climate risks increase, the role of governments in managing these risks has expanded, along with the growing reliance on policies and institutions to support low-income households.

Despite the widespread and increasing interest among scholars and policymakers in climate change governance (Persson, 2019), there is a limited amount of research on the effectiveness of climate change adaptation initiatives and policies in facilitating communities' ability to adapt to the impacts of climate change. Moreover, while there is a growing research interest in gaining a better understanding of climate change adaptation governance arrangements to advance the implementation of adaptation objectives (Huitema *et al*., 2016), there is limited empirical evidence describing adaptation governance and the effectiveness of institutional structures that drive the climate change adaptation agenda (Bednar and Henstra, 2018). Additionally, the governance of adaptation is considered a challenge for various levels of government (Keskitalo, 2010); however, the impact of institutional frameworks on other levels of governance remains unclear. Several scholars argue for the need to enhance the evidence base and deepen our understanding of the role of institutions in climate change adaptation and mitigation (Arbuckle *et al*., 2015; Eriksen *et al*., 2015a). Furthermore, Wong *et al*. (2014) contend that theoretically grounded empirical research on institutional dimensions of climate change adaptation is particularly limited. The DEA (2018) and Ziervogel *et al*. (2014) further argue that there is limited information detailing the ideal

institutional structures, functions, and processes that would inspire effective and efficient climate change adaptation governance in multifaceted countries such as South Africa. This assertion is supported by Mubaya and Mafongoya (2017), who emphasise the urgent need to examine the role of institutions and institutional arrangements in adaptation processes. Consequently, there is a general scarcity of research devoted to understanding how the combination of horizontal and vertical structures can enhance the adaptive capacity of impoverished communities in the face of climate change impacts.

In view of this, this study investigated how institutions operating at different scales (national, provincial, and local) play a role in either enabling or hindering the development and implementation of comprehensive policies and strategies for climate change adaptation in uMkhanyakude District Municipality. At its core was the need to understand how climate change policies and strategies are developed and whose voices matter in their development and implementation in South Africa.

1.4 Research Questions

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

(i) What are the community's perceptions of the impacts of climate change in uMkhanyakude District Municipality?
(ii) To what extent can the current policies and strategies achieve climate change adaptation for communities in South Africa?
(iii) To what extent are grassroots communities involved in the formulation and adoption of policies and strategies in South Africa?
(iv) What role do government institutions play in the implementation of climate change adaptation policies and strategies in South Africa?
(v) What are the key barriers and opportunities for the implementation of climate change adaptation policies and strategies?

1.5 Research Aims and Objectives

The main aim of this study was to investigate the role of institutions operating at the different government levels (national, provincial, and local) in enabling or hindering the development and implementation of comprehensive policies and strategies for climate change adaptation in South Africa, using uMkhanyakude District Municipality as a case study.

To achieve this aim, the following objectives were formulated:

(i) To assess community perceptions on the impacts of climate change in uMkhanyakude District Municipality,
(ii) To identify the current climate change adaptation policies and strategies,
(iii) To explore the extent to which grassroots communities are involved in the formulation of policies and strategies,
(iv) To examine the role of institutions in driving the climate change adaptation agenda in South Africa, and
(v) To investigate the key barriers and opportunities to climate change adaptation in South Africa.

1.6 Summative Perspectives on the Key Literature of the Study

Feliciano *et al*. (2022) posit that climate change has wide-ranging effects on various domains, such as ecology, environment, socio-politics, and socio-economics, thus presenting a complex global intergovernmental predicament. The IPCC (2023) contends that climate change has hindered the achievement of Sustainable Development Goals by jeopardising food security and impacting water security due to rising temperatures, altered precipitation patterns, depletion, and diminishment of cryospheric components, as well as heightened frequency and intensity of climatic extremes. In several regions across the globe, an increase in drought occurrences is expected in the near future as a consequence of climate change (Malhi *et al*., 2021). It is projected that by 2100, the extent affected by drought will have expanded from 15.4% to 44.0%. Projections indicate that a significant proportion of the global population, approximately half, will face high water stress conditions in the coming decades as a result of anticipated climate change (Byers *et al*., 2018).

The sub-Saharan African region is expected to be the most affected by moisture deficits as changes in rainfall patterns are resulting in changes in the areas suitable for growing many crops (Davis-Reddy and Vincent, 2017). It has been projected that, in the absence of the development of new regulations and measures, there will be a significant increase in carbon dioxide emissions by an additional 25–90% by the year 2030 (IPCC, 2007). The IPCC (2022) asserts that, in the absence of adaptation, climate change will lead to an estimated 132 million individuals falling into extreme poverty within the next ten years alone. Furthermore, the necessity of adapting to climate change is widely recognised by several policymakers and scholars, particularly in critical areas of policy such as infrastructure, agriculture, public health, and urban planning (Wamsler and Pauleit, 2016; Albers *et al*., 2015). While the concept of adaptation has been examined across different levels of analysis, the academic discourse on adaptation often places a strong emphasis on the significance of locally focused initiatives. In this context, the incorporation of local and site-specific strategies becomes instrumental in attaining favourable outcomes in adaptation efforts (Measham *et al*., 2011). Thus, successful adaptation requires "socially and environmentally sustainable development pathways that include both social justice and environmental integrity" (Eriksen *et al*., 2011: 8).

It is suggested that, in the context of climate change, variations among nations arise due to the structural characteristics of their economies and industries, as well as the adopted national policy positions that establish a connection between climate change and economic development (Griffiths *et al*., 2007). Whereas McNall (2010) holds the perspective that a combination of political neglect and a disregard for the welfare of future generations has led global society to a pivotal turning point. On the other hand, Reid *et al*. (2012) observed that worldwide, civil society is gradually assuming a significant role in raising awareness about climate change while utilising advocacy to ensure that insights from local adaptation initiatives permeate national-level policies. Adger (2006) argued that adaptation to climate change is not a discretionary option for vulnerable groups but rather an obligation; however, these same groups are frequently disregarded in the decision-making process of adaptation policies.

Bryan and Behrman (2013) argue that although the literature on climate change adaptation is quite extensive, much of it focuses on policy responses to climate change (either nationally or internationally) or independent adaptation at the individual or household level, often leaving out

community-level adaptation efforts. Zacarias (2018) and Lemos *et al*. (2013) emphasise that responding to climate change at the rural community level in southern Africa is a major development challenge that is considered in the context of wider development pressures, which include poverty and sustainable management of forest and land resources. Hernandez *et al*. (2022) highlight the significance of Indigenous knowledge, stating that it has been a survival mechanism for ages. Indigenous knowledge is an essential component of communities that is passed down through generations, and in this way, so is the culture of the community (Sraku-Lartey, 2014). Bernauer and Gampfer (2013) found that the public was more supportive of climate change policies if civil society was involved in the process.

Keskitalo and Kulyasova (2009) make us aware of the importance of understanding climate adaptation governance as a multi-level phenomenon. A multi-level climate governance approach can bring about a bigger "alignment" or "orchestration" of climate actions (Abbott, 2017; Chan *et al*., 2015; Zelli and van Asselt, 2013). The importance of multi-level governance for transformative climate action has gained increasing global attention (Abbott, 2017; Chan *et al*., 2015; Zelli and van Asselt, 2013).

Drexhage (2008) argues that over the many years that climate change has been a subject of serious international negotiations, the trend has been towards broadening participation in those deliberations, but, for the most part, it continues to be led by environment departments and constituencies. This is evident in South Africa, where the National Department of Environment, Forestry, and Fisheries is the lead department for climate change adaptation efforts. However, Ziervogel and Parnell (2012) are of the view that one of the challenges that local governments face in mainstreaming adaptation to climate variability is the lack of authority held by environmental departments to address climate variability.

According to Kotzé (2009), South Africa's existing environmental governance system is fragmented, leading to ineffectiveness, and, as such, suggests that integrating climate change governance will pose considerable challenges. The main challenge seems to be that "implementation failure at the local level limits the effective functioning of the environmental governance framework" (DEA, 2006: 75). This is supported by Averchenkova *et al*. (2019), who are of the view that, despite South Africa having an elaborate system for vertical and horizontal coordination, the effectiveness of coordination and the level of integration remain low. In fact, in

South Africa, many factors contribute to vertical fragmentation, including structural fragmentation, a lack of capacity at local or provincial levels, a lack of understanding and awareness about climate change, a lack of long-term planning, financial inequalities among provinces and municipalities, a high level of heterogeneity among provinces and municipalities, a lack of horizontal coordination, and a poor understanding of the environmental framework in local government, among many others (Giordano *et al*., 2011). The fragmentation of governmental institutions is seen as one of the major challenges in the field of environmental protection in South Africa (Craige *et al*., 2009a; Kotzé, 2009). In addition, Averchenkova *et al*. (2019) found that there is little coordination and cooperation among different non-state actors. This is in part due to the high level of competition for consulting contracts among consulting companies and research institutions. As a result, many actors with the highest levels of knowledge, a supportive stance on climate change policy, and high levels of personal commitment miss out on the opportunity to cooperate and be more effective in pushing for a more ambitious climate policy. Lonsdale *et al*. (2015) argue that existing governance regimes inside and outside of the climate domain tend to be dominated by incremental decision-making, short-term policy cycles, and powerful interests favouring optimisation in the short-term, thus precluding more disruptive changes in the long-term and perpetuating dangerous maladaptation.

In view of the above, the establishment of the IPCC (1988) and the United Nations Framework Convention on Climate Change (UNFCCC) (1992) were two essential milestones for scientists and policymakers in understanding climate change and striving to address its effects and causes. The UNFCCC procedures and agendas have greatly influenced the direction of thinking as well as policy on climate change and variability adaptation. In addition, the 2015 Paris Agreement under the UNFCCC established several adaptation provisions. This included, for the first time, a global goal on adaptation: "enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change to contribute to sustainable development and ensure an adequate adaptation response in the context of the temperature goal referred to in Article 2" (Article 7.1). Furthermore, adaptation was indisputably recognised as a "global challenge" (Article 7.2). McKibbin and Wilcoxen (2002) are of the view that the Kyoto Protocol is an impractical policy focused on achieving an unrealistic and inappropriate goal. Furthermore, McKibbin and Wilcoxen (2002) argue that as long as the Kyoto Protocol remains focused on establishing a targets-and-timetables approach to climate change policy, it will be of little substance.

In South Africa, the key policies that resulted from the National Climate Summit, "Climate Action Now," in 2005 include the National Climate Change Response White Paper (Government of the Republic of South Africa, 2011) and South Africa's Second National Communication under the United Nations Framework Convention on Climate Change (DEA, 2011). Given the above, Stern (2022) holds the perspective that there remains a chance for climate change policy to adopt an effective and feasible shape. However, it is imperative for leaders to emerge and prevent the loss of this opportunity. A detailed account of this discussion is presented in Chapter 2.

1.7 Summary of Methodological Underpinnings

According to Saunders *et al*. (2012), research methodology can be defined as a comprehensive framework that delineates the principles and guidelines for conducting research. It encompasses the underlying theoretical and philosophical assumptions that underpin the research process, as well as the ramifications these assumptions have on the selection and implementation of research methods. It was important for this study to adopt an appropriate research methodology. Therefore, to explore the perceptions of communities on issues relating to the governance of climate change adaptation in South Africa, this study employed a combination of participatory research tools. These included online surveys, semi-structured interviews, and a documentary review of existing data. A mixed method is defined by Creswell and Poth (2016) as a methodology that places emphasis on the collection, analysis, and integration of both quantitative and qualitative data within a singular investigation or sequence of investigations. Its fundamental principle posits that the utilisation of both quantitative and qualitative approaches in conjunction yields a more comprehensive comprehension of research quandaries compared to the implementation of either approach in isolation. The study focused on communities in uMkhanyakude District Municipality, which comprises four local municipalities, namely Big 5 Hlabisa Local Municipality, Jozini Local Municipality, uMhlabuyalingana Local Municipality, and Mtubatuba Local Municipality. A purposive sampling method was used to identify key stakeholders in the four local municipalities of uMkhanyakude District Municipality in northern KwaZulu-Natal. The target population for the study involved key stakeholders, which included councillors, religious or church leaders,

traditional leaders (iziNduna[1] and Amakhosi[2]), business leaders, school principals, representatives from different non-government organisations, and community leaders representing different community-based organisations. The study population also included key actors from the national Department of Forestry, Fisheries and the Environment, the KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs, and the uMkhanyakude District Municipality.

Two philosophical positions underlined this research. Firstly, there is the constructivist philosophy. It expresses that people actively construct their social world through experience; they are not the cultural dopes or passive dolls of positivism (Gemma, 2018). Secondly, this research followed the interpretivist philosophy. Gemma (2018) contends that there is a distinction between the natural and social worlds and that social organisation and social experiences shape our perceptions of reality and truth. A detailed research methodology is provided in Chapter 3 of this study.

1.8 Scope and Limitations of the Study

This study was carried out in uMkhanyakude District Municipality in the province of KwaZulu-Natal, South Africa. The District Municipality consists of four local municipalities, which are UMhlabuyalingana Local Municipality, Jozini Local Municipality, Mtubatuba Local Municipality, and Big 5 Hlabisa Local Municipality. The context of this study was at study sites where the communities have low adaptive capacity and resilience towards the impact of climate change.

The study is subject to a few limitations. Firstly, it focused on the perceptions of key individuals in the community. Although engaging with key individuals in the community is important in acquiring a better understanding of the local community's needs and resources, household members are the ones who navigate climate change issues daily. This study recognised that there are two ways to tackle climate change: adaptation and mitigation. However, the scope of this study is limited to the governance of climate change adaptation. In view of this, the study examined the

[1] iziNduna: tribal councillor(s) or headmen among the Zulu people of South Africa
[2] Amakhosi: chiefs or leaders of communities or tribes among the Zulu people of South Africa

perceptions of key stakeholders in the uMkhanyakude District /Municipality. Furthermore, climate change adaptation government officials were engaged in articulating the role of institutions in facilitating climate change adaptation at national, provincial, and local scales. This is in a bid to influence the development and implementation of current and future climate change policies and strategies in South Africa.

The study was conducted during the global pandemic (COVID-19) and thus relied on online data collection methods. This may have posed a limitation because digitally illiterate participants may not have been able to participate in the online survey. Thus, this led to a digital divide, which increased the social exclusion of already vulnerable groups. This study focused only on the barriers to climate change adaptation. While the findings of this study reaffirm the importance of investigating and addressing the barriers to climate change adaptation, the researcher is aware that the barriers are highly context-specific, challenging to compare, and difficult to use for a more generalised understanding. Most notably, the analysis focused narrowly on the barriers to climate change adaptation without taking into consideration the barriers encountered by government officials working in subsectors of the economy such as water, agriculture, and energy that are affected by climate change. I recommend that these limitations be addressed and explored in future studies.

1.9 Ethical Considerations

Bhandari (2023) argues that ethical considerations in research are a set of principles that guide the research design process and practices. It refers to an “ethos” or “way of life" or “social norms for conduct that distinguish between acceptable and unacceptable behaviour” (Ongong’a and Akaranga, 2013). Winkler (2022: 5) argues that ethics “are a system of moral principles and norms that guide the relationships between humans and their natural and artificial environment.” For this study, the ethical considerations that were observed included the researcher obtaining ethical clearance from the University of the Witwatersrand Human Research Ethics Committee to conduct research in uMkhanyakude District Municipality, KwaZulu-Natal Department of Economic Development and Environmental Affairs, and the Department of Forestry, Fisheries and the Environment. Ethics approval was issued on October 16, 2020, and the protocol number is

H20/10/27 (see Appendix A: Ethical Clearance Certificate). Further, permission was requested from the uMkhanyakude District Municipality KwaZulu-Natal Department of Economic Development and Environmental Affairs, and the Department of Forestry, Fisheries and the Environment, as these departments drive the climate change discourse. Once permission was granted, the research participants were contacted through their e-mail addresses, and the nature and importance of the study were explained to them. Subsequently, their informed consent to participate in the study was requested. The right to confidentiality and anonymity and the right to withdraw from the study were observed. To ensure confidentiality and anonymity, no names were asked in the online survey. The research participants were also given the opportunity to ask questions and request clarification whenever they needed to. The researcher also advised the research participants on the availability of the research findings, which will be published as research articles and PhD theses and are accessible through Wits WIReDSpace.

1.10 Structure of the Thesis

The thesis is a monograph that comprises six chapters. **Chapter One** of this thesis introduces the study and details how the research was conceptualised. This chapter also provides the frames of reference, which include the thematic consideration, the significance of the study, the research questions, the aims and objectives, and the theoretical considerations. **Chapter Two** provides a comprehensive review of the existing literature on climate change governance and outlines the existing thematic gaps. **Chapter Three** presents the detailed methodological considerations that were designed to guide the research process of this study. **Chapter Four** presents the empirical evidence of this study. This includes identifying the impacts of climate change on the communities of uMkhanyakude District Municipality. The chapter details the role of institutions in driving the climate change adaptation agenda in South Africa. Furthermore, it exposes how climate change policies and strategies are developed and implemented. **Chapter Five** provides an analysis and discussion of the findings of this study. **Chapter Six** draws a synthesis and conclusion of the study. In addition, this chapter provides policy recommendations and suggestions for future research.

CHAPTER TWO

THEORETICAL CONSIDERATIONS AND LITERATURE REVIEW

2.1 Introduction

The climate is changing rapidly, and it is having devastating impacts on the lives of many people globally (IPCC, 2022; Clarke *et al*., 2022; Pickson and Boateng, 2022). The sub-Saharan African region is the most susceptible and therefore has a greater need for adaptation (Pachauri *et al*., 2014). However, climate change adaptation is a complex process that involves transformations implemented through governance at multiple levels. The Paris Agreement (Article 7.2) under the UNFCCC argues that adaptation is a global challenge faced by all, with local, regional, subnational, national, and international dimensions. Thus, institutions are gradually viewed as indispensable to advancing adaptation (Eisenack *et al*., 2014; Moser and Ekstrom, 2010).

This chapter is dedicated to examining the diverse perspectives that exist in the literature on climate change adaptation, the policy landscape for climate change adaptation, and the role of institutions in facilitating climate change adaptation. A literature review is defined as "a study that analyses and synthesises an existing body of literature by identifying, challenging, and advancing the building blocks of a theory through an examination of a body (or several bodies) of prior work" (Post *et al*., 2020: 352). A literature review plays an important role in research because science remains, first and foremost, a collective endeavour (Brocke *et al*., 2009). Therefore, it was important for this study to engage with the views of various scholars to gain insights from the literature on what has been investigated pertaining to the governance of climate change adaptation.

This chapter consists of eight sections. Firstly, it explores key concepts of climate change adaptation, governance, institutions, and community participation and contextualises these concepts in a manner that will be understood in the present study. It is important to define these concepts to provide a common understanding of the words we refer to in this study. The second section is dedicated to outlining the global perspective on climate change adaptation. The third section is dedicated to contextualising the climate change adaptation literature in the sub-Saharan African region. The fourth section outlines perspectives on climate change adaptation in South Africa. In the fifth section, perspectives on Indigenous knowledge and pro-poor adaptation are

contextualised. The sixth section contextualises the role of governance in climate change adaptation. The seventh section comprises the theoretical framework. The last section is dedicated to identifying the gaps in knowledge that have been identified as being under-researched or misunderstood. It is through identifying the gaps in knowledge that a theoretical foundation for this study has been provided and positioned within the context of the existing literature on the governance of climate change adaptation.

2.2 Conceptual Framework for Key Concepts

2.2.1 Climate Change Adaptation

The concept of climate change adaptation is perceived in various ways by scholars from different academic disciplines. According to the UNFCCC (1992), climate change adaptation refers only to new actions in response to climate changes that are attributed to greenhouse gas emissions. In the definition provided by the UNFCCC, adaptation does not refer to improving adaptation to climate variability or change that is not attributed to greenhouse gas emissions. Whereas the IPCC Third Assessment Report (IPCC, 2001: 653) defines climate change adaptation as the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." Other scholars define adaptation as transitioning from a phase of awareness and promotion to the construction and implementation of plans, strategies, legislation, and projects at national, subnational, and local levels (Berrang-Ford *et al*., 2011; Preston *et al*., 2011; Romero-Lankao and Dodman, 2011; Biesbroek *et al*., 2010; Tompkins *et al*., 2010). All these definitions provide us with some understanding of what one could regard as adaptation. Smit and Pilifosova (2003) define adaptation as the adjustment of behaviours, actions, and decisions within biological, social, and built systems in response to changes in the climate. These adjustments can either be reactive to past events or anticipatory in preparation for future events or conditions (Smit *et al*., 2000). Given that climate change adaptation aims to reduce vulnerability and enhance resilience, a comprehensive approach is necessary in the planning and decision-making processes at national, regional, and global levels. One of the objectives of adaptation is to enhance adaptive capacity, which refers to the ability to effectively respond to changing stresses and shocks in order to manage or mitigate risks (Engle, 2011).

Another objective is to increase resilience, which is the capacity of a social or ecological system to continue functioning when faced with unexpected challenges and stresses (Nelson *et al*., 2010). The third objective is to reduce vulnerability, which pertains to the susceptibility to harm when exposed to external hazards (Yamin *et al*., 2005). These three goals have emerged from different academic disciplines, including ecology, human geography, sustainability science, risk management, and development, and have converged within the realm of adaptation research (Goldman *et al*., 2018). As explained by Smit and Wandel (2006), these adaptation goals are often interconnected.

Climate change adaptation utilises a combination of structural (such as organisational structures) and non-structural measures, including policies, knowledge development, awareness, and participatory approaches. These measures have the ability to effectively decrease disaster risk and enhance the adaptive capacity of communities and nations (Tearfund, 2008). The governance of climate change adaptation is both facilitated and constrained by organisational structure (Burch, 2010b). In well-designed organisational structures, institutions can facilitate the implementation of adaptation measures, while certain rules and procedures (or lack thereof) may act as constraints (Biesbroek *et al*., 2013). In situations of high uncertainty, particularly those of epistemic nature, Refsgaard *et al*. (2013) argue that non-structural planned measures are preferred over structural measures. This is because as new knowledge is acquired, it will be easier and less expensive to modify the response compared to structurally planned actions.

Both structural and non-structural measures related to climate change adaptation aim to influence human behaviour and decision-making (Bowen *et al*., 2014; Vaughan and Dessai, 2014), introduce innovative technologies and infrastructure (Schenk *et al*., 2016; Hill, 2015), implement management, governance, and institutional policies (Henstra, 2016; Okereke *et al*., 2009), enhance people's access to resources (Ribot, 2011; Adger, 2006), and reduce exposure to environmental risks (Jost *et al*., 2016; Jordan *et al*., 2015). Experts and policymakers should promote the integration of climate change adaptation into sustainable development plans and policies. The IPCC (2014), for instance, suggests that incorporating climate adaptation into sustainable development strategies can lead to mutually beneficial outcomes (Roy *et al*., 2018). Therefore, it is crucial to mainstream climate change adaptation into national development plans, poverty

reduction strategies, sectoral policies, and other development tools and techniques (Melgarejo and Lakes, 2014; Tearfund, 2008).

Despite the growing recognition of climate change adaptation, there are obstacles that hinder its effective integration. On a global and international scale, the institutions responsible for implementing climate change adaptation strategies often operate separately. Therefore, it is crucial to establish linkages between global, national, and sub-national platforms and organisations. Climate change adaptation should be grounded in comprehensive approaches that encompass the identification and assessment of risks, the implementation of safeguard measures, and the establishment of early warning systems (EFDRR, 2013). The involvement of all relevant actors from the local authorities at various stages of the process is crucial and should be facilitated through a governance framework (EFDRR, 2013). Figure 2. 1 has been drawn to provide a conceptual framework for better understanding climate change adaptation at the local, provincial, and national government levels.

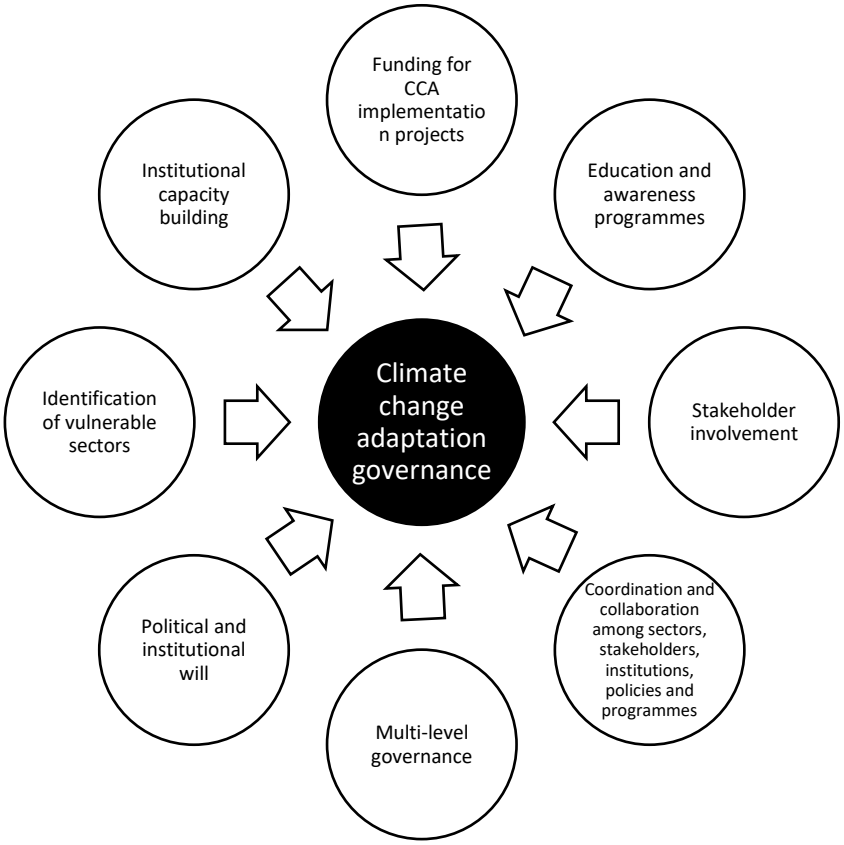

Figure 2. 1: Conceptual framework for climate change adaptation

Source: Adapted from Begum *et al*. (2014)

Gero *et al*. (2011) have proposed a multi-faceted and multi-sectoral approach to climate change adaptation governance. Thus, it is imperative to engage stakeholders such as local governments, non-governmental organisations, community members, and pertinent national and international institutions in the decision-making process. The participation of interested parties can mitigate uncertainties in policy implementation by reducing the likelihood of unforeseen opposition (Newig *et al*., 2005). Inclusion of a broader range of stakeholders also grants access to diverse forms of knowledge, which is essential for a comprehensive evaluation of resource governance challenges and for the development of innovative solutions (Ozdemir *et al*., 2023). The concept of multi-level governance within polycentric systems implies that decision-making authority is distributed across a nested hierarchy rather than concentrated at a single level. This model rejects a top-down approach where decisions are enforced solely by the highest level of government, as well as a medium-level approach where states or provinces make decisions that only benefit their own region without considering others. It also rejects a decentralised approach where individuals have complete freedom to act or are solely governed by market dynamics (Pahl-Wostl, 2009).

Education and awareness campaigns regarding the significance of climate change adaptation can contribute to effective development planning and programming. The efficient allocation and disbursement of funds can enhance the integration of climate change adaptation measures, including capacity building for planning, preventive actions, preparedness, and the management of climate-related disasters such as droughts and floods in vulnerable regions (DFID, 2008). This can be achieved through well-designed funding mechanisms, clear guidance, and effective negotiation among relevant parties at the international, regional, national, and local levels. The successful integration of climate change adaptation requires the establishment of coordinated and collaborative efforts across sectors, stakeholders, institutions, and programmes (Runhaar *et al*., 2018; Fünfgeld, 2015). The integration of climate change adaptation into all sectors will only materialise if there is strong political and institutional commitment. Therefore, it is paramount to prioritise attention to the political and institutional will (Runhaar *et al*., 2018; Fünfgeld, 2015).

2.2.2 Governance of Climate Change Adaption

The concept of governance pertains to the exercise of political power in managing the affairs of a nation (Leftwich, 1993: 610). Mayntz (2006: 15), on the other hand, defines it as the co-existing forms of collective regulation of societal circumstances, ranging from institutionalised civil society self-regulation to various forms of cooperation between public and private stakeholders, as well as sovereign action by governmental stakeholders. The Commission on Global Governance (1995) provides the definition of governance as the sum of the ways in which individuals and institutions, both public and private, manage their common affairs. It is an ongoing process that allows for the accommodation of conflicting or diverse interests and enables cooperative action. This includes formal institutions and regimes with the authority to enforce compliance, as well as informal arrangements that individuals and institutions either agree to or perceive to be in their best interest. Governance has four distinct characteristics. Firstly, it is not a set of rules or an activity, but rather a process. Secondly, the process of governance is centred around coordination rather than control. Thirdly, it encompasses both the public and private sectors. Lastly, governance is not a formal institution but rather a continuous interaction (Keping, 2018: 3). According to Benz *et al*. (2007), governance is a theory that deals with managing interdependencies among actors at multiple levels and in multiple sectors. Climate change governance refers to the broad range of coordination forms related to climate change adaptation and mitigation (Olsen, 2009: 257; Heinelt and Kübler, 2004; Mayntz, 2004; Kooiman, 2003).

The effectiveness of governance in climate change adaptation is crucial to addressing one of humanity's most significant and persistent challenges (Stevenson and Dryzek, 2012). There are ongoing debates surrounding the emerging configurations and conditions of climate governance, including discussions on polycentric governance, the integration of climate change across policy sectors, and climate governance experimentation (van Asselt *et al*., 2018; Jordan *et al*., 2018). It is acknowledged that various types of actors play a role in the development and implementation of climate governance strategies and actions. This includes subnational and non-state actors such as local and regional governments, community-based organisations, and businesses (Wurzel *et al*., 2019; Hildén *et al*., 2017; Burch *et al*., 2016). While the broader context of global climate governance can be seen as an institutional complex, we refer to it here as the wider “governance

landscape" to differentiate it from sectoral institutional complexes (e.g., van Asselt and Zelli, 2018; Keohane and Victor, 2011).

2.2.3 Institutions

Ingram and Clay (2000: 526) provide a definition of institutions as "the rules, along with their mechanisms of enforcement, that restrict the choices made by actors." According to North (1990: 3), institutions can be defined as "the rules of the game within a society, or, more formally, the constraints that are devised by humans and shape human interaction." The Institutions Project of the International Human Dimensions Programme defines institutions as "systems of rules, decision-making procedures, and programmes that give rise to social practices, assign roles to participants in those practices, and guide interactions among those occupying relevant roles" (IDGEC, 1999: 14). Institutions are seen as shared practices through which individuals address their mutual interdependencies (Paavola, 2007), attributing meaning and normativity to specific situations (Vatn, 2005). Institutions exist in order to tackle collective action problems. They provide a socially justified meaning to individual actions (Knight and North, 1997; Denzau and North, 1994), thereby influencing how individuals perceive problems (including climate change) and connect them with potential solutions (including adaptation). Institutions can serve as crucial coordination mechanisms through which communities, organisations, and societies can develop and utilise their knowledge, skills, technology, infrastructure, financial resources, and other necessary resources for adaptation (Yates, 2012; Moser, 2009; Ivey *et al*., 2004). Institutions influence decision-making through various means: they restrict, enable, and incentivize actions; connect individual actions, events, and outcomes; distribute authority and power; define reciprocal rights and duties; and shape beliefs, motivations, and social learning (Pahl-Wostl, 2009; Hagedorn, 2008; Paavola, 2007; Ostrom, 2005; Vatn, 2005; North, 1990).

2.2.4 Community Participation

The scholarly literature surrounding climate change has recently witnessed notable advancements in explicating the crucial role of community participation as a mechanism for achieving successful

and effective adaptation strategies (Galicia *et al*., 2015; Ross *et al*., 2015). Scholars have highlighted that the absence of a universally accepted definition of participation (Rowe and Frewer 2000), which has resulted in diverse terminologies, conceptualizations, characteristics, and manifestations, is the primary factor responsible for ineffective and insignificant community engagement in climate change adaptation efforts (Piggot-Mckellar *et al*. 2019; Samaddar *et al*. 2015). The concept of community participation remains ambiguous and contentious due to the absence of a systematic endeavour to establish a participatory framework for climate change adaptation. A robust framework for community participation is understood to encompass a set of processes and outcome-based variables that encompass the involvement of communities in the decision-making process (Samaddar *et al*., 2017; Reed, 2008). This is exemplified by continuous community engagement or involvement of relevant stakeholders, utilisation of local resources and knowledge, effective facilitation, accountability and fairness, ownership, equality, and other related aspects.

2.3 Contextualising the literature on climate change adaptation: A global perspective

It has been conclusively argued that the climate is changing rapidly, with disruptive impacts in many ways in all parts of the world (IPCC, 2022). It has also been confirmed that the emission of greenhouse gases is a major cause of global warming (IPCC, 2013). Studies by the IPCC suggest that climate change is often attributed to both natural and anthropogenic (human-induced) factors (IPCC, 2007b). This is further echoed by Stern (2008), who argues that anthropogenic factors such as (i) carbon pollution from fossil fuels; (ii) agriculture, mostly from soil and livestock; and (iii) land use changes, mainly deforestation, are primarily contributing to greenhouse gas emissions. Robledo and Forner (2005) established that the increased concentration of greenhouse gas emissions in the atmosphere causes instabilities in the climate system. Such instabilities include changes in the precipitation regime, the frequency and severity of extreme events (e.g., typhoons, hurricanes, flooding, etc.), or changes in the rhythm and intensity of phenomena such as El Nino. While Denisova *et al*. (2019) assert that in the absence of measures to counteract prevailing patterns of fossil fuel consumption and deforestation, a projected increase of 6 °C in the Earth's mean temperature is expected to transpire within the coming century.

In view of the above assertions, there is a rich body of literature that posits that climate change has devastating impacts on most of the subsectors of the economy. These impacts and other observations are represented in Figure 2. 2 as identified by the IPCC in 2023.

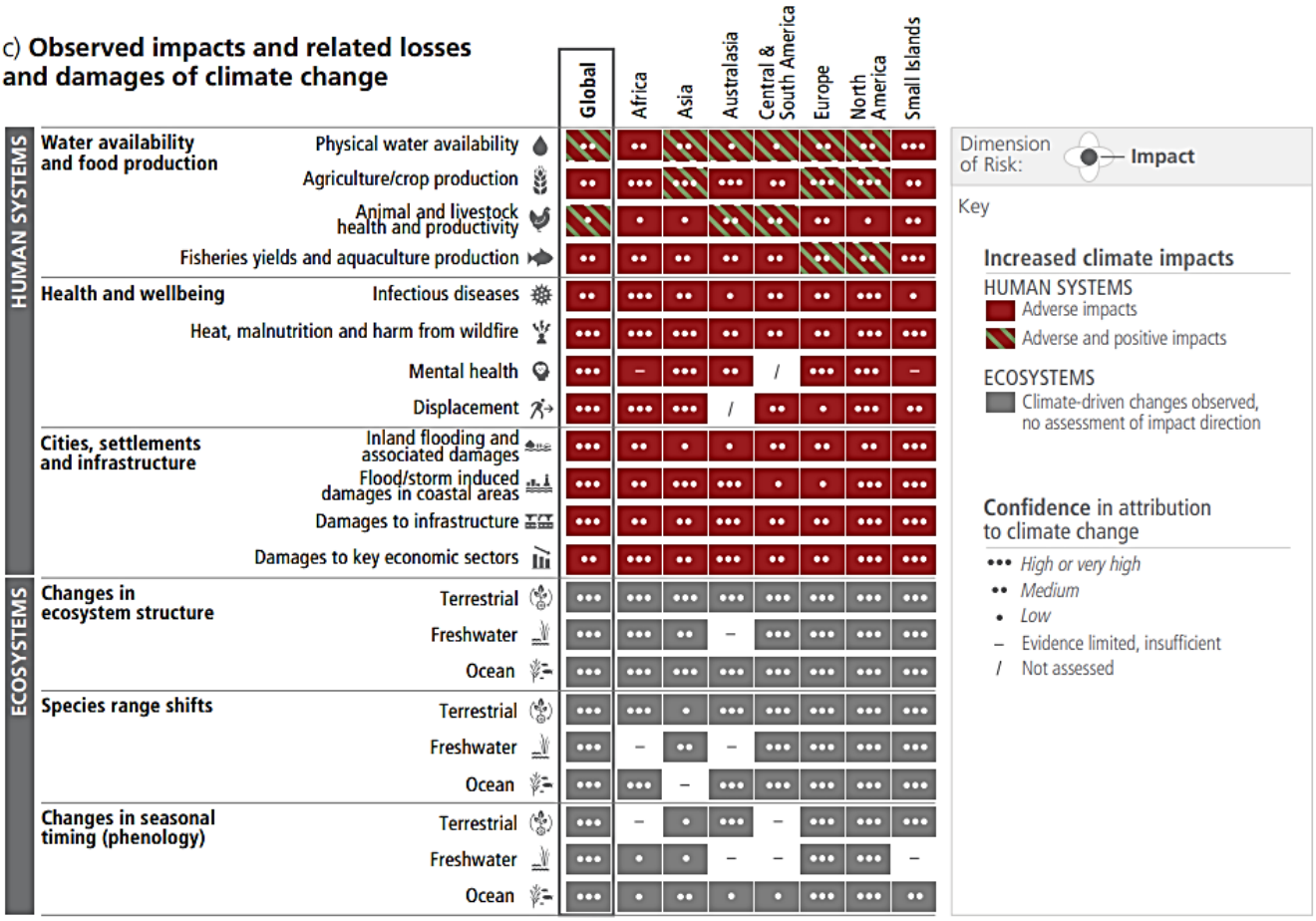

Figure 2. 2: Impacts of climate change observed in many ecosystems and human systems worldwide

Source: IPCC (2023: 49)

As depicted in Figure 2. 2 above, the IPCC (2023) asserts that the phenomenon of climate change has resulted in a decline in food security and the disruption of water security. This is primarily attributed to the rise in temperature, alterations in precipitation patterns, the reduction and loss of cryospheric components, and an escalation in the frequency and intensity of climatic extremes. Consequently, these factors impede the attainment of the Sustainable Development Goals. Moreover, climate change has had deleterious effects on human well-being, livelihoods, and

essential infrastructure. The economic repercussions associated with climate change are increasingly encroaching upon individuals' livelihoods and are generating economic and societal consequences that transcend national boundaries. It is worth noting that the impacts of climate change have disproportionately affected the most vulnerable populations and systems across various sectors and regions (IPCC, 2023). An earlier study conducted by Preston *et al*. (2006) highlights that climate change impacts can be seen in five major areas, which are coastal communities, ecosystems and biodiversity, infectious disease and heat-related mortality, water resources, agriculture, commercial forestry, and regional economies. This assertion is supported by a growing body of literature that argues that vulnerability to the impacts of climate change is greater in (i) coastal regions (McGranahan *et al*., 2007); (ii) natural resource-dependent community-based areas (Agrawal and Perrin, 2008); (iii) mountain regions based on geography and remoteness (Pradhan *et al*., 2012; Macchi *et al*., 2011; Köhler *et al*., 2010); (iv) societies based on class differences, impacting the poor and marginalised (Pinto *et al*., 2022); and (v) societies where women experience discrimination based on gender differences (Onwutuebe, 2019; Eastin, 2018; Djoudi *et al*., 2016). In addition, there is more literature that demonstrates that the observed and projected impacts of climate change are in the areas of agriculture and food security, water resources and energy, forests and biodiversity, human health, urban settlement and infrastructure, and climate-induced disasters (Muyambo *et al*., 2023; Raven and Wagner, 2021; Muluneh, 2021; Dhimal *et al*., 2021; Gaaloul *et al*., 2021; De la Sota *et al*., 2019; Gupta *et al*., 2017).

The literature reviewed recognises that there has been a rise in studies that examine climate change adaptation. A study by Tanner and Mitchell (2008), for instance, argues that the rise of the adaptation issue can be attributed to the increasing engagement of the development community, particularly through emphasising the differentiated nature of impacts across the world and within societies. The literature provides strong evidence that the issue of adaptation, both in practice and politics, has become a crucial part of international climate discussions (Ciplet *et al*., 2015; Biermann, 2014; Khan and Roberts, 2013; Schipper, 2006). The Paris Agreement (Article 7.2) under the UNFCCC unequivocally stated that adaptation is a global challenge faced by all with local, regional, subnational, national, and international dimensions.

Within the climate change discourse, scholars have different views on what adaptation is. Nightingale (2009), for example, understands adaptation as a political process that involves social

capital and power relations. Deressa (2007) views adaptation to climate change as a two-step process: first, the household must perceive that the climate is changing, and then they must respond to changes through adaptation. On the other hand, Adger *et al.* (2005) view adaptation as an adjustment in ecological, social, or economic systems in response to observed or expected changes in climatic stimuli and their effects and impacts to alleviate the adverse impacts of change or take advantage of new opportunities. However, Cabral *et al.* (2017) and Nkhonjera (2017) observed that African cities are underrepresented in climate change research and assessments of successful adaptation initiatives.

In view of the above discussion, scholars have argued that it is important how climate change adaptation is framed. Barret (2008), for example, argues that although the framing of adaptation is now expanding, literature during the first two decades of climate negotiations looked at adaptation largely as a private good and a local or national public good. Moser and Satterthwaite (2008), supported by several scholars (e.g., Measham *et al.*, 2011; Hodson and Marvin, 2009; Sanchez-Rodriguez, 2009; Stringer *et al.*, 2009), are of the view that adaptation is a development issue (current development stressors and challenges; existing policy and agendas; and knowledge, risks, and issues communities already face). In addition to this, Hall (2016) frames adaptation as "climate-resilient development" and has identified how development institutions are expanding into adaptation activities. Eriksen *et al.* (2015) contend, however, that adaptation cannot be reduced to a technical means of a society's responding to biophysical change but rather must be understood as a component of social dynamics. This perspective acknowledges the significant role played by social scientists in comprehending the concepts of inequality and social justice in the context of adaptation and transformation discussions. A considerable amount of this knowledge has been consolidated in the most recent report of the IPCC (2023).

Most recently, however, the literature has acknowledged that the framing of adaptation is being expanded by multidisciplinary thinking from the national to the global level, requiring international cooperation and multi-stakeholder engagement (IPCC, 2018; Khan, 2016; Dzebo and Stripple, 2015). Leary (2008) argues that adaptation is a process that includes learning about risk, evaluating response options, creating the conditions that enhance adaptation, mobilising resources, implementing adaptation, and reviewing choices with new learning. Adger *et al*. (2009) are of the view that adaptation is a multiscalar process of multilevel governance concerned with the

interfaces of individual and collective behaviours acting from the bottom-up and top-down in response to changing circumstances. In view of the literature discussed above, the UNFCCC under the United Nations Climate Change regime comprehensively frames climate change adaptation as a process that involves assessing impacts, vulnerability, and risks; planning for adaptation; implementing adaptation measures; and monitoring and evaluating adaptation. The adaptation policy cycle and support offered under the United Nations Climate Change regime are presented in Figure 2. 3.

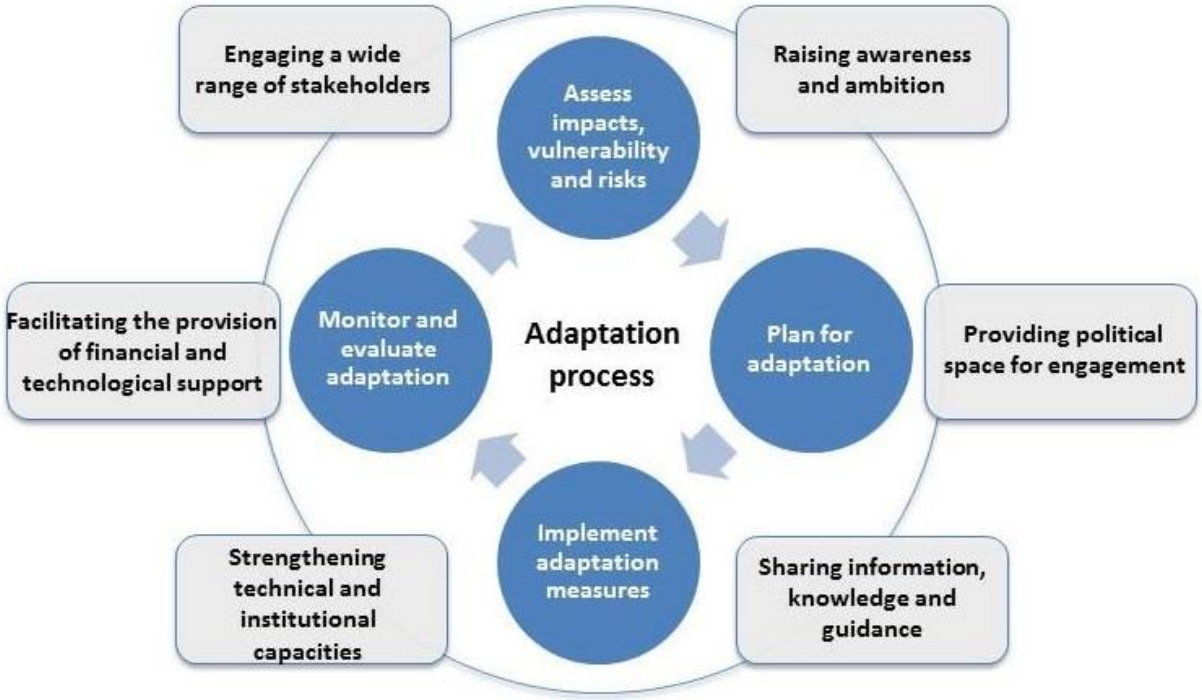

Figure 2. 3: The Adaptation process offered under the UN Climate Change regime[3]

In view of Figure 2. 3, Parties to the UNFCCC and its Paris Agreement recognise that in order to integrate adaptation into pertinent socioeconomic and environmental policies and actions, adaptation action should follow a country-driven, gender-responsive, participatory, and fully transparent approach, taking into account vulnerable groups, communities, and ecosystems. It should also be based on and guided by the best available science as well as, as appropriate,

[3] https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/what-do-adaptation-to-climate-change-and-climate-resilience-mean

traditional knowledge, knowledge of indigenous peoples, and local knowledge systems. Furthermore, the United Nations through its Sustainable Development Goal (SDG) number 13, encourages all nations to take action to combat climate change by promoting the use of adaptation strategies (Tosun and Leininger, 2017).

2.4 Contextualising the literature on climate change adaptation: Perspectives from sub-Saharan Africa

The IPCC report on regional climate projections states that by 2050, the average temperatures in Africa are predicted to increase by 1.5–3 ℃ (IPCC, 2007b). The warming of the African continent is very likely to be larger than that of the globe. Hulme *et al.* (2001) observed that temperatures across the African continent are predicted to rise by 2–6 ℃ over the next 100 years. Further projections by the IPCC (2007b) suggest that, due to drought, by 2100, arid and semi-arid regions of Africa are expected to expand by 5–8%, or 60–90 million hectares, resulting in agricultural losses of between 0.4–7% of gross domestic product (GDP) in Northern, Western, Central, and Southern Africa. Fauchereau *et al.* (2003), supported by Niang *et al.* (2014) and Tschakert and Dietrich (2010), are of the view that there have been increases in the incidence of extreme events such as droughts and floods in sub-Saharan Africa. Furthermore, Baarsch *et al.* (2020) observed that the mean climate-induced losses in Africa range between 10% and 15% of the GDP per capita growth, demonstrating that most African economies are poorly adapted to climate change.

Smit and Pilifosova (2003) observed that most developing countries are strongly vulnerable to the impacts of climate change due to their population, dynamic profit, natural resources, poor conditions, and land declination. Van der Bank and Karsten (2020) cogently argue that in countries with poor and weak economic systems and policy frameworks, the impacts of climate change always have far-reaching and wide-ranging effects. These impacts tend to affect and subject the poor to unprecedented levels of risk from environmental hazards. This is due, in part, to weak institutional and policy frameworks, a lack of infrastructure, stagnation, deterioration in the economic systems, and a general lack of political will in poor countries (Amoah and Simatele, 2021; Etale and Simatele, 2021). In addition to this, studies highlight that Africa suffers from low levels of technological advancement, education, rapid population growth, high rates of poverty, and a lack of social safety nets (Perez *et al.*, 2015; IPCC, 2014). These biophysical, political, and

socioeconomic stresses interact to heighten the region's susceptibility to climate change, despite it being the least greenhouse gas emitter in the world (Leal Filho *et al.*, 2019, 2018; Hummel, 2016; Bewket, 2012; IPCC, 2007b; Reid and Vogel, 2006). Furthermore, Ayers and Huq (2009), supported by Vink and Schouten (2018), are of the view that poverty, hunger (food insecurity), higher dependence on agriculture for livelihoods, increasing external debt, and poor governance can combine to exacerbate low capacity to adapt to climate change. In view of this assertion, it is clear that there is agreement in the literature that the poor in the developing world are already facing and are more likely to suffer from the impacts of climate change-induced extreme weather events (Urothody and Larsen, 2010; Dulal *et al.*, 2010; Hedger *et al.*, 2008; Tubiello and Fischer, 2007; Adger *et al.*, 2003).

The WFP (2014) and the FAO (2003) observed that around one in four people in sub-Saharan Africa is malnourished; this amounts to a quarter of the world's undernourished people. While levels of undernutrition across the sub-Saharan African region are already on the rise, projections indicate that with a warming of 1.2–1.7 C by 2050, the proportion of the population that is undernourished would increase by 25–90% (Lloyd *et al.*, 2011). UNFCCC (2007) and Madzwamuse (2010) argue that, given that many people in sub-Saharan Africa depend on farming, climate change prevents the poor from engaging in effective and efficient food production practices. This is echoed by Yilmaz and Yazicigil (2011), who argue that nowhere else will the impact of climate variability be more severe than in the water and agricultural sectors. In addition, studies on the impacts of climate change provide strong evidence of negative impacts on crop yields (e.g., Nelson *et al.*, 2014) and livelihood outcomes for people in the sub-Saharan Africa region (IPCC, 2014).

According to the FAO (2003), over 60% of Africans depend on agricultural activities for their livelihoods. The IPCC (2007b) states that, due to climate change, agricultural productivity in sub-Saharan Africa will decline from 21% to 9% by 2080. In view of this, climate change affects agricultural production and exacerbates the problem of food security in Africa (Kumssa and Jones, 2010). Halimani *et al.* (2021) argue that declining water supplies negatively affect livestock production, especially for subsistence farmers who rely heavily on surface water, whereas Macchi *et al.* (2011), Köhler *et al.* (2010), and Marston (2008) found that, in a rural area in Nepal, climate change resulted in water scarcity, which added to income insecurity. A study by Angelsen and

Dokken (2015) observed that the poor generate 29 percent of their income from environmental resources. Furthermore, Angelsen and Dokken (2015) found that in sub-Saharan Africa, poor rural households located in less-favourable arid areas are already directly experiencing declining incomes from extreme climate conditions and high forest loss and face further loss of future forest benefits due to climate change. In the same vein, Tschakert (2007) found that in Senegal, climate change interacts with rural unemployment, poor health, and inadequate infrastructure, which increase people's vulnerability. Adger *et al.* (2003) argue that climate change does not only disturb the livelihoods of poor people but also compromises the economic growth and national development of countries, particularly those in the developing south. Together, these studies highlight how climate change significantly affects rural livelihoods, contributes to increased levels of food insecurity, and enhances poverty.

Overall, the impact of climate change on poor communities is undisputed, more so in the sub-Saharan African region. Hummel (2016), supported by Leal Filho *et al.* (2019), is further of the view that the impacts of climate change are disproportionally felt by the poor people living in poor countries around the world. This assertion, therefore, demonstrates that the impacts of climate change are expected to disproportionately affect the poor, young, elderly, sick, women, and other marginalised populations (Otto *et al.*, 2017; Levy and Patz, 2015). Thurston *et al.* (2021) mention unequal power relations as one of the major drivers in defining people's vulnerability to natural hazards and experiencing the negative effects of climate change. A study by Dankelman and Fansen (2010) observed that the experiences of women and men with climate change and climate variability may vary. The same goes for their perceptions of the associated risks, their priorities and perceived skills and responsibilities concerning adaptation and local gender norms, as well as their gendered responsibilities, differences in decision-making power in relation to environmental resources, and their thoughts about mitigation of climate change. This is echoed by Tsige *et al.* (2020), who argue that women and men may be affected differently depending on how social relations shape rights and responsibilities in production, reproduction, and decision-making.

Women face many gender-specific barriers that limit their ability to cope with and adapt to climate change-related vulnerabilities and stresses (Gannon *et al.*, 2022; Lau *et al.*, 2021). A growing body of literature has shown that limited access and restricted rights to resources make women particularly vulnerable to climate change. This is mainly so if crop failure, fuel shortage, and water

scarcity affect their capacity to release what is deemed to be their food provision responsibility (Kes and Swaminathan, 2006). Adzawla and Baumüller (2021) and Balikoowa *et al.* (2019), for example, argue that women have higher climate vulnerability indices, particularly due to their low access to productive resources. A recurring argument warns that women run the potential risk of carrying the burden of environmental care and management because they are "closer to nature, are hardest hit by environmental degradation, and have special knowledge of natural resource systems" (Resurrección, 2013: 33). According to this reasoning, climate change and the many alterations in natural conditions that follow in its wake (including environmental degradation, land-use change, and water scarcity) will render women even more vulnerable if they are too close to and dependent on nature.

Emerging evidence demonstrates that the underrepresentation of women in decision-making processes is a characteristic of modern democratic societies and has led to mostly male-favourable policies in almost all aspects of life (Edvardsson Björnberg and Hansson, 2013). Elaborating on these observations, Carr and Thompson (2014) argue that women are often constrained in their decision-making and access to resources that can improve their livelihoods. Furthermore, Owusu *et al.* (2019) posit that women, particularly in the Global South, are more vulnerable to climate change than men. This is evident through factors such as restricted access to resources, poor housing, and limited participation in adaptation governance. It is important to note the differing view of Nhamo (2014: 156) who argues that although the empowerment of women in climate change policy varies between countries, there are signs that the mainstreaming of gender and women's needs in climate change responses is increasing in policy documents in East and Southern Africa. The role women play in climate adaptation cannot be undervalued. For the most part, this is because women are important agents of change. Sundström and McCright (2014), for example, observed that women are more concerned with the environment than men. However, O'Neill *et al.* (2010) argue that research on the effects on equity, efficiency, and identity necessitates further studies on the gender dynamics of climate change.

In view of the above literature, there is evidence that the need for adaptation is considered higher among developing countries, where vulnerability is presumably also higher. A study by Abegunde *et al.* (2019) on climate change adaptation in sub-Saharan Africa found that the negative impacts of climate change can be reduced through adaptation efforts. These efforts could vary from small

to significant changes in approaches that can bring about transformation. However, the literature fails to consider how the exclusion of women in the development and implementation of climate change adaptation initiatives further marginalises these vulnerable groups.

2.5 Contextualising the literature on climate change adaptation: Perspectives from South Africa

In South Africa, Midgley *et al.* (2008) argue that climate change is predicted to result in increased average temperatures of between 1°C and 3°C by 2050. van der Bank and Karsten (2020) observe that over the last five decades, annual temperatures have increased by approximately 1.5 times in South Africa and 0.65 °C globally. Furthermore, climate change is expected to have the largest impact on rainfall, temperature, and water availability in South Africa (Turpie and Visser, 2012). The western regions of South Africa are projected to have 30% reduced water availability by 2050 (Turpie and Visser, 2012). This is supported by Nhamo and Agyepong (2019), who reported that the overall dam levels in Cape Town, in the Western Cape province of South Africa, dropped from 92.5% to 23% during the 2014–2017 drought. On the other extreme, in 2000, severe floods affected northern South Africa, resulting in multiple deaths and damaged infrastructure (Thomas *et al.*, 2007). In 2016 and 2017, there were reported cases of localised flooding in several provinces across South Africa. Most recently, the 2022 Durban floods had devastating impacts on the lives of many vulnerable people. Savelli *et al.* (2021) assert that in South Africa, poor and marginalised individuals are likely to experience the worst impacts of future water shortages. The literature discussed above demonstrates that South Africa is susceptible to the impacts of climate change. It demonstrates that the impacts of climate change have been observed in most, if not all, sectors of the economy, environment, and society (Skogen *et al.*, 2018). In light of the above, it is undeniable that South Africa is very susceptible and vulnerable to the impacts of climate change (Hummel, 2015). Given the highly interactive and wicked nature of climate change, many scholars, including Dasgupta *et al.* (2023) and Ngcamu (2023), have analysed the impact of climate change on marginalised communities in South Africa.

Ziervogel *et al.* (2014) argue that in the context of South Africa's critical socio-economic developmental needs and threatened ecosystem services, climate change adaptation is critical. Furthermore, Pelling *et al.* (2014) argue that in South Africa, climate change adaptation can

contribute to inclusion, equality, and social justice. Lemos *et al.* (2013) are of the view that responding to climate change at a community level in South Africa is a major development challenge, considered in the context of wider development pressures, which include poverty and sustainable management of forest and land resources. In view of the above, there is agreement in the literature that adaptation needs to be embedded in South Africa's development plans (Ziervogel *et al.*, 2014).

2.6. Perspectives on Indigenous knowledge and pro-poor adaptation

There is a consensus among scholars that the need for local responses and Indigenous knowledge to reduce vulnerability (Valdivia *et al.*, 2010) calls for the integration of local knowledge into climate policies (Audefroy and Sánchez, 2017; Alessa *et al.*, 2016; Kettle *et al.*, 2014). Jabeen *et al.* (2010) are of the view that there is a need to articulate unplanned and planned adaptation to include grassroot experience, knowledge, and coping capacities in the governance of adaptation and planning processes, thus encouraging learning. A study by Graham *et al.* (2018) explores how understanding the lived values of residents can help inform the development of fairer local climate change adaptation plans. Their work suggests that for adaptation planning and policy to be successful, decision-makers must consider how climate change will interact with the lived values of those who are vulnerable to its impacts. Furthermore, various literature points out that connecting adaptation planning strategies and local development needs and plans (Abbas *et al.*, 2022; Juhola *et al.*, 2022; Silwal *et al.*, 2019; Lyles *et al.*, 2018; Bizikova *et al.*, 2015; Greiving and Fleischhauer, 2014), as well as the use of low-regret strategies, can also support local adaptation strategies and their implementation (Hallegatte, 2009).

Spires and Shackleton (2018), as well as Hossain and Rahman (2017), advocate for pro-poor climate change adaptation policies and strategies that are based on the realities that poor people are confronted with and that have a strong scientific basis. Vernon (2008) cogently argues that climate-resilient growth-enhancing policies should therefore be a core element of a pro-poor adaptation strategy. Challinor (2009), supported by Niang *et al.* (2014), is of the view that pro-poor adaptation initiatives must support the livelihoods of those most vulnerable to climate change. This would be enabled by finding effective strategies to cope with environmental changes and addressing the local and institutional barriers to the use of these strategies. Challinor (2009) further

argues that pro-poor adaptation supports livelihoods by finding effective strategies to cope with environmental change and by addressing the local and institutional barriers to the use of these strategies. Thus, pro-poor adaptation should be based upon, not merely relevant to, the needs of the poor (Spires and Shackleton, 2018; Hossain and Rahman, 2017).

Identifying ways to nurture and leverage private sector engagement in adaptation and market-driven adaptation opportunities is also an important element of a government's pro-poor adaptation strategy (OECD, 2008). Furthermore, Tanner and Mitchell (2008) argue that a pro-poor adaptation approach warrants serious attention from economists, particularly those linked to the renewed focus on economic growth within poverty reduction agendas. Vernon (2008) further argues that governments have an essential role in supporting pro-poor adaptation by deploying poverty-focused measures and addressing constraints that limit autonomous adaptation and the provision of adaptation services by the private sector. These would help poor people avoid climate-driven poverty traps. Governments should also ensure that national development and growth strategies are climate-resilient. They should also deliver poverty-focused support to poor and marginalised people and provide the right tools and incentives for the private sector to adapt and deliver adaptation services.

The literature demonstrates that key actors, advocates, and champions are crucial for initiating, mainstreaming, and sustaining momentum for climate adaptation planning and implementation in different national settings (Runhaar *et al.*, 2018; Bulkey and Newell, 2015; Romero-Lankao *et al.*, 2012; Garrelts and Lange, 2011; Moser and Ekstrom, 2010; Tompkins *et al.*, 2010). Furthermore, Meijerink and Stiller (2013) argue that leadership in climate adaptation needs to influence the policy process to get adaptation policies accepted and implemented. Leadership also needs to enhance connectivity across different policy-making levels, sectors, and actors and increase the adaptive capacity (flexibility) of governance networks concerned with climate adaptation. It is also the role of leadership to enhance the capacity of society to learn in response to feedback from the natural system and to anticipate the long-term impacts of climate change. The literature recognises four areas where improved capabilities can facilitate the creation of governance approaches for adaptation planning and implementation. The first of these areas involves creating learning processes incorporating various knowledge systems and experiences to facilitate developing a common understanding and policies critical for cross-institutional coordination and multi-

stakeholder actions (Huntjens *et al.*, 2012; Engle and Lemos, 2010). The next is enhancing monitoring and evaluation of adaptation planning and implementation, currently limiting opportunities for learning and improvement of current and future adaptation initiatives (Nilsson *et al.*, 2012; Preston *et al.*, 2011; Manuel-Navarrete, 2010). The third area is improving cross-level coordination within government structures at the national, subnational, and local levels (Bulkey and Newell, 2015; Preston *et al.*, 2013; Robinson and Berkes, 2011; Amundsen *et al.*, 2010; Urwin and Jordan, 2008). The fourth and final one involves enhancing the participation of stakeholders from the assessment of vulnerability to the design and implementation of operational approaches to adaptation (Carmin *et al.*, 2012; Dannevig *et al.*, 2012; Anguelovski and Carmin, 2011; Moser and Satterthwaite, 2008).

A considerable body of literature exists from developing and developed countries that emphasises the need for stakeholder participation, representation, accountability, and equality to influence the sharing and shaping of knowledge in adaptation decision-making and achieving change on the ground (Flood *et al.*, 2018; Wamsler, 2017; Burnside-Lawry and Carvalho, 2016; de Vente *et al.*, 2016; Cloutier *et al.*, 2015; Elsawah *et al.*, 2015). Khatibi *et al.* (2021) are of the view that there are significant benefits to public participation and engagement. One such benefit is community development and empowerment, which can occur through a high level of public engagement. Burnside-Lawry and Carvalho's (2016: 4) examination of stakeholder engagement activities that increase risk awareness and encourage collective action for a local government in Portugal indicated that "the implementation of a wide spectrum of public engagement initiatives," including activities in schools, child-care centres, aged-care facilities, and homes for the disabled, had "improved community and government capacity to identify and implement risk reduction strategies." Mabelis and Maksymiuk (2009: 73) note that "the basic idea of community engagement or public participation is to include all stakeholders in the planning process, from start (defining the aims) to end (providing a plan and monitoring its implementation)."

Well-operated collaboration and coordination from each level of governance based on partnerships can facilitate adaptation to climate change and make societies more resilient to the uncertainty of impacts posed by climate change stakeholders (Loring *et al.*, 2011; Paavola and Adger, 2006). A study by Bahauddin *et al.* (2016) shows that strong relationships and collaboration between the government and different communities are important in the climate change adaptation process.

Several scholars are also of the view that creating capabilities through coordination expands the adaptive capacity of local actors, enhances opportunities for policy formulation in larger governance networks, and provides learning opportunities for policy formulation (Keskitalo and Kulyasova, 2009). Recent discussions suggest focusing more attention on how to transform barriers into enablers of action and institutional change (Biesbroek *et al.*, 2013; Moser and Ekstrom, 2010).

In addition, studies highlight that increased collaboration and communication between government actors, consultants, and academics, as well as other actors, support the strengthening of technical and institutional capacity (Romero-Lankao *et al.*, 2012; Ziervogel *et al.*, 2010; Holgate, 2007; IDS/Tearfund, 2006). Leal Filho *et al.* (2018) argue that a key factor in enhancing climate adaptation is "the strengthening of institutions and the implementation of well-designed national and city-level planning policies and governance systems." This view is supported by Nicoson and von Uexkull (2019), who argue that, while climate change does not cause weak governance, weak governance limits individuals' and communities' coping capacities in the face of climate change. A recent study in Kenya by Nthambi *et al.* (2021), for example, shows that poor governance is a major hurdle to the successful implementation of climate change adaptation programmes in the sub-Saharan African region. King (2021) observes that in KwaZulu-Natal there is weak organisational (e.g., government and other institutions) support, and this limits efforts towards combating climate change risks. Thus, the task of enabling decision-making and adaptation requires understanding the interdependencies between institutions, values, and knowledge and how to change them (Gorddard *et al.*, 2016). A variety of approaches to facilitating learning, participatory dialogue, and action across decision levels and knowledge cultures have been proposed. These include creating networks across levels of formal and informal governance (Ostrom, 2010), scenario planning and visioning (Enfors *et al.*, 2008), multi-criteria mapping (Stirling, 2006), and conceptual mapping and soft modelling (Cundill *et al.*, 2012).

There is agreement in the literature that effective climate governance will encourage synergies, learning, innovation, and multi-level cooperation (Termeer *et al.*, 2017; Bulkey and Newell, 2015). However, a growing body of literature on climate change adaptation acknowledges the political implications as well as the procedural and social nature of climate change adaptation (Eriksen *et*

al., 2015a) as central to arriving at more just and effective climate change adaptation measures and policies that strengthen the most vulnerable (Morchain, 2018; Nightingale, 2017).

In conclusion, Frommer (2009) is of the view that climate change governance needs to shift from existing norms and adopt an overarching perspective of the contributory factors. Although an extensive body of literature has argued the need for multi-stakeholder participation in climate change adaptation policy formulation, there is limited literature that demonstrates poor rural communities' participation in this discourse. Therefore, given the impacts of climate change on poor communities, one of the common threads that needs to be addressed is the inclusion of marginalised groups in the development of pro-poor climate change initiatives and policies. The inclusion of all groups plays an important role in achieving effective and transformative climate change governance.

2.7 Contextualising the literature on the role of governance in climate change adaptation -

2.7.1 Perspectives on the role of government from the global to the national scales

A growing body of literature has shown that the inevitable impacts of climate change on poor people and the economies of poor countries are a vital first step in identifying and developing appropriate and strategic policy frameworks for supporting climate change mitigation and adaptation initiatives (Pielke *et al.*, 2007). According to Matson *et al.* (2016), it is through governance systems that knowledge about the impacts of climate change is co-created by various actors, including scientists. It is through these systems that collective choices can be made and contribute to climate change adaptation. Some attempts have been made to evaluate how the understanding of vulnerability varies across scales (Antwi-Agyei *et al.*, 2017; Balica *et al.*, 2009; Birkmann, 2007; O'Brien *et al.*, 2004) and how actors, governance structure, and interactions influence the adaptation governance process (Verkerk *et al.*, 2015; Bates *et al.*, 2014; Fidelman *et al.*, 2013; Keskitalo, 2010) and the resulting challenges that might appear in the governance process (Juhola, 2016; Amundsen *et al.*, 2010). Due to the long-term nature of climate change, climate change governance is also required to offer a stable planning horizon for several decades and often generations (Biermann, 2007). Governance arrangements should therefore be able to react flexibly to new scientific findings and changing stakeholder relationships and consider these,

despite the long-term nature of climate-related planning (Biermann, 2007). It has been argued that a government's overall ability to adapt to climate change pressures is a function of how it and society are organised and the extent to which both can alter their behaviour towards more sustainable practices congruent with the dynamics of climate change (Lyall and Tait, 2004; Innes and Booher, 2003).

Overall, the literature points out that debates about the role of the private sector and third-party actors in adaptation are ongoing within the adaptation community. Empirical research indicates that adaptation is still happening largely within the public sector (Biesbroek and Lesnikowski, 2018; Jordan *et al.*, 2015), with governments from the national to the local level acting as key actors driving the adaptation agenda (Mees, 2017; Keskitalo *et al.*, 2016; Massey *et al.*, 2014). Most recently, the rapidly growing and highly interdisciplinary field of research on climate change adaptation has highlighted the dominance of technocratic and apolitical approaches towards adaptation as a major drawback. It ignores power differentials among actors and thus has the potential to lead to exacerbated vulnerabilities, maladaptation, and ineffective and culturally inappropriate adaptation solutions (Nightingale *et al.*, 2020; Nagoda and Nightingale, 2017; Eriksen *et al.*, 2015b). Klepp and Fünfgeld (2021) highlight the vital role that powerful actors play in appropriating and co-opting the adaptation agenda in support of other goals.

There is agreement in the literature that, due to the unprecedented pace at which the world's climate is changing and the increasing complexity of societies, self-ruling, self-regulated societal adaptation alone is not sufficient and that governments have to play an active role (Berkhout, 2005). This is further echoed by Averchenkova *et al.* (2019), who cogently argue that the unprecedented pace at which the world's climate is changing and impacting society requires that government institutions and instruments take the key posture of facilitating community initiatives and embracing all stakeholders in decision-making processes. A study by Moser and Satterthwaite (2008) and supported by Simatele *et al.* (2012) emphasises the need for community mobilisation and participation in adaptation policy discussions. This is because the pro-poor adaptation initiatives require that the myriad spatial contexts in which the poor live be taken into consideration. Overall, the literature demonstrates that governments have a pivotal role in supporting pro-poor adaptation (Vernon, 2008). Together, these studies speak to the fact that it is important that those mandated to formulate and facilitate community adaptation to the impacts of

climate change recognise the ability of the poor to adapt to the impacts of climate change without preconceived assumptions.

A series of studies indicate that it is important for the governance of adaptation to create the space and conditions for accomplishing specific goals or collective outputs. This would be done by aligning principles and norms for regulations, decision-making procedures, and organisations and by providing an overarching system to address a challenge comprehensively (Dewulf *et al.*, 2015; Young, 2010; Biermann *et al.*, 2009). This proposal is further echoed by McCarney *et al.* (2011), who highlight that there is no blueprint or agreed-upon "best practice" for climate change governance. However, there are some fundamental elements that can benefit successful climate response action at the local level. Bulkeley (2015) is of the view that less attention has been paid to agency, which includes the processes and dynamics through which actors rally, create and change societal structures, and "accomplish" climate governance. The agency-centred perspective empowers the determination of how and by whom the new types of governance capacities are used. It also helps determine what types of conditions indicate the new governance architecture and how effective the capacities are in accomplishing transformative climate governance (Bulkeley, 2015). Termeer *et al.* (2017) introduced the conceptualization of continuous transformational change, which focuses on empowering and accelerating small, in-depth changes. Westphal and Thwaites (2016) define transformational change as a long-term, fundamental shift in a system, whether political, economic, social, or biological. UNDP (2011: 9) defines it as "the process whereby positive development results are achieved and sustained over time by institutionalising policies, programmes, and projects within national strategies." The authors argue that governing continuous transformational change requires the transformation of the governance systems themselves.

Hinkel *et al.* (2010) and Urwin and Jordan (2008) point out the importance of institutional analysis in climate change governance. They are of the view that deciding between options and implementing them is usually not a matter of a one-time decision but rather of an ongoing process that involves complex inter-linkages between public and private decisions at multiple levels of decision-making. The decisions should be made in the context of other issues, existing policies, conflicting interests, and diverse governance structures. A study by Hunt and Watkiss (2011)

observes that climate change adaptation and mitigation have also benefited from locally driven non-governmental organisations formed during the apartheid era.

However, it is important to note the dissimilar interpretation by Bibu *et al.* (2013), which is of the view that non-governmental organisations do not have sufficient capacity to participate adequately in policy decision-making. Some scholars recognise that climate change adaptation requires not only the active participation of multiple stakeholders, including state and non-state actors, but also changes in governance approaches towards governance structures and dynamics that enable learning and transformation (van der Wal *et al.*, 2014; Lynch and Brunner, 2010). A major challenge to the formulation of transformative climate change adaptation lies in what Leck and Simon (2018) have deemed the "siloed and hierarchical approach" to climate change governance. Thus, Ostrom (2010) is of the view that climate change governance requires a coordinated approach at various levels. This is also articulated by Leach and Stirling (2011), who argue that governance needs to "open up," recognise, and support multiple narratives and their associated pathways.

A study by Adger *et al.* (2005) observes that it is significant that climate change adaptation involves a diverse landscape of actors, including individuals, firms, civil society, public bodies, and governments at local, regional, and national scales, as well as institutional agencies. Climate change governance requires cross-generational thinking, which usually surpasses the existing responsibilities and decision periods in policy and planning and therefore poses a significant challenge (Fröhlich and Knieling, 2013). Keskitalo (2010) and Pahl-Wostl (2009) further stress that climate change adaptation needs multiple actors from multifaceted sectors, multiple levels of government, and diverse institutions to achieve effective outcomes. It is therefore evident that the literature on climate change governance strongly agrees that climate change governance occurs within a multifaceted web of stakeholders, governmental as well as private, operating at different levels and with their mutual influence (Jänicke and Jörgens, 2009). Literature has stressed the significance of multi-partner collaboration, including the involvement of local communities and vulnerable populations, in enabling meaningful climate action (Castells-Quintana *et al.*, 2015; World Bank Group *et al.*, 2015). Several previous studies demonstrate that capabilities to enhance and complement the value of local knowledge through scientific knowledge can become a useful source of community-based adaptation planning and implementation (Makondo and Thomas,

2018; Nyseth and Viken, 2016; Rathwell *et al.*, 2015; Kalanda-Joshua *et al.*, 2011; Chalmers and Fabricius, 2007; Tripathi and Bhattarya, 2004).

Twinomuhangi *et al.* (2021) convincingly argue that, despite the frequent exclusion of poor people from participating in policy discussions, if given the right impetus and empowered to define their development, they can resolve many of the challenges they face. Hsieh and Lee (2021) also argue that cultivating the practice of the participation of local people in decision-making always has the benefit of stimulating the achievement of several important objectives, among which are a greater sense of commitment, involvement, and ownership of the resolutions arrived at and the delivery of adaptation services that are much needed by the community. Tompkins and Adger (2004) argue that community-based management enhances the adaptive capacity of local communities by building their networks for coping as well as by retaining the resilience of the underpinning resources and ecological systems. Edifying this observation, Hove *et al.* (2013) are of the view that there is an urgent need to shift the paradigm of policy engagement from a top-down narrative to one that promotes and is based on a strong and genuine grassroots-grown and driven process.

On the contrary, a growing body of literature has shown that a combination of top-down and bottom-up activities may strengthen local adaptation planning and implementation (Preston *et al.*, 2013; Bulkeley *et al.*, 2009; Urwin and Jordan, 2008). It is also important to note the dissimilar interpretations of Challinor (2009), who observed that, while there is a useful inherent focus on needs provided by a bottom-up approach, it seems that another perspective is needed for pro-poor adaptation. Furthermore, Challinor (2009) cogently argues that it is time for science to take an issue-based approach to tackle the challenges of sustainability and pro-poor adaptation. Simatele *et al.* (2012) cogently argue that a people-centred approach, through community involvement, can create sensitivity and enhance the nature of adaptation strategies that poor people can use to build their adaptive capacity and resilience to climate-induced environmental changes. Together, these studies highlight the opposing views that exist in the literature on the best approach or paradigm for effective policy engagement. However, although the arguments differ, bottom-up, issue-based, and people-centred approaches all have a role to play in facilitating the development of pro-poor climate change adaptation initiatives and policies.

2.7.2 Perspectives on the role of local governments

A growing body of literature recognises that local governments have an important role in addressing the challenges of adaptation planning and implementation as well as society's response to climate change (Rosenzweig and Solecki, 2010; Blanco *et al.*, 2009; Sanchez-Rodriguez, 2009). Adger *et al.* (2007: 78) argue that, although climate change affects different levels, the role of local and regional contexts in the successful development of mitigation and adaptation strategies is considered highly important. Edifying these observations, Schwalb and Walk (2007) are of the view that local governance arrangements enhance the commitment and participation of stakeholders, particularly in coping with common tasks and problems. In a wider sense, local governments have been named in many studies as a key factor in the transformation towards a more sustainable society (Granberg and Elander, 2007; Storbjörk, 2007; Aall and Thorsen Norland, 2005). Agrawal (2008) argues that local institutions have three critical roles in climate adaptation: structuring responses to local impacts, mediating between individual and collective responses to vulnerability, and governing the delivery of resources to facilitate adaptation. This finding was also reiterated by Measham *et al.* (2011), who found that local governments are represented as institutional units that have a key role in climate change policy initiatives. Together, these studies highlight that, for governance to be effective, local governments and actors need to critically identify, select, and combine the strengths of diverse approaches.

It has been extensively argued that climate adaptation is context-dependent and distinctively linked to location, making it predominantly a local government and community-level area of action (Mukheibir *et al.*, 2013; Corfee-Morlot *et al.*, 2009). Agrawal (2008), in a parallel argument, states that, if adaptation is inevitably local, there is a great need to involve local institutions more centrally in planning for and implementing adaptation policies and projects. There is emphasis on the role of local institutions in designing, supporting, and implementing adaptation. It is evident that by excluding local actors or ignoring local situations, the efforts of policymakers often result in poor cooperation from local communities at the implementation stage (Hess, 1998). Dixit *et al.* (2012) are of the view that participation should be firmly rooted among civil society actors, included at the early stages of policy development, and promoted by the availability of relevant and sufficient knowledge. Measham *et al.* (2011) found that the opinions and value systems of the mayor or chief planner were influential in shaping other actors' engagement and commitment to climate adaptation policy.

Ivey *et al.* (2004) demonstrate three aspects of the relationship between local and national climate adaptation policies that have major implications for local government and its ability to respond to the impacts of climate change. The first aspect is that jurisdiction must be clearly stated and understood. Secondly, local organisations must have authority to select and implement adaptive measures, and finally, they need support from senior government agencies. However, according to Fakier *et al.* (2005), the delegation of environmental functions to the lowest possible level has placed increasing responsibility on local government and expanded its role from mainly service provision to that of an active development agent. Kotzé (2006) points out that the observation by Fakier *et al.* (2005) is not unique to South Africa. Internationally, municipal, and provincial governments often have considerable authority, sometimes extending to legislation, planning, and investment decisions, including those related to climate change.

Lastly, the literature demonstrates that local governance can be heavily constrained by institutional barriers and resource limitations (Rosendo *et al.*, 2018; Ojwang *et al.*, 2017). Strengthening the ability of local governance to cope with climate change is therefore an urgent necessity to cope with the impacts of 1.5°C, 2°C, and more severe global warming (IPCC, 2022; Rosendo *et al.*, 2018; Baker *et al.*, 2017). However, research demonstrates that, despite the growing interest in climate change policies and attention on climate change adaptation and governance (Aylett, 2015; Leck and Roberts, 2015; Heinrichs *et al.*, 2013), there is inadequate focus on how local government might shift towards pro-poor planning that reduces climate risk in the context of upgrading informal settlements and supporting the informal economy (Amundsen *et al.*, 2018; Bousquet *et al.*, 2016).

Having established the aforementioned, there is agreement in the literature that, without proper adaptation planning and the necessary investments in social safety nets, climate risks can adversely affect efforts to achieve the UN Sustainable Development Goals (Alemaw, 2020; Baarsch *et al.*, 2020; Cacho *et al.*, 2020).

2.7.3 Perspectives on Good Governance

The Cotonou Partnership Agreement, which is an agreement between Africa and European countries, defines good governance as the transparent and accountable management of human,

natural, economic, and financial resources for the purposes of equitable and sustainable development within a political and institutional environment that upholds human rights, democratic principles, and the rule of law (European Commission, 2004). Kanie *et al*. (2014) contend that good governance refers to a set of qualitative characteristics related to the processes of rulemaking and their institutional foundations. It encompasses values such as enhanced participation, transparency, accountability, and public access to information. It also serves to combat corruption and uphold basic human rights and the rule of law.

Pollitt and Bouckaert (2011: 21) illustrate the concept of good governance by emphasising its operational relationship with various societal groups, noting that it involves steering society through networks and partnerships between governments, business corporations, and civil society associations. Simonis (2004: 4) identifies three prominent features of good governance. First, it is based on mutually supportive and cooperative relationships between government, civil society, and the private sector. The nature of these relationships and the need to strengthen mechanisms for interaction are of critical importance. Second, good governance encompasses elements such as participation, transparency in decision-making, accountability, the rule of law, and predictability. Third, good governance is normative in its conception, as it is guided by the values put forth by defining actors and institutions.

Meadowcroft (2009) argues that good governance on climate change necessitates a re-evaluation of national interests in light of the risks posed by climate change. El-Taliawi and Van Der Wal (2019) contend that good governance requires three types of capacities: state capacity, policy capacity, and administrative capacity. These capacities rely on the essential "building blocks" outlined by Painter, which consist of values, indicators, and support systems.

The Sustainable Development Goals Agenda demonstrates a strong commitment to good governance and recognises its vital role. Goal 16 specifically calls for effective governance institutions and systems that are responsive to public needs, deliver essential services, and promote inclusive growth. This highlights the foundational importance of institutions in fostering good governance. Dhaoui (2019) proposes that the assessment of good governance should consider three dimensions: the mechanisms that promote it, the process employed, and the outcomes achieved (demonstrated in Figure 2. 4).

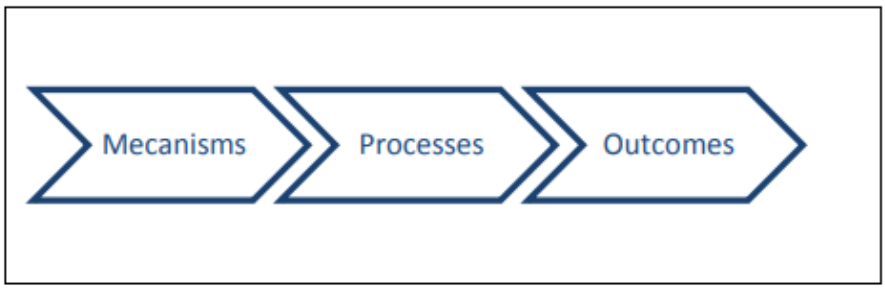

Figure 2. 4: Underpinnings of good governance

Source: Dhaoui (2019)

(i) Mechanisms pertaining to the establishment of sound governance encompass institutions that are both transparent and democratic, as well as public services that are efficient and effective.

(ii) Governance processes encompass the level of participation required to ensure that political, social, and economic priorities are determined through a widespread consensus within society. Moreover, these processes aim to ensure that the voices of marginalised and vulnerable individuals are heard in the decision-making process.

(iii) The desired outcomes of good governance are societies that are peaceful, stable, and resilient. In such societies, services are delivered in a manner that reflects the needs of the communities, thereby encompassing the voices of the most vulnerable and marginalised segments of the population.

According to Kaufmann *et al*. (1999), there are six indicators that determine the quality of governance. These indicators include voice and accountability, political stability, absence of violence, government effectiveness, regulatory quality, and control of corruption. Conversely, Madhu (2005) contends that there are eight key characteristics of good governance: participation, rule of law, transparency, responsiveness, consensus-orientation, accountability, equity and inclusiveness, and effectiveness and efficiency. The key qualities of good governance, as identified in a report by the United Nations Development Programme, include participation, responsiveness, transparency, accountability, effectiveness, efficiency, rule of law, and equity (Qudrat-I Elahi, 2009). On the other hand, Dhaoui (2019) posits that good governance can be defined by seven primary characteristics, as demonstrated in Figure 2. 5. These characteristics ensure the

minimization of corruption, the consideration of community perspectives, and the amplification of the voices of the most vulnerable individuals in society.

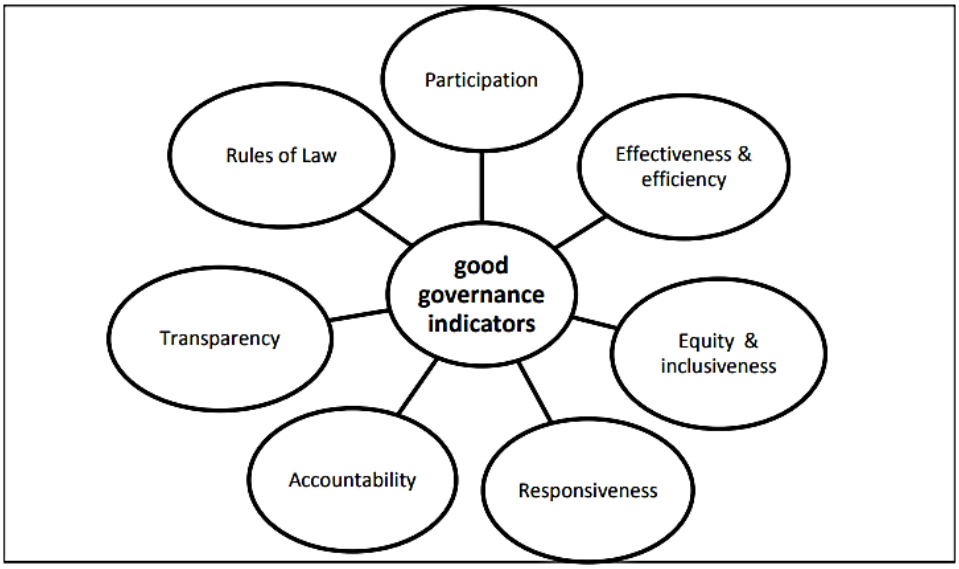

Figure 2. 5: Good governance indicators

Source: Dhaoui (2019)

According to the UNDP (2002), good governance contributes to sustainable development for three main reasons. Firstly, the freedom to participate in political decision-making and have a say in one's own life is a fundamental human right. Secondly, good governance plays a crucial role in safeguarding individuals from economic and political catastrophes, such as famines and other crises. There is a clear connection between poor governance and the occurrence of famines. Thirdly, good governance can foster sustainable development by empowering citizens to influence policies that foster economic growth and prosperity and align with their priorities (UNDP/EU, 2004). Caluser and Salagean (2007) support this viewpoint and argue that the concept of good governance encompasses three out of the four dimensions of sustainable development. The economic dimension emphasises the government's ability to effectively manage limited resources to meet minimum expectations, requiring transparency and accountability in the management of natural resources and the protection of the environment in both the private and public sectors. The social dimension ensures the inclusion of all societal groups, promoting non-discrimination and tolerance. The political dimension emphasises the lawfulness of the government, the accountability

of political elements, and respect for human rights and the rule of law (Caluser and Salagean, 2007).

Choudhary and Neeli (2018) argue that in the context of building disaster and climate resilience, good governance occurs when capable, accountable, transparent, inclusive, and responsive governments collaborate with civil society, the private sector, and vulnerable populations to create an enabling environment that enhances society's ability to prepare for and respond to disasters, as well as adapt to climate change. At the local level, "good governance" refers to the quality, effectiveness, and efficiency of local administration and public service delivery. It also encompasses the quality of local public policy and decision-making processes, their inclusiveness, transparency, and accountability. Additionally, it pertains to how power and authority are exercised at the local level (World Bank, 1992). Gani (2012) argues that countries with good governance are able to pursue, develop, and invest in advanced, innovative technologies aimed at mitigating environmental damage. This aligns with a study conducted by Afrifa *et al.* (2020), which found that good governance contributes to a 23.544% reduction in climate change issues with a 10% investment in innovative technologies. Good governance has the potential to enforce and regulate environmentally sustainable policies, guiding societies and individuals towards the sustainable use of the environment (Wingqvist *et al.*, 2012).

2.8 Theoretical Framework

The issue of adaptation to climate change has given rise to a range of complex governance inquiries, resulting in its classification as a "wicked problem" (Jordan *et al.*, 2014; Balint *et al.*, 2011). The concept of wicked problems, originally introduced by Rittel and Webber (1973), serves to differentiate between problems that are controllable and those that are unmanageable. The literature has experienced a significant increase in the number of publications exploring wicked problems and the governance of climate change adaptation (Head, 2022; Sapiains *et al.*, 2021; Wamsler *et al.*, 2020; Termeer *et al.*, 2019, 2011).

As a result, there has been a proliferation of theories and frameworks utilised to advance the discourse on the governance of climate change adaptation. This study critically examined some of these theories and frameworks based on their relevance to the subject matter under discussion. The

theories of collaborative governance (Huxham *et al.*, 2000) and network governance (van Bueren *et al.*, 2003; Klijn and Koppenjan, 2000; Roberts, 2000) acknowledge the diversity of perspectives and aim to provide strategies for incorporating these multiple positions while avoiding intractable controversies. The theory of collaborative governance aims to bring together public and private stakeholders in collective forums alongside public agencies, with the goal of engaging in consensus-oriented decision-making. While the concept of network governance asserts that networks have the potential to contribute to policy improvement (Klijn and Koppenjan, 2000). Rooted in organisational theory, the theory of multi-actor collaboration focuses on cooperation and negotiation among numerous interdependent actors within the context of a "wicked problem" domain, where they all have a vested interest (Craps *et al.*, 2019). Collaboration, as defined by Gray (1989: 5), is "a process through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible."

Multilevel governance theory emerged from policy debates and the restructuring of the European Union under the Maastricht Treaty in 1992 to examine the vertical integration of national and international politics (Marks, 1993). In addition, multilevel governance theory examines the relational dynamics between state governments, governance institutions, and those being governed. Evolutionary governance theory, proposed by van Assche *et al.* (2014) and Beunen *et al.* (2015), provides a temporal dimension to the understanding of governance. Kooiman (2016: 29) defines interactive governance theory as "the aggregate of governing activities carried out by societal actors in response to public needs and visions." Kooiman (2016: 45) argues that "there are no interactive governance or issues of governability without attention for power differentials and sources of conflict." The collective action theory considers the dynamics at the community-based or local level while also considering the influence of broader levels through nested governance via rules. Institutional structures and their impact on actors' behaviour are given prominence. The literature on adaptive governance aims to address the inherent complexity and unpredictability of ecosystem dynamics through innovative governance or management concepts (Pahl-Wostl, 2007; Folke *et al.*, 2005). Adaptive governance can be understood as the governance context that enables, or at least justifies, adaptive management strategies. Significant attention is focused on enhancing the adaptive capacity of such governance systems (Williams *et al.*, 2020).

The various theories presented above demonstrate that most scholarly work on climate adaptation governance originates from a monocentric perspective (Ostrom, 1972), also known as the government perspective (Rhodes, 1997), hierarchical governance (Hill and Lynn, 2004), or command and control systems of governance (Kooiman, 1993). From this perspective, the state assumes primary political power and authority, with policy processes following a structured sequence and technical rationality prevailing. The state, based on scientific research and considering the interests involved, selects the most appropriate technical climate adaptation strategy, which is then implemented and assessed. However, the monocentric approach is generally considered insufficient for dealing with wicked problems (Duit and Galaz, 2008; Koppenjan and Klijn, 2004). While this approach may be effective for less challenging issues, it fails to provide lasting solutions for wicked problems.

On the other hand, the alternative perspective, known as the polycentric approach (Ostrom, 1972) or the governance perspective (Pierre and Peters, 2000; Rhodes, 1997; Kooiman, 1993), is based on complex systems that encompass multiple centres of power interconnected through dynamic interdependencies, seemingly chaotic policy processes, and diverse competing rationalities. Polycentric governance systems have been described as a theory of complex adaptive systems (Andersson and Ostrom, 2008) and as "multiple governing authorities at different scales rather than a monocentric unit" (Ostrom, 2010). The theoretical advantage of a polycentric perspective lies in its ability to better adapt to social and ecological changes, whether actual or anticipated, compared to more centralised forms of governance (Stephan *et al.*, 2019; Carlisle and Gruby, 2017; Marshall, 2015). However, Blomquist and Schlager (2005) note that accountability in some polycentric governance systems may be compromised due to the large number of governance actors, each with their own lines of accountability, and the fluidity or lack of clarity that often characterises relationships between these actors. In contrast, Sovacool (2011) suggests that polycentric governance systems may enhance accountability, as it may be more difficult for narrow interests to influence multiple levels of governance compared to a single level. Similarly, Ostrom (2000) observes that polycentric governance systems, with their multiple centres of power at different levels, provide more opportunities for citizens and officials to address imbalances in authority and prevent takeovers by opportunistic individuals. This is supported by Pahl-Wostl and Knieper (2014), who argue that polycentric governance systems have a higher likelihood of demonstrating improved adaptive capacity as compared to monocentric or centralised governance

systems. Consequently, this can result in more favourable environmental and social outcomes. A recent investigation conducted by Lofthouse and Herzberg (2023) has outlined six advantages associated with the implementation of a polycentric approach. These advantages encompass various aspects. Firstly, polycentric systems promote competition among multiple decision-makers, which serves as a restraint on the misuse of decision-making authority and an incentive for increased responsiveness to the demands of constituents or consumers. Secondly, polycentric systems facilitate collaboration between different entities, enabling a cooperative environment among decision-makers to develop institutional solutions that align with the magnitude of the problems faced and adhere to local preferences. Thirdly, polycentric systems decentralise decision-making to lower levels, thereby enhancing local legitimacy as decisions are made by local representatives rather than those who are detached from the local context. When individuals perceive rules as legitimate, they are more inclined to engage in the joint effort of monitoring and enforcement, thereby augmenting the likelihood of successful collective action. Fourthly, the presence of multiple decision-makers allows for the exploration of diverse approaches, thereby facilitating experimentation and mutual learning. Fifthly, polycentric systems possess greater institutional resilience and robustness compared to monocentric systems, as failures only impact a portion of the overall system rather than the system. Lastly, polycentric systems enable the emergence of desirable outcomes at a larger scale through the aggregation of smaller-scale actions without the need for central planning.

In light of the above discussion, the theoretical foundation of the study was based on the polycentric or governance perspective. According to this perspective, successful climate change adaptation depends on the involvement of various public, private, and societal actors with their own ambitions, interests, beliefs, knowledge, and resources. It also requires an understanding of policy dynamics and opportunities, as well as alignment with the formal and informal rules of existing institutions. This governance approach holds greater potential for addressing wicked problems (Duit and Galaz, 2008; Koppenjan and Klijn, 2004).

Additionally, the literature presents a comprehensive overview of numerous frameworks related to the governance of climate change adaptation. The Institutional Analysis and Development Framework, for example, as proposed by Ostrom *et al.* (1994), offers a methodical approach to comprehending the functioning of institutions. It presents a methodical process for conducting a

thorough analysis of the "design and performance of an institutional arrangement" (Imperial, 1999: 453). Over time, this framework has undergone significant modifications and has been utilised to facilitate the analysis of diverse resource bases by incorporating various factors. This integration allows for a comprehensive understanding of specific institutional processes and contexts (Rudd, 2004). Ostrom (2007) further extends this framework by introducing the Social-Ecological Systems framework. This expanded framework explores the attributes of the biophysical world that are influenced in different action situations, aiming to foster interdisciplinary efforts in comprehending complex social-ecological systems. Within this framework, a social-ecological system comprises interconnected systems at multiple levels. The first level encompasses the four fundamental subsystems—(i) resource systems, (ii) resource units, (iii) governance systems, and (iv) users—which are interconnected not only with each other but also with the social, economic, and political contexts, as well as the associated ecosystems.

The Adaptation as Action Framework, introduced by Eisenack and Stecker (2011), was developed to analyse adaptation action by examining the dynamic interaction between actors, who function as receptors and operators of adaptation, and the means, represented by resources, within a particular exposure unit. The adaptation readiness framework developed by Ford and King (2015) and Tilleard and Ford (2016) serves the purpose of identifying the factors that enable governments and other decision-makers to engage in adaptation, foster support, determine relevant policy strategies, and eliminate barriers to adaptation. By utilising institutional and policy network approaches, this innovative theoretical framework aims to theorise the facilitation and hindrance of cross-level interactions between national and subnational governance levels through power relations. The innovative theoretical framework developed by Di Gregorio *et al.* (2019) draws from institutional and policy network approaches to theorise how power relations facilitate and impede cross-level interactions between national and subnational governance levels.

Dany *et al.* (2015) employed a four-indicator approach (collaboration, finance, technology, and information) to assess the institutional capacities of the health and water sectors in Cambodia regarding climate change. Cole *et al.* (2019) introduced the Combined Institutional Analysis and Development Framework and the Social-Ecological Systems (CIS) Framework. These frameworks are pertinent for unravelling the complexities of institutions as they provide an evidence-based understanding of the functioning and effectiveness of these institutions.

Nevertheless, some frameworks are excessively intricate for evaluating individual institutions, while others lack comprehensiveness.

A study conducted by Termeer *et al.* (2011) in Europe has identified six fundamental qualities of institutions that are essential for facilitating climate change adaptation. Among these qualities, three are considered core qualities: variety, learning, and room for autonomous change. The presence of diverse institutions plays a crucial role in effectively addressing uncertainty, as it reduces the possibility of all institutions experiencing failure in response to a single system shock or change (Akamani and Wilson, 2011). Furthermore, this combination of different institutions also improves their performance in terms of developing and implementing rules (Akamani and Wilson, 2011). The degree to which institutions allow for and promote variety is determined by the involvement of diverse policy frames and actors during policy formulation and implementation, as well as the flexibility to develop customised solutions. Furthermore, the extent to which institutions foster learning is indicated by their willingness to learn from others across boundaries, engage in single- and double-loop learning, and prioritise open discussions over defending fixed views. Lastly, the degree to which institutions enable autonomous change is demonstrated by continuous monitoring and interpretation of potential climate change impacts, a culture that values improvisation, the capacity for self-organisation, and a government system that shares responsibility for climate adaptation and potential risks. Additionally, three supporting qualities have been identified in the literature, namely leadership, resources, and fair governance. Termeer *et al.* (2011) argue that institutions should also encourage visionary, entrepreneurial, and collaborative leadership. Moreover, they emphasise the importance of generating financial resources, human resources, and authority to enable climate change adaptation. Additionally, institutions should facilitate legitimate policy processes, protect basic rights and equity, and exhibit responsiveness, transparency, and accountability (Termeer *et al.*, 2011).

The evaluation of climate change institutions entails the identification of five fundamental components, as acknowledged by the World Bank's 2021 study. These components encompass organisation, planning, public finance, subnational governments and state-owned enterprises, and accountability. The first component, organisation, involves the scrutiny of the regulatory framework governing climate change policy, the functional mandates of government agencies, coordination arrangements, and the technical capacity required to support climate change policy.

Planning, on the other hand, evaluates the systems employed for assessing climate change risk and vulnerability, as well as the strategies, plans, and regulatory framework governing the climate change planning and policy process. Public finance examines the integration of climate strategies, plans, and policies within fiscal and public financial management practices, as well as the mobilisation of resources for climate action. The treatment of climate change within the intergovernmental system and in the management of state-owned enterprises, the capacity of subnational governments, and the incentives for climate action are assessed under the component of subnational governments and state-owned enterprises. Lastly, accountability scrutinises the transparency and stakeholder engagement mechanisms for civil society, the private sector, and other stakeholders, as well as the roles played by expert advisory and oversight institutions.

The systematic diagnostic framework proposed by Moser and Ekstrom (2010) aims to address the identification and analysis of barriers to climate change adaptation by recognising the complex nature of natural resource systems. Within the current cycle of adaptation, which encompasses the comprehension, planning, and management phases, obstacles to adaptation are classified based on their typicality for each stage. Moreover, a variety of overarching concerns, referred to as "barriers," are recognised as universally significant in the decision-making process for adaptation. These barriers encompass leadership, resources, communication, and information, as well as deeply ingrained values and beliefs. By employing diagnostic inquiries, this framework enables researchers to trace the origin of barriers and establish an initial point for interventions.

All of these frameworks, including the diagnostic framework, the adaptation as action framework, and the adaptation readiness framework, acknowledge the complex nature of adaptation governance and strive to systematically compile and categorise barriers to adaptation. Notably, the diagnostic framework stands out as the sole policy framework intentionally devised to identify and analyse barriers to adaptation. Given the intricate nature of natural resource systems, it is improbable that any singular decision-making centre possesses the requisite knowledge to generate an appropriate institutional fit. (Galaz *et al.*, 2008).

Therefore, in light of this, the diagnostic framework was employed in this study to identify and analyse barriers to climate change adaptation in South Africa. The systematic diagnostic framework consists of three elements, which determine the nature of the barrier, its origin, and the location of influence over the barrier. The process of identifying the nature of the barrier is supported by four phases of adaptation, namely understanding, planning, implementation, and monitoring (Figure 2. 6). According to Moser and Ekstrom (2010), the understanding phase emphasises the availability of adequate and valuable information and knowledge, as well as the capacity of actors to effectively engage with it. The planning phase involves the development of adaptation options, the assessment of options, and the selection of options. The management phase focuses on the execution of the selected options, monitoring the environment and outcome of the implemented options, and evaluation.

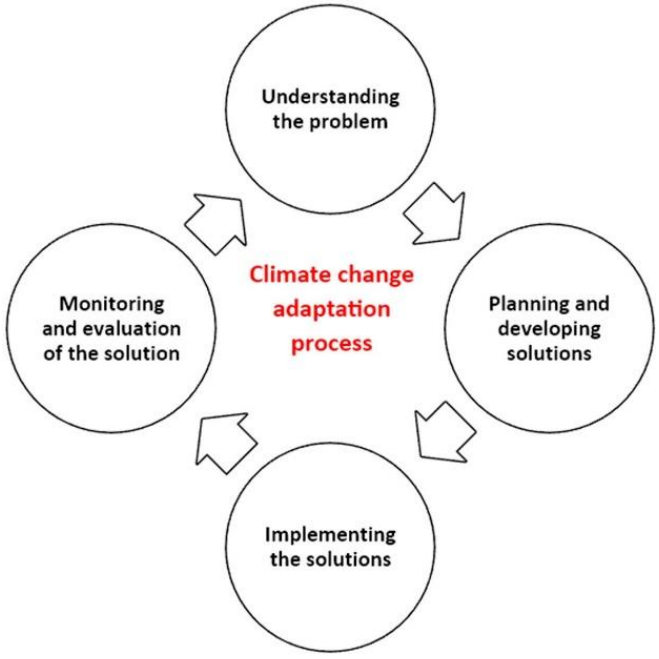

Figure 2. 6: Depiction of the systematic diagnostic framework

Source: Reprinted/adapted with permission from Moser and Ekstrom (2010)

According to Moser and Ekstrom (2010), the understanding phase focuses on the availability of adequate and valuable information and knowledge and the capacity of actors to engage efficiently with it. The planning phase encompassed the development of adaptation options, the assessment of options, and the selection of options. The management phase focuses on the implementation of

the selected options, monitoring the environment and outcome of the realised options, and evaluation.

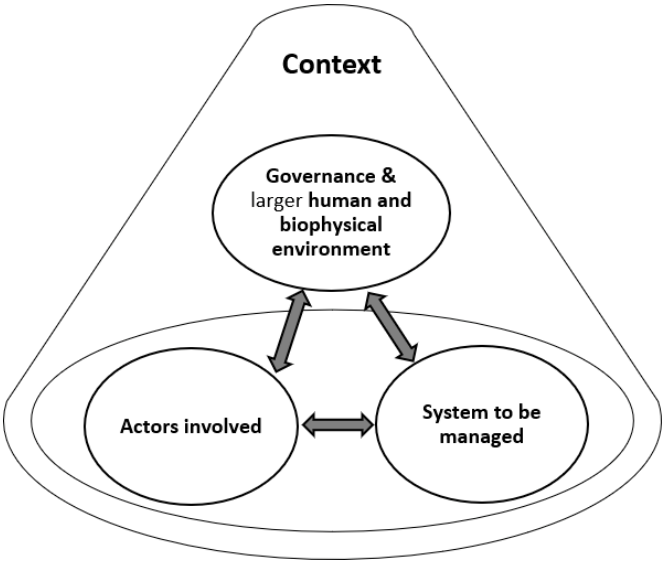

Figure 2. 7: The structural elements of the diagnostic framework

Source: Reprinted/adapted with permission from Moser and Ekstrom (2010)

The second component of the framework involved identifying the source. The three essential sources of the barriers include the actors involved in the adaptation process, the larger context in which they act, and the object upon which they act (Ekstrom and Moser, 2014; Moser and Ekstrom, 2010).

The last component of the systematic diagnostic framework provided a "guide" to identify and understand the barriers and to design strategies to evade, eradicate, or reduce them. A barrier that is both proximate and contemporary is one over which government officials have direct control here and now (A in Figure 2. 8), whereas a remote contemporary barrier is one that occurs now but is beyond the official's direct control (B in Figure 2. 8). A proximate legacy barrier is one where a law prevents the official from taking a certain adaptation action (C in Figure 2. 8). A remote legacy barrier is one that is a legacy of past science-policy decisions by remote officials (D in Figure 2. 8).

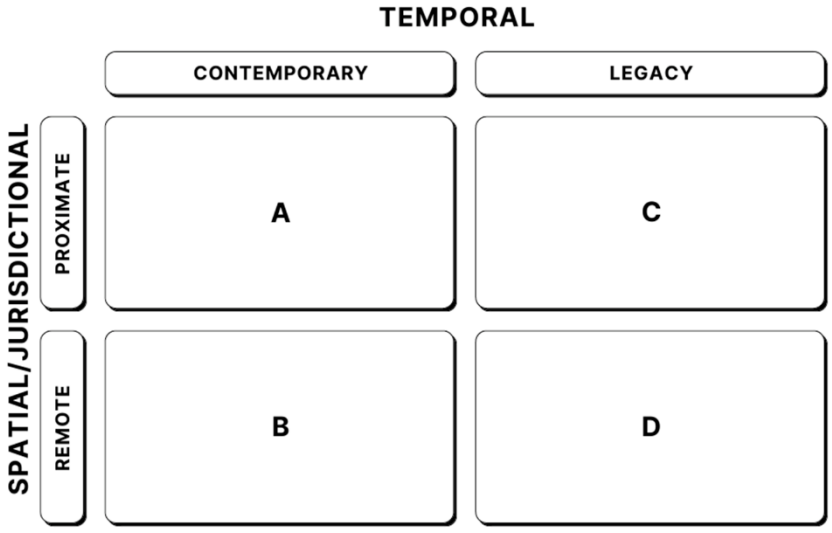

Figure 2. 8: Opportunities to overcome barriers

Source: Reprinted/adapted with permission from Moser and Ekstrom (2010)

The framework uses theories of coupled socioecological systems thinking and multi-level governance theories by focusing on "scale, contextual processes, and structures, amongst other factors, and it enables a flexible approach to examining barriers" (Mukheibir *et al*., 2013: 18).

2.9 Identifying the gaps in knowledge on the governance of climate change adaptation

The aforementioned literature demonstrates the unmistakable occurrence of climate change on a global scale, with anthropogenic factors predominantly attributing to alterations in meteorological trends. The literature has effectively substantiated that comprehensive investigations into the ramifications of climate change have been conducted on a worldwide basis. However, Blicharska *et al.* (2017) argue that most of the research on climate change is being conducted in the North, and there is less focus on research in the South, where there is a distinct lack of knowledge and information to develop models based on regional and local micro-climatic variations. It was also revealed that people with different sociodemographic features are unevenly affected by the impacts of climate change, with communities that depend directly on natural resources being disproportionally impacted (IPCC, 2022). Thus, it is important to further examine the

differentiated impacts of climate change on different livelihood sectors and groups, such as gender, ethnic groups, social groups, and geographical locations, for effective adaptation planning (Dixit *et al.*, 2015).

Despite the growing literature on adaptation, Singh *et al.* (2017) and Spires *et al.* (2014) found that research on adaptation to climate change in economically underdeveloped countries is still relatively scarce. These studies demonstrate the great need to intensify climate change adaptation efforts, particularly for marginalised communities. Furthermore, Biesbroek *et al.* (2010) and Keskitalo (2010) are of the view that the number of studies on climate change adaptation and the forms it takes is so far restricted, and much remains to be understood about the governance of adaptation and how this may affect its success or failure. Thus, further climate change research must be conducted in the sub-Saharan African region to provide regional and local context. Furthermore, although there is a rich presence of literature focusing on the impacts of climate change and the adaptive capacity to the implications of climate change of vulnerable groups in KwaZulu-Natal, there is a gap in knowledge on how institutions operating at different scales (national, provincial, and local) play a role in either enabling or hindering the development and implementation of comprehensive policies and strategies for climate change adaptation. Griffiths *et al.* (2007) argue that further research is needed to understand how institutional governance systems develop the capability to structure the adaptation process as climate change conditions change. While there is a rich body of literature focusing on the governance of adaptation (Keskitalo, 2010; Adger *et al.*, 2005), scholarship that underscores how climate change institutional frameworks affect different levels of governance and communities' ability to adapt to the impacts of climate change remains limited. Although several studies have analysed the role of national adaptation strategies in adaptation policymaking (Biesbroek *et al.*, 2010; Keskitalo, 2010; Hulme, 2009; Massey and Bergsma, 2008), the public governance of climate change adaptation going beyond adaptation strategies is still a blind spot in social science and climate policy research (Schipper and Burton, 2009; IPCC, 2007b: 19f). This is supported by Bauer *et al.* (2012), who argue that there is a research gap because not paying enough attention to the question of how to develop and implement adaptation policies in adequate governance settings would inevitably hinder effective adaptation driven by public policies. There is an urgent need for an in-depth understanding of the role of climate change governance in facilitating community adaptation. Despite the abundance of policies, strategies, and other institutional frameworks and tools to

support mainstreaming climate adaptation in policy, the literature demonstrates that, despite the political will of governments, implementation has lagged (Runhaar *et al.*, 2018). Ostrom (2014) and Rayner and Jordan (2013) are of the view that the literature would seem to bear out the general claim that climate governance has become more polycentric. However, it is unclear in the research literature why this is so. Thus, this constitutes a significant research gap. There is a need to intensify research in this area.

Furthermore, the literature reviewed demonstrates that, although limited, studies have been conducted on identifying climate change adaptation legislation, policies, and strategies. The missing link, however, is understanding how climate change adaptation policies are developed and whose voice they represent. This is supported by Bauer *et al.* (2012), who argue that there has been limited research on understanding how to develop and implement adaptation policies in an adequate governance setting. Overall, there seems to be agreement in the literature that participation by grassroots communities and other groups is at the heart of environmental governance. However, Ali and Ariffin (2017) argue that there is a substantial research gap concerning how grassroots communities are involved in policy formulation. So far, scholarship on grassroots community participation relating to climate change adaptation policy implementation in South Africa has been limited.

Pielke *et al.* (2007) argue that there is an urgent need to end the "taboo" on adaptation in both climate change research and policy circles, and they call for a more integrated discussion of the relationship between mitigation and adaptation in climate protection. Moser and Dilling (2007) suggest that there are significant opportunities for action, or community-based, forms of research in which members of the academic community partner with local stakeholders to identify research needs to address local concerns.

Furthermore, there is still a limited understanding of how institutions operating at different scales (national, provincial, and local) play a role in either enabling or hindering the development and implementation of comprehensive policies and strategies for climate change adaptation. There exists a significant void in the existing body of literature that examines the structural aspects of coordination among national government departments, both horizontally and vertically, in relation to climate change. This applies at both the global level and within the specific context of the sub-Saharan African region. Consequently, it is imperative that research efforts in the field of climate

change governance are intensified. By doing so, we can effectively identify strategies to enhance climate change governance, which in turn directly impacts the ability of communities to adapt to the challenges posed by climate change. It is worth noting that while there has been extensive research conducted on the barriers to climate adaptation in regions such as Europe, Australia, Canada, and the United States, as evidenced by the works of Barnett *et al.* (2015), Kuruppu and Willie (2015), Matasci *et al.* (2014), and McNeeley (2012), there is a glaring dearth of empirical evidence on the barriers to adaptation to climate change, specifically in the sub-Saharan African region. This void persists despite the existence of studies conducted by Boyd *et al.* (2013) and Nielsen and Reenberg (2010). A growing body of literature exists on the barriers to climate change adaptation in South Africa (Ortega-Cisneros *et al.*, 2021; Alemaw and Simatele, 2020; Cockburn *et al.*, 2020); however, previous research can only be considered a first step towards a more profound understanding of climate governance, particularly in facilitating effective climate change adaptation.

CHAPTER THREE

METHODOLOGICAL CONSIDERATIONS

3.1 Introduction

This chapter is dedicated to a discussion of the research methodology that was employed in this study. Research methodology refers to a coherent group of methods that complement one another and that can be used to deliver data and findings that reflect the research question and suit the researcher's purpose (Henning *et al.*, 2004). Similarly, Patel and Patel (2019) are of the view that a methodology outlines a way to systematically solve the research problem. For a study of this nature, it was important to adopt a comprehensive methodology, answer the research questions, and achieve the research aims and objectives. In view of the above description, this chapter is made up of four main sections. In the first section, the research aims and objectives are recapitulated. It is important to reiterate the research aims and objectives because they inform the nature of the research philosophy and the methodology that was adopted for this study. The second section discusses the philosophical approach adopted in this study. The third is the research design. Outlined here is a description of the research sites, target population, sampling procedure, data instrumentation, and data analysis. The last section is dedicated to a reflection on the research methodology.

3.2 Recapping of the Research Aims and Objectives

In Chapter 1, the aims, objectives, and research questions for this study were stated. However, it is important to recap them to ensure that they are aligned with the research methodology employed in this study. The aim of this study was to investigate the role of institutions operating at the different government levels (national, provincial, and local) in enabling or hindering the development and implementation of comprehensive policies and strategies for climate change adaptation in South Africa. The first objective was to investigate the communities' perceptions of the impacts of climate change in uMkhanyakude District Municipality. The second objective was to identify current climate change adaptation policies and strategies. The third was to explore the

extent to which grassroots communities are involved in the formulation of policies. The fourth objective was to examine the role of institutions in driving the climate change adaptation agenda in South Africa. The fifth and final objective was to investigate the key barriers and opportunities to climate change adaptation in South Africa.

3.3 The Philosophical Considerations

A research philosophy selected by a researcher is influenced by theoretical perspectives and the epistemological stance of the researcher (Al-Ababneh, 2020). Guba and Lincoln (1982) argue that the philosophical paradigm within research is very important, as it is the "basic belief system or worldview that guides the investigation." According to Holden and Lynch (2004) and supported by Saunders *et al*. (2012), a research philosophy is a particular way of developing knowledge that defines the philosophical paradigm. This development and understanding of knowledge depend on assumptions based on an individual's perspective of the world (Saunders *et al*., 2012; Holden and Lynch, 2004). According to Burrell and Morgan (2017), whether you are consciously aware of them or not, at every stage of your research, you will make several types of assumptions. The assumptions that are relevant to the research philosophy are ontological assumptions (the nature of social reality), epistemological assumptions (the nature of knowledge), and axiological assumptions (the extent and ways your values influence your research process). Al-Saadi (2014) suggests that ontological assumptions give rise to epistemological assumptions, which give rise to methodological considerations, which, in turn, give rise to issues of instrumentation and data collection. This is supported by Saunders *et al*. (2012), who are of the view that basic paradigm beliefs not only guide the investigation (in terms of the choice of design and method) but also in its ontology (nature of reality and being) and epistemology (nature and scope of knowledge). Crotty (1998) defines epistemology as a way of understanding and explaining how we know what we know. Epistemology is the explanation of how we think. It is required to be able to determine the truth from the false by determining a proper method of evaluation. It is also important for obtaining knowledge of the world around us. Crotty (1998) argues that without epistemology, we cannot think. More specifically, we would have no reason to believe our thinking was productive or correct, as opposed to random images flashing before our minds.

In view of this, Sikes (2004) argues that it is important for all scholars to spend some time thinking about how they are paradigmatically and philosophically positioned and to be aware of how their position and the fundamental assumptions might influence their research. Sikes (2004) further argues that regardless of how each researcher is positioned in terms of their epistemological assumptions, it is essential that scholars are clear in their minds as to the implications of their stance and that they state their position explicitly. According to Ponterotto (2005) and supported by Turyahikayo (2021), four major paradigms structure and organise social science research, namely, positivism, post-positivism, critical theory, and constructivist or interpretivism. Whereas, according to Crotty (2003), there are two types of epistemological assumptions: objectivism (or positivism) and subjectivism (or constructivism or interpretivism). Lakoff (1987) argues that objectivism is "one version of basic realism," according to which reality exists independent of humans. While subjectivism is an assumption, social reality is made from the perceptions and consequent actions of social actors (people). Alvesson and Sköldberg (2009) are of the view that, as a researcher, one needs to develop their reflexivity to become aware of and actively shape the relationship between one's philosophical position and how they undertake their research.

Therefore, considering the preceding arguments, the selected philosophy was the most suitable for the aims, objectives, and research questions formulated for the current study. In this study, the researcher leaned towards the philosophy of constructivism and interpretivism. The selection of these research philosophies and research methods was based on the data needed to answer the research questions stated in Section 3.1. What was clear in this study is that there were research questions that could only be answered using both qualitative and quantitative methods of research. Thus, the constructivist and interpretivist philosophies allowed for the application of the mixed method (both quantitative and qualitative methods) in collecting and analysing the data in the study. This study used surveys as a quantitative method and in-depth interviews as a qualitative method within a constructivist approach to understanding how climate change adaptation policies and strategies are constructed and who is involved in the process.

The constructivist paradigm predominantly uses qualitative methods such as interviews, observations, and document reviews. The qualitative approach focuses mostly on words and observations to express reality and tries to describe people and research phenomena in natural situations (Amaratunga *et al.,* 2002). Lincoln and Denzin (2002: 1047) summarised different

aspects related to qualitative research as follows: “Qualitative research is many things at the same time.” It is multi-paradigmatic in focus. Its practitioners are sensitive to the value of the multimethod approach. They are committed to a naturalistic perspective and an interpretive understanding of human experience. At the same time, the field is inherently political and shaped by multiple ethical and political allegiances.

Qualitative approaches are applied in correspondence with the assumption about the social construction of reality that research can be conducted only through interaction between and among investigators and research participants (Savin-Baden and Major, 2023). This interactive approach is sometimes described as hermeneutical and dialectical in that efforts are made to attain diverse perspectives that produce better interpretations of meanings (hermeneutics) that are compared through a dialectical interchange involving the juxtaposition of conflicting ideas, forcing a reconsideration of previous positions (Lincoln and Guba, 2000). Constructivism is understood as a paradigm (Guba and Lincoln, 1994), a set of fundamental assumptions and worldviews underlying most of the theories used by strategy-as-practice scholars. Honebein (1996) defines the constructivist philosophical paradigm as an approach that emphasises that people construct their understanding and knowledge of the world through experiencing things and reflecting on those experiences. Similarly, Cashman *et al.* (2008) argue that constructivism assumes that people form or construct much of what they learn through experience. On the other hand, Mastin (2008) defines constructivism (also known as constructionism) as a relatively recent perspective in epistemology that views all our knowledge as “constructed” in that it is contingent on convention, human perception, and social experience.

Eichelberger (1989: 9) describes the methodological work of the constructivist (hermeneutical) researcher as follows: “They want to know what meaning people attribute to activities... and how that related to their behavior. These researchers are much clearer about the fact that they are constructing “reality” on the basis of the interpretations of data with the help of the participants who provided the data in the study.” These scholars are much clearer about the fact that they are constructing “reality” based on the interpretations of data with the help of the participants who provided the data in the study. They often carry out their research much as anthropologists do in their studies of culture. They do a great deal of observation, read documents produced by members of the groups being studied, do extensive formal and informal interviewing, and develop

classifications and descriptions that represent the beliefs of the various groups. The constructivist paradigm grew out of the philosophy of Edmund Husserl's phenomenology and Wilhelm Dilthey's and other German philosophers' study of interpretive understanding called hermeneutics (Eichelberger, 1989). Hermeneutics is the study of interpretive understanding or meaning. Clegg and Slife (2009) further explain the concept of hermeneutics by citing Heidegger (2008), who argued that all meaning, including the meanings of research findings, is fundamentally interpretive. According to Schwandt (2000), the basic assumptions guiding the constructivist paradigm are that people active in the research process socially construct knowledge and that scholars should attempt to understand the complex world of lived experience from the point of view of those who live it. The constructivist paradigm emphasises that research is a product of the values of scholars and cannot be independent of them.

Constructivist philosophy expresses that people actively construct their social world; they are not the "cultural dopes" or passive dolls of positivism (Cashman *et al.*, 2008). Furthermore, Guba and Lincoln (1994: 143) argue that constructions are residents in the minds of individuals; "they do not exist outside of the persons who create and hold them; they are not part of some objective world that exists apart from their constructors." In addition, constructivism means that human beings invent concepts, models, and schemes to make sense of their experiences, and we modify these constructions according to our new experiences. According to Guba and Lincoln (1994), constructions are attempts to make sense of or interpret experiences, and most are self-sustaining and self-renewing. In terms of epistemology, social constructivism is linked to the theory of interpretivism (Sarantakos, 2005). Thus, the interpretivist philosophy was also considered suitable for the study, particularly in collecting data from climate change government officials from all levels of government. Interpretivism, also called the anti-positivist stance, was derived from cultural and historical interpretations of social life (Crotty, 1998). Interpretive researchers spend much time with the people they are researching and try to understand how people construct meaning in natural settings using methods such as participant observation and field research (Soss, 2014). Costelloe (2016) contends that there is a distinction between the natural and social worlds and that social organisation and social experiences shape our perceptions of reality and truth. According to Taylor (1987), interpretive inquirers attempt to establish a certain interpretation of the meaning of social action. It assumes that meaning is a determinate, object-like entity waiting to be discovered in a text, a culture, or the mind of a social actor. The interpretivist perspective

allows researchers to gain a deeper understanding of the phenomenon and its complexity in its unique context instead of trying to generalise the base of understanding for the whole population (Creswell, 2007).

In-depth interactive interviews, which form part of the interpretivist approach, "allow the researcher to investigate and prompt things that we cannot observe; researchers can probe an interviewee's thoughts, values, prejudices, perceptions, views, feelings, and perspectives" (Wellington and Szczerbinski, 2007: 81). For this study, the interpretivist approach allowed for valuable data to be collected and provided a richer understanding of the climate change governance discourse. Using the interpretivist approach, the researcher was able to gain deep insights on how climate change adaptation policies are developed.

3.4 Research Design

A research design is the "procedures for collecting, analysing, interpreting, and reporting data in research studies" (Creswell and Plano-Clark, 2007: 58). Babbie (2004: 112) defines research design as "a plan that involves a set of decisions regarding what topic is to be studied among which population with which research methods for what purpose." Herein, "research design" refers to the processes undertaken to conduct the research to achieve the outcomes of this research. Therefore, the research design sets the procedure for the required data, the methods to be applied to collect and analyse this data, and how all of this is going to answer the research question (Grey, 2014). The goal of a sound research design is to provide results that are judged to be credible (MacMillan and Schumacher, 2001).

This study adopted a mixed-methods research approach. According to Johnson *et al.* (2007), mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (for example, the use of qualitative and quantitative viewpoints, data collection, analysis, and inference techniques) for the broad purposes of breadth and depth of understanding and corroboration. Johnson *et al.* (2007) indicate that mixed-methods research is a natural complement to using either of the traditional qualitative or quantitative research methods in isolation. However, Creswell (2009) argues that mixed-

methods research is more than simply collecting both qualitative and quantitative data; it implies that data are integrated, related, or mixed at some stage of the research process.

Onwuegbuzie and Leech (2006) identified four rationales for conducting mixed research. The first is participant enrichment. An example of this is mixing quantitative and qualitative research to optimise the sample using techniques that include recruiting participants, engaging in activities such as institutional review board debriefings, and ensuring that each participant selected is appropriate for inclusion. The second is instrument fidelity, an example of which is assessing the appropriateness and/or utility of existing instruments, creating new instruments, and monitoring the performance of human instruments. The third rationale for conducting mixed research is treatment integrity (i.e., assessing the fidelity of intervention), and the fourth rationale is significance enhancement. An example is facilitating the thickness and richness of data and augmenting the interpretation and usefulness of findings.

Teddlie and Tashakkori (2009) argue that combining questionnaires and interviews in a single study increases the breadth and depth of the study. Thus, the overall purpose and central idea of mixed methods studies is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems and complex phenomena than either approach alone (Creswell and Plano-Clark, 2007). Therefore, mixed-methods research is about heightened knowledge and validity (Schoonenboom and Johnson, 2017). Qualitative research in this study used in-depth semi-structured interviews, which allowed the government officials working at the national, provincial, and district levels to express their views on the subject matter being researched.

To facilitate the collection of qualitative and quantitative data, the study used a descriptive and exploratory research design. Descriptive research encompasses gathering data that describes actions and then organising, tabulating, depicting, and describing the data collection (Koh and Owen, 2000). Data collected through qualitative research design is presented in the form of data tables, process diagrams, and excerpts of participant communications.

Quantitative research in this study used surveys through questionnaires, which allowed research participants to express their perceptions on the role of climate change governance in community adaptation. Data collected through quantitative research design is presented descriptively in the form of graphs to complement and enrich the representation of qualitative data. Therefore,

adopting the constructivist and interpretivist approaches allowed the researcher to unravel the existing climate change governance processes and ascertain whether these enabled or hindered community adaptation to the impacts of climate change.

3.4.1 Description of the research site

uMkhanyakude District Municipality was selected for this study as it is one of the most vulnerable districts in South Africa. It houses the most impoverished communities that lack the resources needed to adapt to the impacts of climate change. The research site has unique characteristics that are relevant to the study. The research sites are representative of many rural regions in KwaZulu-Natal that continue to grapple with poverty and the impacts of climate change on their livelihood-supporting systems. Therefore, the study sites represent grassroots communities that have low adaptive capacity and resilience to the implications of climate change. As climate risk increases in intensity, frequency, and duration, these communities will increasingly rely on government provisions to build their adaptive capacity and resilience. Therefore, it was important to explore the role played by institutions in facilitating climate change adaptations for grassroots communities such as that of uMkhanyakude District Municipality.

uMkhanyakude District Municipality is in the far northern region of the KwaZulu-Natal province (latitude 27°37’21.63’S, longitude 32°01’47.14’E). uMkhanyakude refers to the Acacia Xanthophloea fever tree and means “that shows light from afar” (UKDM, 2022). The name reflects both the uniqueness of its people and their hospitality, as well as the biodiversity and conservation history of the region. The area is part of the former homelands in South Africa, which were predominantly characterised by the negligence of the apartheid government in providing basic service delivery (David *et al.*, 2018; Mpanza and Govender, 2017). The district is the second largest in the province, covering an area of 12,818 km2. uMkhanyakude District Municipality extends from the Mfolozi River in the south up to the Mozambican border in the northeast and Swaziland to the north (UKDM, 2022).

uMkhanyakude District Municipality is predominantly rural and has an estimated population size of 625,846 people and a population density of 45,17 per km2 (Statistics South Africa, 2011). Of the total population size, 40% is under 15 years old, 55% is between 15 and 64 years old, and 5%

is over 65 years old. uMkhanyakude District Municipality has a population that is largely young and uneducated, with over 25% having no formal education. In uMkhanyakude, approximately 70% of the unemployed population is younger than 35 years of age. Of these, 35.2% are younger than 25 years of age, and 34.9% are aged between 25 and 34 years (UKDM, 2018). According to UKDM (2018), 53.9% of households are female-headed. In addition, the population is largely dependent on agriculture to support its livelihood (Patrick, 2021; Statistics South Africa, 2011). This is reiterated in the Integrated Development Plan (2018–2019), which states that nearly 95% of uMkhanyakude's population are rural dwellers, most of whom rely at least partly on subsistence agriculture to meet their food requirements. According to Patrick (2021) and Statistics South Africa (2011), uMkhanyakude District Municipality ranks 51 out of the 55 socioeconomically deprived municipalities in South Africa and is one of the poorest municipalities in the country. The poverty rate for the district municipality ranges between 72.1% and 88.6% of the total population. According to Patrick (2021), over 70% of the population in uMkhanyakude survives on less than R800 per month, and over 83% of the total households live below the poverty line. The extent of poverty in the rural areas of uMkhanyakude has forced 95% of the inhabitants to survive through subsistence farming, grants from the government, and remittances from family members working outside the municipality (UKDM, 2019; Dlamini, 2018).

Data from the South African Weather Service (2016) on uMkhanyakude shows extreme variation in rainfall and temperature. Climate-related impacts on water resources as well as agricultural practices that are unsustainable and have negative impacts have adverse impacts on food security and livelihoods (IDP, 2018–2019). About 30%, a figure significantly higher than the provincial total of 13%, of households are utilising untreated water, directly from springs, dams, or rivers (IDP, 2018–2019).

Figure 3. 1 below shows the geographical location of uMkhanyakude District Municipality.

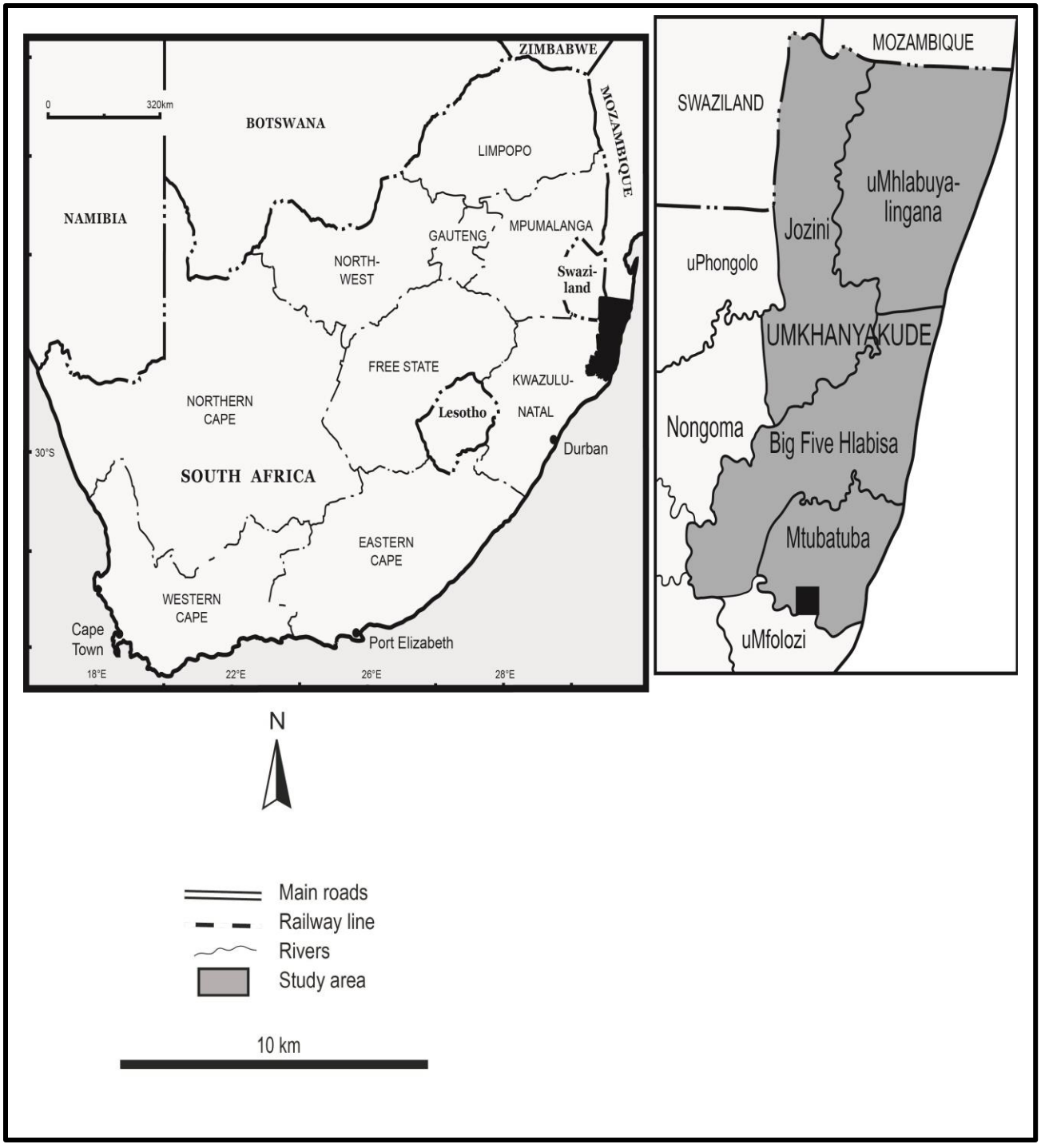

Figure 3. 1: Location of the research site

Source: Wendy Phillips, Cartography Unit, University of the Witwatersrand (2021)

uMkhanyakude District Municipality comprises four local municipalities, namely, Big 5 Hlabisa Local Municipality, Jozini Local Municipality, Mtubatuba Local Municipality, and uMhlabuyalingana Local Municipality (UKDM, 2018). The district has eighteen traditional leaders in each of the four local municipalities (UKDM, 2022).

(i) **uMhlabuyalingana Local Municipality**

The municipality spreads over approximately 3621 km² in land area and has a rural classification of 99%, hence the referral to a rural municipality (uMhlabuyalingana Local Municipality, 2021). Its population is approximately 163,694, of whom 99% are black Africans, and the other races make up a percentage of less than 1% (Statistics South Africa, 2011). The climate condition of the uMhlabuyalingana Municipal Area is always warm and humid and is normally frost-free. The municipality is extremely rural, with informal settlements at Mbazwana and Manguzi (uMhlabuyalingana Local Municipality, 2021).

(ii) **Jozini Local Municipality**

Jozini Local Municipality is in northern KwaZulu-Natal and borders Swaziland and Mozambique. The climate of Jozini is hot and semi-arid. The average annual temperature in Jozini is 21.7 °C (Climate Data, 2021). The precipitation is approximately 621 mm per year. The driest month is June, with 11 mm of rain. The most precipitation falls in January, with an average of 97 mm (Climate Data, 2021).

(iii) **Big 5 Hlabisa Local Municipality**

The Big 5 Hlabisa Local Municipality was established by the amalgamation of the Big 5 False Bay Local Municipality and Hlabisa Local Municipality on August 3, 2016. The municipality covers approximately 3466 km² of land (Big 5 Hlabisa Local Municipality, 2021). Hlabisa is 511 metres above sea level. A large proportion of the land is used for agriculture and game lodge activities and is sparsely settled. The climate is semi-arid. In Hlabisa, there is little rainfall throughout the

year. The average annual temperature is 20.6 °C, and the annual rainfall is approximately 678 mm (Big 5 Hlabisa Local Municipality, 2021).

(iv) **Mtubatuba Local Municipality**

Mtubatuba Local Municipality spreads approximately 1970 km² (Mtubatuba Local Municipality, 2021). According to the 2016 Community Survey, the municipal area has a total population of 202,176 (Mtubatuba Local Municipality, 2021). The population is spread unevenly among the 20 municipal wards. More than half of the households in the municipality live in tribal villages or on rural farms. The climate of Mtubatuba is humid subtropical, with an annual average temperature of 21.5 ºC. While summers are humid and hot, winters are generally cool and mild. The annual rainfall ranges between 600 mm and 700 mm in the western areas, which are predominantly rural, and between 1201 mm and 1250 mm on the eastern side, along the coastal sea belt (UKDM, 2022).

3.4.2 Target Population and Sampling Procedure

Herein, "target population" refers to the total number of individuals, groups, subjects, or things that the researcher wishes to investigate. As mentioned above, the four local municipalities located within uMkhanyakude District, uMhlabuyalingana Local Municipality, Jozini Local Municipality, Big 5 Hlabisa Local Municipality, and Mtubatuba Local Municipality, were used as study sites. These local municipalities comprise several wards, which are represented by councillors and traditional leaders (Table 3. 1).

Table 3. 1: Number of Households, Wards and Traditional Leaders

Local Municipality	**Number of Households**	**Number of Wards**	**Number of Traditional Leaders**
UMhlabuyalingana	39 614	18	4
Jozini	44 584	20	7
Mtubatuba	25 255	20	1
Big 5 Hlabisa	41 792	13	6
Total number	**151 245**	**71**	**18**

Source: uMkhanyakude District Municipal IDP 2020/2021

It is important to note that the study was particularly interested in understanding community-level participation in climate change adaptation discourse. Thus, the first target population was made up of key individuals who represent the communities of uMkhanyakude District Municipality. The study targeted ward councillors, traditional leaders (AmaKhosi and iziNduna), non-government organisations, community-based organisations, and key individuals (church leaders, principals, doctors and nurses, business leaders, etc.). However, although there is information on the number of wards in the district municipality, there are no statistics on the total number of key stakeholder groups within the communities. Thus, given the scenario above, the study could not work out the precise population size of the key stakeholders in the communities of uMkhanyakude District Municipality. However, various stakeholder group lists (which had individual names, job titles, phone numbers, and e-mail addresses) were supplied by Mtubatuba Local Municipality and Big 5 Hlabisa Local Municipality. For the municipalities in which I did not receive a list of stakeholders, I relied thoroughly on the information that was available on the local municipalities' websites. In total, 237 key stakeholders' names were sourced from the four local municipalities. All 237 key stakeholders were purposefully sampled, as they all represent the voice of the communities in which they are located. Out of the 237 key stakeholders, there were 126 research participants; as a result, the response rate was 53%. The 126 research participants were sampled to provide both qualitative and quantitative data. The precise composition is demonstrated in Table 3. 2.

Table 3. 2: Composition of key stakeholders from uMkhanyakude District Municipality

Local Municipality	**Type of participant**	**Number of Participants**	**Total Number of participants**
UMhlabuyalingana	Inkosi	5	28
	Community-Based Organisation	5	
	Non-Government Organisation	4	
	Induna	1	
	Ward Councillor	5	
	Key Individual in the Community	8	

Jozini	Inkosi	0	29
	Community-Based Organisation	4	
	Non-Government Organisation	5	
	Induna	4	
	Ward Councillor	5	
	Key Individual in the Community	11	
Mtubatuba	Inkosi	0	42
	Community-Based Organisation	2	
	Non-Government Organisation	0	
	Induna	1	
	Ward Councillor	4	
	Key Individual in the Community	35	
Big 5 Hlabisa	Inkosi	0	27
	Community-Based Organisation	3	
	Non-Government Organisation	0	
	Induna	3	
	Ward Councillor	6	
	Key Individual in the Community	15	
Total number			**126**

Source: Based on fieldwork survey (2021)

A purposive sampling method was the most appropriate for identifying key individuals who occupy the specific positions of interest identified above. According to Campbell *et al.* (2020), purposive sampling is used when scholars wish to target certain individuals with characteristics of interest in the study. While the sample is not likely to be representative of the population, those

included in the study could provide a great deal of information on the topic of the specific research question.

Purposive sampling is a technique widely used in qualitative research for the identification and selection of information-rich cases for the most effective use of limited resources (Patton, 2002). This involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest (Creswell and Plano-Clark, 2011). In addition to knowledge and experience, Bernard (2002) notes the importance of availability, willingness to participate, and the ability to communicate experiences and opinions in an articulate, expressive, and reflective manner. According to Palinkas *et al.* (2015), purposive sampling methods place primary emphasis on saturation, which refers to obtaining a comprehensive understanding by continuing to sample until no new substantive information is acquired. Furthermore, Hair Jr. *et al.* (1998) suggest that a sample size of less than 100 is considered small. Ahmad and Halim (2017) contend that the recommended sample size should fall within the interval of 100 and 400. The key stakeholders that participated in this study were 28 from uMhlabuyalingana Local Municipality, 29 from Jozini Local Municipality, 27 from Big 5 Hlabisa Local Municipality, and 42 from Mtubatuba Local Municipality. These participants took part in an online survey that collected the communities' perceptions on climate change adaptation in uMkhanyakude District Municipality.

In addition, the study engaged government officials from three spheres of government (local, provincial, and national) working on climate change adaptation who could provide information and give in-depth context in answering the research questions of this study. A list containing the names, e-mail addresses, and positions held by the government officials was received from the uMkhanyakude District Municipality, the KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs, and the National Department of Forestry, Fisheries and the Environment. A purposive sampling method was used to select the government officials who were interviewed. A total of 30 government officials working on climate change adaptation at the national, provincial, and district levels were sampled. In total, 13 government officials participated in this study, making the response rate 43%. The 13 government officials were sampled to provide both qualitative and quantitative data. The precise composition is demonstrated in Table 3. 3.

Table 3. 3: Composition of climate change adaptation government officials from national, provincial and district government levels

Institution	**Job titles**	**Role in Climate Change Adaptation Governance**	**Number of participants**
Department of Forestry, Fisheries and the Environment	Climate Change Specialist	Directorate: Climate Change and Air Quality **Main Function:** (i) Lead and/or support, inform, monitor and report efficient and effective national, provincial, and local climate change adaptation responses.	6
	Chief Director – Climate Change Adaptation		
	Control Environmental Officer		
	Director of Adaptive Capacity Programme		
	Director – Climate Change Adaptation		
	Director – Climate Change Adaptation		
KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs	District Manager – Environmental Management	**Main Function:** (i) Alongside DFFE develop climate change responses that will help mitigate anticipated job losses due to climate impacts, while promoting job creation within the green economy.	3
	Control Environmental Officer		

	Climate Change Intern		
uMkhanyakude District Municipality including the local municipalities	District and Local Government support –	**Main Function:** (i) To build local municipalities where there is no capacity. (ii) To initiate economic development of the district. (iii) To provide in the basic needs of people living in deprived areas.	4
	Environmental Management Official		
	Executive Director – Community Services		
	Youth Environmental Coordinator		
Total number			**13**

Source: Based on fieldwork survey (2021)

3.4.3 Data Collection Tools

Creswell (2009) describes a data collection instrument as a research instrument that is used to compute, examine, or report data. Data collection is an important part of any research study. Thus, it was significant that appropriate data collection tools were used to collect data for this study. The section below discusses the tools that were used to collect data for this study. Three data collection methods were utilised in this study, mainly because data collection was conducted at a time of unprecedented change and disruption due to a global pandemic, COVID-19. Therefore, to conform to health and safety restrictions, face-to-face interviews were not recommended. Online research methods are extensions of traditional methods, using infrastructure provided by the internet (Chen and Hinton, 1999; Jankowski, 1999) and numerous digital technologies. Nonetheless, according to Mann and Stewart (2000), the advantage of computer-based communication is that scholars could interview participants over a wide geographical range, which eliminates the space barrier. In addition, by using online data collection methods, the researcher benefited from lower financial (Cater, 2011; Joinson, 2005) and time investments (Jankowski and van Selm, 2005; O'Connor and Madge, 2003), increased accuracy of data collection (Oringderff, 2004), and easier logistical and organisational procedures (Lobe, 2017).

(i) Internet-based/Online surveys

Online surveys were conducted for this study. The use of online surveys enabled the collection of diverse views and perceptions from various community representatives within the uMkhanyakude District Municipality. In total, 126 key stakeholders from the uMkhanyakude District Municipality participated in the online survey. Couper (2000) is of the view that online surveys provide a means to conduct research, even in populations considered either impractical or financially impractical to access. Several features of online surveying make it attractive to scholars; the most cited are cost, reduced distribution time, and response time (Evans and Mathur, 2005; Shannon and Bradshaw, 2002), as well as automated electronic data collection, entry, and analysis (Dillman, 2007). The low cost of implementing online surveys is advantageous in that it facilitates large sample sizes (Witte and Allen, 2000). Evans and Mathur (2005) maintain that large samples of people may participate in online surveys, owing to the ease of access to global databases, the virtual

effortlessness with which scholars can e-mail messages to participants, the availability and assistance of expert research companies, and the relatively low costs involved. Scholars are readily able to send follow-up reminders to participants who have not replied as a means of increasing the survey response rate (Evans and Mathur, 2005). Furthermore, there are nominal costs involved in distributing the survey questions, and the capture of the responses is automated, minimising the need for paid researcher assistants to ask face-to-face questions or enter data. This also reduces data entry errors (Callegaro *et al.*, 2015) and makes the coding and cleaning of data almost superseded (Alessi and Martin, 2010). Laskey and Wilson (2003) argue that once the last questionnaire for a study is submitted, the researcher instantly has all the data stored in a database.

Individuals allowed to participate online in whatever setting they choose are more likely to disclose information that they would otherwise be uncomfortable revealing (Campos *et al.*, 2011). Carbonaro and Bainbridge (2000) point out that easy access to surveys for all participants is essential to online data collection. To compile and conduct online surveys, it is important to follow the correct procedures. Firstly, online surveys must be designed in such a way that they are simple to complete. Online surveys must have a built-in security system to ensure credibility and anonymity, and finally, online surveys should require only a minimum of computer skills for their completion.

That said, e-mail messages containing the web address were sent to all the participants, inviting them to take part in the online survey. The researcher was proficient in both English and IsiZulu; therefore, the e-mails that were sent to the participants were compiled in both English and IsiZulu to allow all the participants to choose the language they were most comfortable with. Furthermore, the online-based survey was also designed in both languages (English and IsiZulu). The online survey was created using Google Forms. The research participants were able to participate in the survey between February and October 2021.

Dillman and Bowker (2001) suggest that a successful internet-based survey should consider the inability of some participants to access and respond to internet-based questionnaires. Lefever *et al*. (2007) emphasise that online data collection protects against the loss of data and simplifies the transfer of data into a database for analysis. Ilieva *et al*. (2002) argue that using a web survey guarantees a possibly higher response rate. For this study, there were cases where e-mail addresses were not available for some of the sampled participants; however, in such instances, the researcher

made use of the phone numbers that were available to request that the individuals participate in the online survey. Once permission was granted, the participant gave the researcher an e-mail address or phone number where the web link for the online survey could be shared. Dillman *et al*. (1998) make us aware that in a web-based survey, the eyes are focused on the screen while the hands are either on the keyboard or on the mouse, and so completion is difficult. This was one of the reasons the researcher avoided asking participants a lot of open-ended questions. Open-ended questions were kept to a minimum of six.

The following are the formats that the researcher used to pose the questions:

a) Radio buttons provided participants with a list from which they could select one option. The researcher used radio buttons frequently throughout the survey, particularly for questions requiring single responses.
b) Checkboxes provided participants with a list from which they could select multiple options. The checkboxes were used to ask the participants what risks they thought were associated with climate change in South Africa.
c) A drop-down list comprised the districts in which the participants were located. The researcher found the drop-down list advantageous in its space-saving ability.
d) The open-ended text allows freeform text with formatting rules.

Smyth (2016) states that research participants use "pre-attentive processing" when approaching internet-based surveys. This means they try to take in and understand the whole screen before attending to the items. Puleston (2011) advises scholars to consider online surveys as a form of creative communication that needs to be visually attractive, possibly containing imagery or animation. Dillman *et al*. (1998), on the contrary, compare the influence of plain as opposed to fancy internet-based survey designs and layouts on response rates and the quality of data. That said, virtual features were taken into consideration when the researcher created the internet-based survey. Only one image was used as the header, and short, simple, and straightforward wording was used in the survey for this study. The questions followed a logical flow to not confuse the participants. The wording was all in one font type, and only section headings had bigger font sizes and bolded words.

(ii) Telephonic and Online Interviews

According to Kvale (1996: 174), an interview is "a conversation whose purpose is to gather descriptions of the [lifeworld] of the interviewee" concerning the interpretation of the meanings of the "described phenomena." In addition, Schostak (2006) defines an interview as an extendable conversation between partners that aims to have "in-depth information" about a certain topic or subject and through which a phenomenon could be interpreted in terms of the meaning the interviewees bring to it. Boyce and Neale (2006: 3) define interviews as a qualitative research technique that involves "conducting intensive individual interviews with a small number of participants to explore their perspectives on a particular idea, programme, or situation." For this study, we refer to an interview as a conversation between people that gathers in-depth information about a certain topic.

Telephonic and online interviews allowed the researcher to reach many participants over a large geographical range, including individuals from two different provinces, Gauteng (national-level view) and KwaZulu-Natal (provincial and district-level view). The use of interviews in research demonstrates a shift away from seeing human subjects as simply manipulative and data as somehow external to individuals and towards viewing knowledge as generated between humans, often through conversations (Kvale, 1996). According to Rubin and Rubin (2005: 17), interviewing requires "respect for and curiosity about what people say" and "a systematic effort to hear and understand what people tell you." Connaway and Powell (2010) advise that in conducting an interview, the interviewer should attempt to create a friendly, non-threatening atmosphere. Much as one does with a cover letter, the interviewer should give a brief, casual introduction to the study, stress the importance of the person's participation, and assure anonymity and confidentiality. Similarly, Dornyei (2007: 140) states that a "good" qualitative interview has two key features: "(a) it flows naturally, and (b) it is rich in detail."

There are different types of interviews, such as unstructured, semi-structured, and structured interviews. Semi-structured interviews consist of several key questions that will help to define the areas to be explored but also allow the interviewer or interviewee to diverge to pursue an idea or response in more detail (Adams, 2015). Kvale and Brinkmann (2009) are of the view that semi-structured interviews are often the most effective and convenient way of gathering information. Bihu (2020) suggests that all interviews should be tape-recorded and transcribed afterward, as this

protects against bias and provides a permanent record of what was and was not said. It is often also helpful to make "field notes" during and immediately after each interview about observations, thoughts, and ideas about the interview, as this can help in the data analysis process (Phillippi and Lauderdale, 2018; Creswell and Poth, 2016). In the data collection process, notes were taken. For this study, semi-structured interviews were conducted with 13 government officials from three levels of government. This included government officials from uMkhanyakude District Municipality, the KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs, and the national Department of Forestry, Fisheries and the Environment. The participants were first contacted via email to request that they participate in the study. The email briefly detailed the researcher's name and the purpose of the study. The e-mail also included a copy of the participant information sheet and consent form. Interviews were conducted telephonically and online using Microsoft Teams. A tape recorder was used to record the dialogue for those government officials that were interviewed telephonically. The online interviews were recorded using the record option on Microsoft Teams. In addition to the recordings, notes were taken during the interviews. Each session was structured to be conducted for 60–90 minutes; this was informed by the nature of the answers provided by each participant. The researcher began each interview by giving a brief introduction to the study, explaining the importance of participating, and ensuring anonymity and confidentiality. Thereafter, the interviewee was allowed to ask any questions they needed clarification on. The first set of questions comprised what the interviewee's role is; these were then followed by more technical questions.

It is recognised that computer-mediated communication offers greater flexibility in the time and location of data collection (Jankowski and van Selm, 2005), which can be described as a highly socialised form of interaction (Joinson, 2005). Computer-mediated communication also enables scholars to access populations that are difficult to work with or have access to, such as mothers with small children and people with disabilities (Mann and Stewart, 2000). While traditional methods for data collection, particularly interviews, are different online, the scholars still face the same problems, which are how to communicate with their participants and how to present themselves (Garcia *et al.*, 2009). Cilliers and Viljoen (2021) warn that during the use of online platforms, participants can get caught up in a false sense of anonymity, which can lead them to disclose more information than they might in face-to-face situations.

According to Morgan and Lobe (2011), to guarantee successful moderation, a set of instructions should be sent to a participant, including a request to minimise the disturbing factors, shutting down other possible applications and social networking sites, silencing phones, and so on, to ensure a high-quality environment for the interview. Therefore, the researcher sent each participant a participant information sheet, which consisted of a list of information about the interviewer and the study being conducted. A consent form was also sent to the participants a week before the interview. Patton (1980) suggests that it is important to maintain the interviewee's motivation; therefore, the interviewer must keep boredom at bay, for example, by keeping demographic and background questions to a minimum. The interviewer must quickly build rapport by listening attentively and respectfully to the information shared by the interviewee (Spradley, 2016). As such, the researcher only had a few background questions at the beginning of the interview as an icebreaker. Thereafter, significant questions were asked, and at the end, light questions were asked to conclude the interview.

(iii) Documentary review of existing data

Document study (also known as document analysis) refers to the review of written materials by the researcher (Russell and Gregory, 2003). Document analysis is often used in combination with other qualitative research methods as a means of triangulation—the combination of methodologies for the study of the same phenomenon (Natow, 2020). In a time when scholars all over the world collect an enormous amount of data frequently, the practicality of utilising existing data for research is becoming more prevalent (Doolan *et al.*, 2017; Andrews *et al.*, 2012). Andrews *et al.* (2012) suggest that it is important to define secondary data analysis as a systematic research method. Document reviews are a way of collecting data by reviewing existing documents (Bretschneider *et al.*, 2017). Like other analytical methods in qualitative research, document analysis requires that data be examined and interpreted to draw meaning, gain understanding, and develop empirical knowledge (Corbin and Strauss, 2008). Literature from various disciplines indicates that policy analysts have in the past used document reviews and continue to use secondary data for research purposes (Dunn, 2015; Freeman and Maybin, 2011).

Novak (1996) argues that secondary data helps design subsequent primary research and can provide a baseline with which to compare your primary data collection results. Therefore, it is always sensible to begin any research activity with a review of the secondary data (Novak, 1996). Most research begins with an investigation to learn what is already known and what remains to be learned about a topic (Creswell, 2009); in addition to related and supporting literature, one should also consider previously collected data on the topic (Doolan and Froelicher, 2009). Merriam (1988) pointed out that "documents of all types can help the researcher uncover meaning, develop understanding, and discover insights relevant to the research problem." (May, 1997: 164) observes that "[documents] do not simply reflect but also construct social reality and versions of events." Documents provide broad coverage; they cover a long period, many events, and many settings (Yin, 1994). Documents can be analysed to verify findings or corroborate evidence from other sources (Angrosino and Mays de Perez, 2000). A further strength of the use of documentary evidence is its non-reactivity (Webb *et al.*, 1984). Records tend to be unbiased as the documents are collated, usually for other purposes. Many scholars argue that when conducting documentary analysis, the primary focus lies on institutional memoranda, reports, census publications, government pronouncements, proceedings, diaries, and a majority of other written, visual, and pictorial sources in various forms (Polit and Hungler, 1999; Bailey, 1994, 1982; Webb *et al.*, 1984; Treece and Treece, 1982). According to Bailey (1994), documentary research entails the examination of documents that contain information pertaining to the phenomena being studied.

For this study, the researcher reviewed annual reports, development plans, and documents available on the institutions' websites, as well as financial reports, strategies, and policy reports for various government institutions. The institutions that were examined included the Department of Forestry, Fisheries and the Environment and the KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs. Reviewing documents from these institutions allowed the researcher to establish the various departments' mandates, roles, and responsibilities and whether these departments have a role to play in climate change adaptation efforts.

3.4.4 Data Analysis

Shamoo and Resnik (2007) define data analysis as the process of systematically applying statistical and/or logical techniques to describe, illustrate, condense, recap, and evaluate data. According to Shamoo and Resnik (2007: 69), various analytic procedures "provide a way of drawing inductive inferences from data and distinguishing the signal (the phenomenon of interest) from the noise (statistical fluctuations) present in the data." The data analysis procedures for each of the data instruments used in this study are discussed below.

(i) Internet-based/Online surveys

The responses received from the online survey were written in both English and IsiZulu. Therefore, the responses that were written in IsiZulu were translated to English to ensure that they were all in one language. Subsequently, all the survey responses were migrated from Google Forms to a Microsoft Excel worksheet, generating 25 columns consisting of all responses for each of the questions. Subject numbers were assigned because the survey was anonymously filled out by participants. A unique identifier was allocated to each participant, using the letter P in place of "participant," e.g., P1, P2, P3, etc. Other identifiers were the letters A and B; for each of the questions for the two sections on the survey, section A was named A1, A2, etc., and section B questions were named B1, B2, B3, etc. The data was initially reviewed and cleaned. Spelling and grammatical errors were corrected where necessary. Data cleaning refers to detecting incomplete, inaccurate, or irrelevant data and then replacing it with clean entries in a methodical way (Welch *et al.*, 2017). Microsoft Excel spreadsheets enabled editing, coding, sorting, and organising the data into different groups. After editing, sorting, and organising the data from the open-ended questions, the emerging themes were identified. Using data analysis in Microsoft Excel, frequency tables, charts, and figures were drawn for the different variables. Data analysis in Microsoft Excel was the most accessible and cost-effective tool for the researcher. Microsoft Excel is relatively simple, inexpensive, and widely accessible, and it has an increasing range of functionality. Pie charts and graphs were drawn to illustrate the research participants understanding of climate change and its impacts on the communities of uMkhanyakude District Municipality. In addition, the level of communities' awareness of climate change initiatives, policies, and strategies in

uMkhanyakude District Municipality was realised and presented in a graph. A word cloud presentation method using an online cloud-generating software called Word It Out was used to analyse the data obtained on the factors hindering grassroots communities' awareness of climate change adaptation policies and strategies. The word cloud presentation method is a tool that comprises a form of graphic visualisation constructed on the frequency of words from the participants' answers (Camargo and Justo, 2013). Furthermore, the level of participation by communities in climate change initiatives, policies, and strategies in uMkhanyakude District Municipality was quantified, and a graph was drawn. The descriptive analysis was used to determine the views emerging from the findings and draw conclusions. Direct quotations were also used to present the direct responses of the research participants.

(ii) Telephonic and Online Interviews

The data obtained through telephonic and online interviews with the government officials working on climate change adaptation at uMkhanyakude District Municipality, KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs, and the Department of Forestry, Fisheries and the Environment were transcribed using field notes and audio recordings. The content of the data received was analysed. Krippendorff (2018) defined content analysis as a method for examining and evaluating communication in a methodical, unbiased, and quantitative manner in order to assess variables. According to Prasad (2008), content analysis adheres to the fundamental principles of scientific methodology, encompassing objectivity, systematicity, and generalizability. Objectivity entails conducting the analysis based on explicit guidelines, ensuring that different researchers can obtain identical outcomes using the same documents or messages. Systematicity involves the consistent application of rules for including or excluding content, thereby eliminating the possibility of selectively incorporating materials that align solely with the researcher's viewpoints. Lastly, generalizability denotes the ability to apply the researcher's findings to comparable situations.

The content analysis process enabled the researcher to articulate, using government officials' views, the current institutional arrangement of climate change in South Africa, the role of institutions in policy implementation, and the policy-making process for climate change adaptation in South Africa.

Furthermore, the data on the barriers to climate change adaptation was analysed using thematic analysis. This involved familiarising and engaging with the data, generating codes for the data, searching for themes, reviewing themes, and defining and naming themes. According to Nowell *et al.* (2017), a rigorous thematic analysis can generate insightful and reliable findings. This is aligned with Braun and Clarke (2006), who argue that thematic analysis is flexible for identifying, describing, and interpreting themes within a data set in detail. It is tailored to qualitative studies that seek to investigate complex research issues, such as the one this paper sets out to investigate.

To analyse the barriers to climate change adaptation in South Africa, the study also used a systematic diagnostic framework developed by Moser and Ekstrom (2010). It was important for a study of this nature to adopt this framework because understanding barriers to climate change adaptation requires a holistic approach. The systematic diagnostic framework is based on four phases of adaptation: understanding, planning, implementation, and monitoring. The systematic diagnostic framework enabled the classification of the barriers identified in this thesis and a comparison of the barriers across the various government levels to be provided. In addition, direct quotations were used to present direct responses from government officials. The data was also quantified using descriptive statistics, such as frequency tables.

(iii) Documentary review of existing data

Secondary data obtained through the document review process became a baseline against which the researcher was able to compare primary data. The secondary data was evaluated to ensure that it was appropriate for analysis in this study. Using a data evaluation technique provided by Stewart and Kamins (1993:18), the following evaluation steps were followed to analyse the secondary data:

a) What was the purpose of this study?
b) Who was responsible for collecting the information?
c) What information was collected?
d) When was the information collected?
e) How was the information obtained? and
f) How consistent is the information obtained from one source with the information available from other sources?

The data evaluated was used to draw a diagram of the institutional arrangement of climate change in South Africa. In addition, this method was used to compare the data obtained from government officials on the policy landscape of climate change adaptation in South Africa and to compile a data table on the aim of each of the policies and strategies for climate change adaptation in South Africa. Lastly, using secondary data analysis, a data table on the role of the key national, provincial, and local government institutions in South Africa was drawn. To this end, the data collection and data analysis tools used in this study are represented in Figure 3. 2 below.

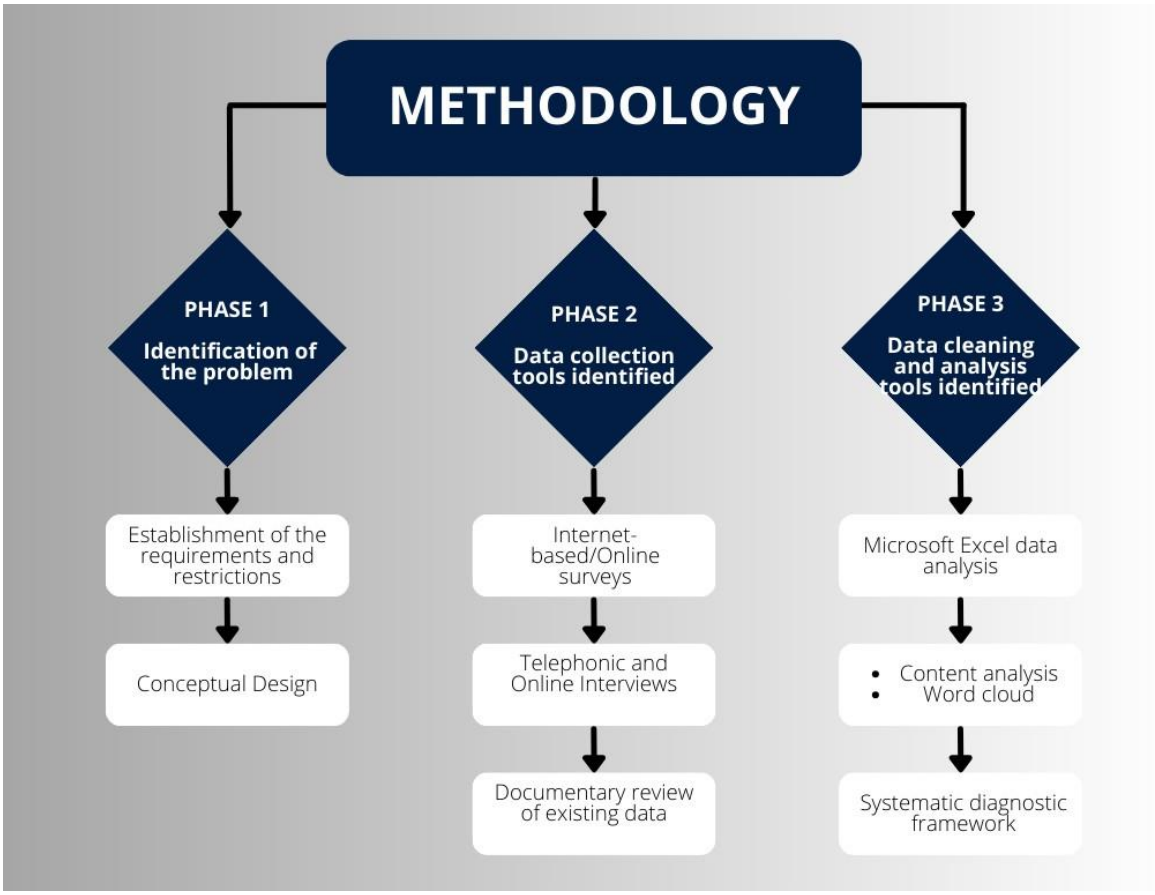

Figure 3. 2: Methodology used in this study

3.4.5 Strategy for validity and reliability - Triangulation

The data collected using the various data instruments discussed in Section 3.4.3 was triangulated and analysed in a professional, unbiased, and thorough manner. This ensured that the findings were valid and reliable. Triangulation can be defined as a process of verification that enhances validity through the integration of multiple methods and perspectives (Heale and Forbes, 2013). Triangulation entails the amalgamation of two or more theories, data sources, methods, and researchers in the examination of a singular phenomenon to converge on a single construct. This technique can be applied in both quantitative (validation) and qualitative (inquiry) studies. The concept of validity in research essentially establishes the accuracy with which a particular approach measures something and the degree of proximity between the findings and the actual values or concepts under investigation (Noble and Heale, 2019). It indicates the extent to which the findings of a specific study can be deemed trustworthy. In the realm of social studies, it has become an accepted practice to employ some form of triangulation or a combination of diverse methods to investigate the same phenomena (Yeasmin and Rahman, 2012). Methodical triangulation is also referred to as mixed-methods research (Bekhet and Zauszniewski, 2012). The utilisation of methodical triangulation enables researchers to mitigate or counterbalance the limitations of employing a single research method by capitalising on the strengths of other methods (Sharif and Armitage, 2004; Denzin, 1978).

In order to ensure accuracy, “truth value,” “applicability,” “consistency,” and “neutrality,” as suggested by Casey and Murphy (2009), triangulation was employed. A triangulation process was executed to acquire an understanding of climate change governance, thereby enriching the descriptions and verifying the significance of issues through diverse methods and sources. The objective was to augment external validity by comparing and cross-checking the consistency of information obtained from different levels and through different means within the qualitative method. This facilitated a comparison of the perspectives of research participants from varying standpoints, encompassing both sets of interviews and document analysis. Consequently, it enabled a comparison of the views or perceptions of the participants with the framework's perspective utilised in this study. Data triangulation also aided in corroborating interview responses with secondary documentary reviews to validate the reported information provided by the research participants (Patton, 2002: 8559).

It is based on this rationale that the methodological approach, in conjunction with the philosophical foundation of this study, is grounded in a pragmatism approach that emphasises the integration of qualitative and quantitative methodologies within a singular study. Given the nature of this study, no single method was considered sufficient to yield optimal results; thus, a combination of methodological approaches was employed to enhance the credibility of the research (Figure 3. 3).

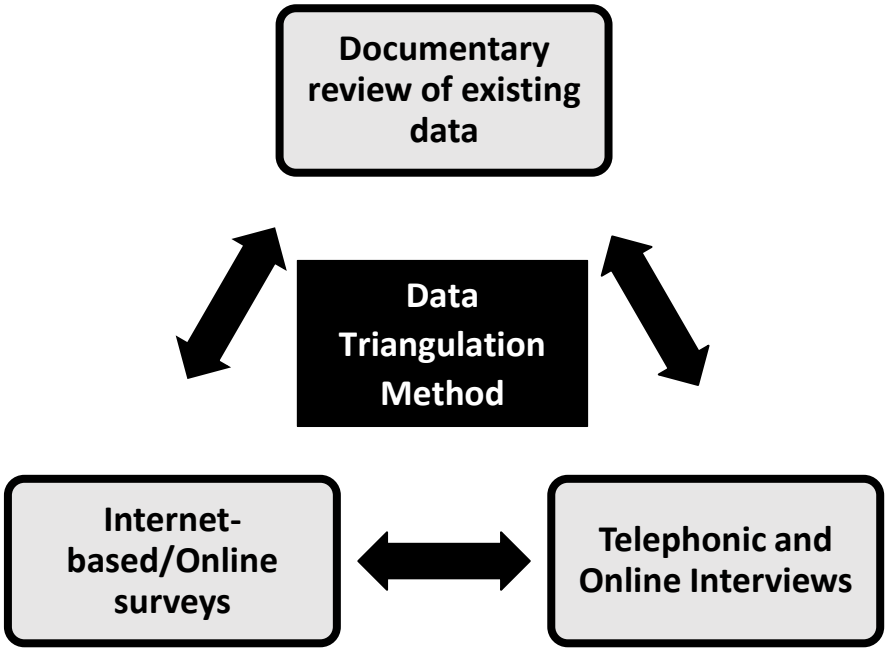

Figure 3. 3: Data triangulation

3.5 Methodological Reflections

Collecting data during a global pandemic (COVID-19) presented several challenges. One of the challenges was the difficulty of collecting data using online data collection methods. In addition, obtaining lists of key individuals from some of the local municipalities and the district municipality was quite a tedious task. Some of the municipalities did not have comprehensive lists; thus, there were cases where the researcher depended on contact information that was readily available on the municipalities' websites to compile a comprehensive list of key individuals in the communities. Once the lists were compiled, some of the e-mail addresses that were provided by the local municipalities were not functional. Mail sent bounced back. In such cases, the researcher had to find alternative ways to reach the participants and invite them to this study. The researcher used

the cellphone numbers of the research participants to call them to ask if they could participate in the study and to provide valid e-mail addresses. Once permission was granted, some of the research participants allowed the researcher to send text messages to their cellphone numbers indicating the web address where they could complete the survey. In cases where participants provided the correct e-mail address, the web address was shared with them.

Furthermore, it was quite a challenge to get the research participants to complete the survey in time, and thus, frequent reminders had to be sent to them to ask them to participate in the online survey. This resulted in having to keep the survey open for a longer period to attain an acceptable sample size. The online survey was compiled in both IsiZulu and English. This was done to accommodate every participant and to remove boundaries that could have been potentially created by the language used to collect the data. Although the online survey was written in both IsiZulu and English, this did not guarantee that every participant could complete the survey, considering that not all key individuals had access to the internet or had adequate computer skills.

In view of the above assertion, some of the research participants who lacked computer skills preferred to print the questionnaire, complete it manually, and then send the researcher a scanned copy. Several research participants preferred that the researcher ask the questions from the survey telephonically, and the researcher then recorded the responses manually on the questionnaire. This method worked well as the researcher could obtain information from the participant without having to exchange hardcopy materials in a time where the exchange of materials presented a risk of transmission of the coronavirus.

Although the use of online surveys allowed the researcher to reach a broad spectrum of key individuals from different geographical areas, administering online surveys restricted physical engagement with the communities under study. Physical engagement would have allowed the researcher the opportunity to observe the various aspects and situations alluded to by the key stakeholders. Nonetheless, the research participants provided a clear picture of what is happening on the ground regarding climate change governance and its role in facilitating or hampering community adaptation. In contrast to the online survey, data collection for online and telephone interviews was challenging. One of the challenges encountered was having to send copious email requests to government officials who work on climate change adaptation at the various levels of government (national, provincial, and local). There were several cases where government officials

would agree to a date and time for a telephonic or online interview, only to turn down the researcher's call on the day. Thus, in such cases, the researcher had to reschedule the appointment. Furthermore, there were government officials who would, an hour before the scheduled appointment time, postpone, citing more pressing issues to attend to. I was grateful for the courtesy they afforded me and was happy to wait until they were ready to start the interview at a time convenient to them. The data collection process revealed that working with communities and government officials requires a lot of patience and humility. Luckily, these two qualities were the researcher's strong points.

Lastly, although the global pandemic (COVID-19) presented several challenges in terms of collecting data, it was important for me to keep a positive mindset and take it one day at a time. My ability to adapt to difficult and challenging times also helped me find innovative and flexible methods to be able to collect data and continue with my research during this time.

CHAPTER FOUR

EMPIRICAL EVIDENCE

4.1 Introduction

This chapter is dedicated to presenting the empirical evidence of this study. The data presented in this chapter was collected between February and October 2021. Qualitative and quantitative research methods were used to collect the data, which is presented descriptively in the form of frequency tables, pie charts, diagrams, and graphs, as well as illustratively in the form of direct speech. Direct speech by research participants was used to express the precise views articulated by the research participants. It is important to have empirical evidence from which conclusions can be drawn. This chapter is structured and categorised around the research questions that were asked in Section 1.4 of this thesis. The chapter is organised to present findings on: (1) community perceptions on the impacts of climate change in uMkhanyakude District Municipality; (2) policies and strategies for climate change adaptation; (3) grassroots participation in climate change adaptation policy formulation and adoption; (4) the role of institutions in the implementation of climate change adaptation policies and strategies; and (5) key barriers and opportunities to climate change adaptation.

Part of the data presented in this chapter was used to develop two research articles titled "Empowering the Voiceless: Securing the Participation of Marginalised Groups in Climate Change Governance in South Africa,"[4] published in the journal *Sustainability* (see Appendix J: Research Article 1) and "Overcoming Bureaucratic Resistance: An Analysis of Barriers to Climate Change Adaptation in South Africa,"[5] published in the journal *Climate* (see Appendix K: Research Article 2).

[4] Sibiya, N.; Sithole, M.; Mudau, L.; Simatele, M.D. (2022). Empowering the Voiceless: Securing the Participation of Marginalised Groups in Climate Change Governance in South Africa. *Sustainability*, 14, 7111. https://doi.org/10.3390/su14127111.

[5] Sibiya, N.P.; Das, D.K.; Vogel, C.; Mazinyo, S.P.; Zhou, L.; Kalumba, M.A.; Sithole, M.; Adom, R.K.; Simatele, M.D. (2023). Overcoming Bureaucratic Resistance: An Analysis of Barriers to Climate Change Adaptation in South Africa. *Climate*, 11, 145. https://doi.org/10.3390/cli11070145.

4.2 Community perceptions on the impacts of climate change in uMkhanyakude District Municipality

This section presents results on community perceptions of the impacts of climate change in uMkhanyakude District Municipality. In answering the first research question, the study used qualitative and quantitative research methods to acquire relevant data from the research participants. Quantitative data was used to complement and enrich the representation of qualitative data. This section comprises data on the research participants understanding and experiences of climate change. It was important to examine community perceptions to better comprehend how communities view climate change and the impact it has on their life-supporting systems.

4.2.1 Research participants knowledge and perceptions about climate change

The way in which people perceive climate change is important for the effective implementation of climate change adaptation policies and strategies. In view of this, one of the components that this study was interested in was understanding how communities in the uMkhanyakude District Municipality view climate change. It was imperative to first determine the level and extent to which communities understood their weather or observed changes in weather patterns. The participants were asked, "*Do you believe climate change exists?*" and their responses are presented in Figure 4. 1.

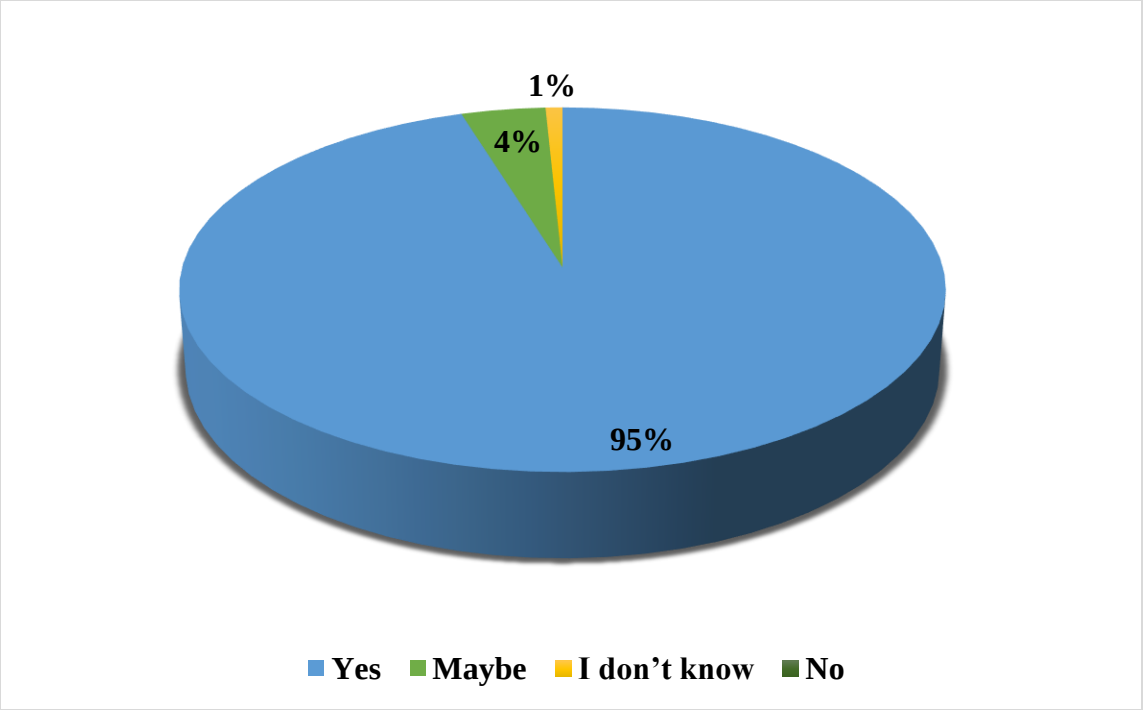

Figure 4. 1: Research participants' understanding of climate change in uMkhanyakude District Municipality

Source: Based on fieldwork survey (2021)

An examination of Figure 4. 1 suggests that 95% of the research participants believe climate change exists. An estimated 4% of the research participants were not sure whether climate change exists or not, and 1% of the research participants indicated not having any knowledge of climate change. Therefore, these findings seem to suggest that the majority of the key stakeholders in uMkhanyakude District Municipality are of the view that climate change exists.

4.2.2 Perceived impacts of climate change in the study sites

This section investigated the research participants' lived experiences with the changing climatic conditions. It was important to establish the impacts of climate change on the grassroots communities of uMkhanyakude District Municipality. The research participants were asked whether they had any knowledge of the impacts of climate change. This question was significant for this study because it exposed the research participants' knowledge on the impacts of climate

change in uMkhanyakude District Municipality. Table 4. 1 reflects the responses of the research participants.

Table 4. 1: Research participants knowledge of climate change in uMkhanyakude District Municipality

Type of response	**Knowledge of climate change impacts on community (Number of cumulative response)**	**Percentage (%)**
Yes	114	91%
I don't know	9	7%
No	3	2%
Total number	**126**	**100%**

Source: Based on fieldwork survey (2021)

Table 4. 1 demonstrates that 114 research participants, representing 91%, have knowledge of the impacts of climate change. In total, 7% of the research participants indicated that they do not know, and the remaining 2% stated that they do not have any knowledge of the impacts of climate change.

In addition, it was important to examine and understand what community members consider to be the manifestation of climate change in their respective communities. The research participants were thus asked to identify the impacts of extreme weather events in uMkhanyakude District Municipality. The views are illustrated in Figure 4. 2.

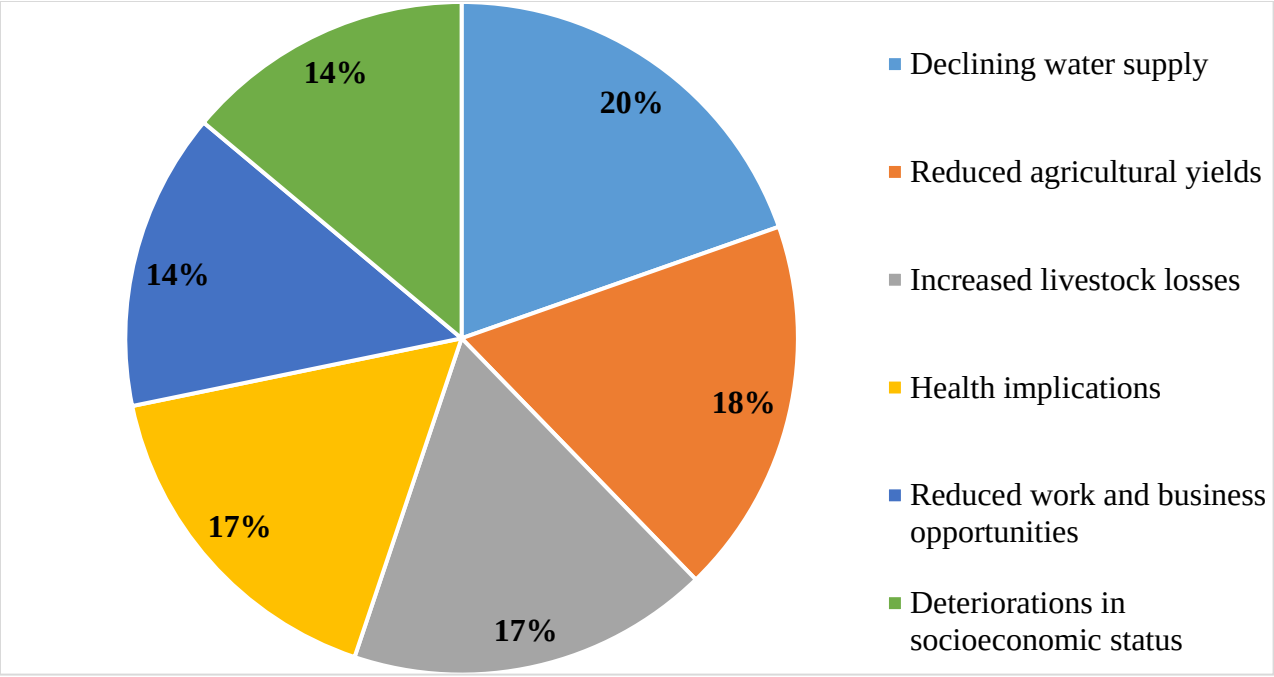

Figure 4. 2: Observed impact of extreme events in uMkhanyakude District Municipality

Source: Based on fieldwork survey (2021)

Scrutinising Figure 4. 2 suggests that an estimated 20% of the research participants alluded to the declining water supply in the study sites as a factor in the impacts of climate change, while 13% of the research participants pointed to a deterioration in socio-economic status because of climate change. It is important to note the combined impacts of climate change on livelihood-supporting systems (such as water supply, agricultural yields, and livestock farming), which are estimated to account for 55% of the total responses. To illustrate the impacts of climate change on livelihoods, a female research participant from the Big 5 Hlabisa Local Municipality stated:

> *"The change in weather always has a story to tell. There is no family here who cannot tell you how the change in weather has impacted them. My mother, for example, has lost 15 cows in just two weeks. The temperatures are very high, and there is no water for the animals to drink. The animals in this village are a source of food and money; without them, we are completely done."* (Pers.com 2021a).

A similar view was expressed by a male participant from the Jozini Local Municipality, who indicated that:

> *"Between 2014 and 2020, we in the northern part of KwaZulu-Natal have been experiencing prolonged absences of rainfall... and severe droughts have now become our order. We are losing our most valuable assets... livestock is dying, and agriculture is failing. Indeed, climate change is real."* (Pers.com 2021b).

Furthermore, a ward councillor from Jozini Local Municipality alluded to the fact that:

> *"Because of climate change, people lost their jobs, especially those working on farms. People also experienced shortages of water around the community. Food production became low, which led to food prices increasing."* (Pers.com 2021c).

Whereas a female research participant from Mtubatuba Local Municipality stated that:

> *"Climate change has resulted in water shortages, and the grazing land is also affected, resulting in the loss of livestock."* (Pers.com 2021d).

A research participant from a community-based organisation in uMhlabuyalingana Local Municipality stated that:

> *"There is no reliable water supply in my area, and this has dire repercussions on our community-based organisation, mainly because we are unable to produce our own vegetables, which usually assists us in the organisation's reducing running costs, and those funds are used for other expenses."* (Pers.com 2021e).

Another female research participant from Jozini Local Municipality, when asked to comment on the impacts of climate change, stated the following:

> *"The impacts of the drought have had health implications for people in the community. The loss of water supplies has resulted in people using dirty water that isn't purified. This causes stomach problems such as diarrhoea and other water-related illnesses."* (Pers.com 2021f).

Although it can be argued that the above assertions are perceptions lacking in scientific basis, they are indications that changes in climatic conditions are presenting several challenges for local and rural communities in South Africa. This exacerbates the existing livelihood challenges for communities, making an already dire situation worse.

4.3 Appraisal of the policy landscape for climate change adaptation in South Africa

The study sought to assess and evaluate the current policies and strategies used to drive the climate change adaptation agenda in South Africa. In this section, the level of effectiveness of the current policies and strategies is evaluated in order to establish the extent to which the current policies and strategies can promote climate change adaptation in the study sites. Furthermore, the section examines the way in which climate change adaptation policies and strategies are developed in South Africa and the stakeholders involved in the policy-formulation process. Therefore, in answering the second research question, interviews with climate change adaptation government officials working at the national, provincial, district, and local government levels were held to gain insights on the policy landscape of climate change adaptation in South Africa.

4.3.1 Climate change adaptation policies and strategies in South Africa

This question investigated the different climate change initiatives that are used to drive the climate change adaptation agenda in South Africa. In line with this study, it is imperative to critically discuss these interventions in order to gain a deeper understanding of how these policies and strategies have contributed to facilitating climate change adaptation in South Africa. Therefore, climate change adaptation government officials were asked to identify the climate change adaptation policies and strategies used at the national, provincial, and district levels to drive the climate change adaptation agenda. Their responses are presented in Figure 4. 3.

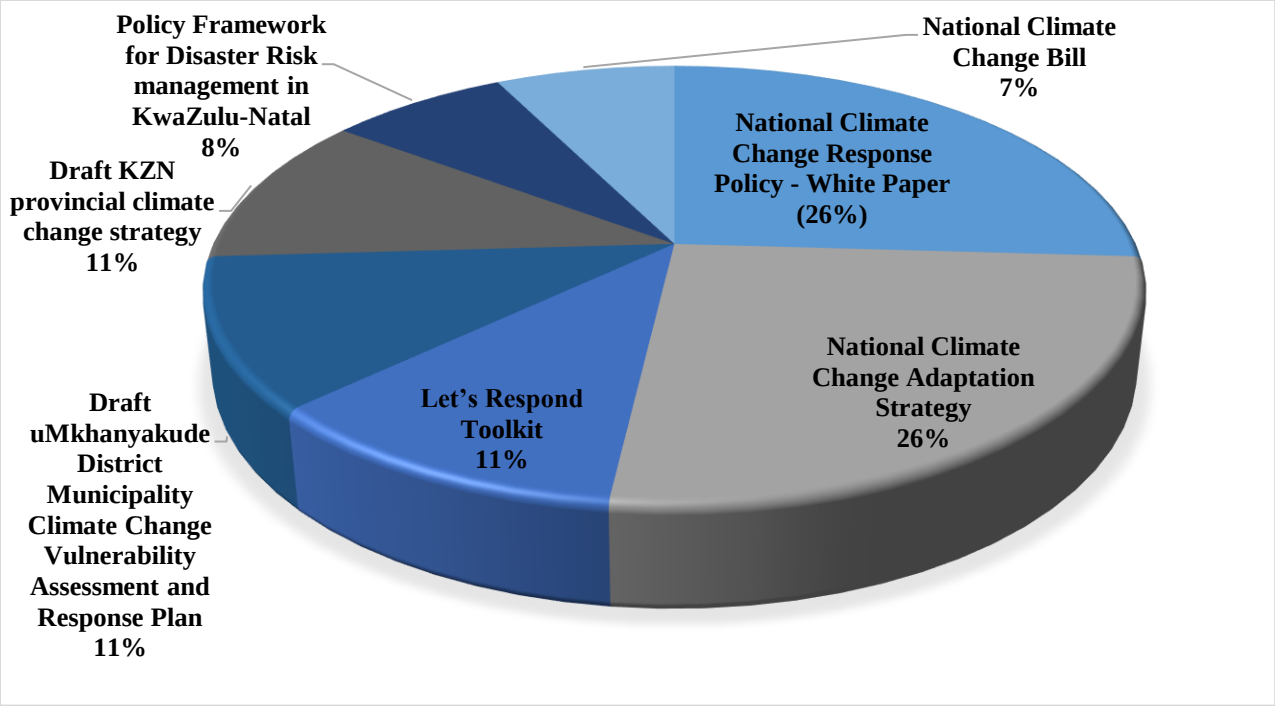

Figure 4. 3: Instruments for climate change adaptation in the study sites

Source: Based on fieldwork survey (2021)

Figure 4. 3 demonstrates that there are several instruments used to drive the climate change adaptation agenda in South Africa. These include the National Climate Change Bill, the National Climate Change Response Policy White Paper, the National Climate Change Adaptation Strategy, the Provincial Policy Framework for Disaster Risk Management, the draft Provincial Climate Change Strategy, the draft District Municipality Vulnerability Assessment and Response Plan, and the Let's Respond Toolkit. However, an important element emerging from Figure 4. 3 is that the National Climate Change Response Policy (NCCRP) and the National Climate Change Adaptation Strategy (NCCAS) are two policy documents that predominantly guide climate change adaptation at the national, provincial, district, and local government levels.

In addition to the data presented above, a secondary data analysis on the existing climate change adaptation policies in South Africa was conducted to complement the primary data. Figure 4. 4 below illustrates the existing legislation and policies guiding climate change adaptation in South Africa.

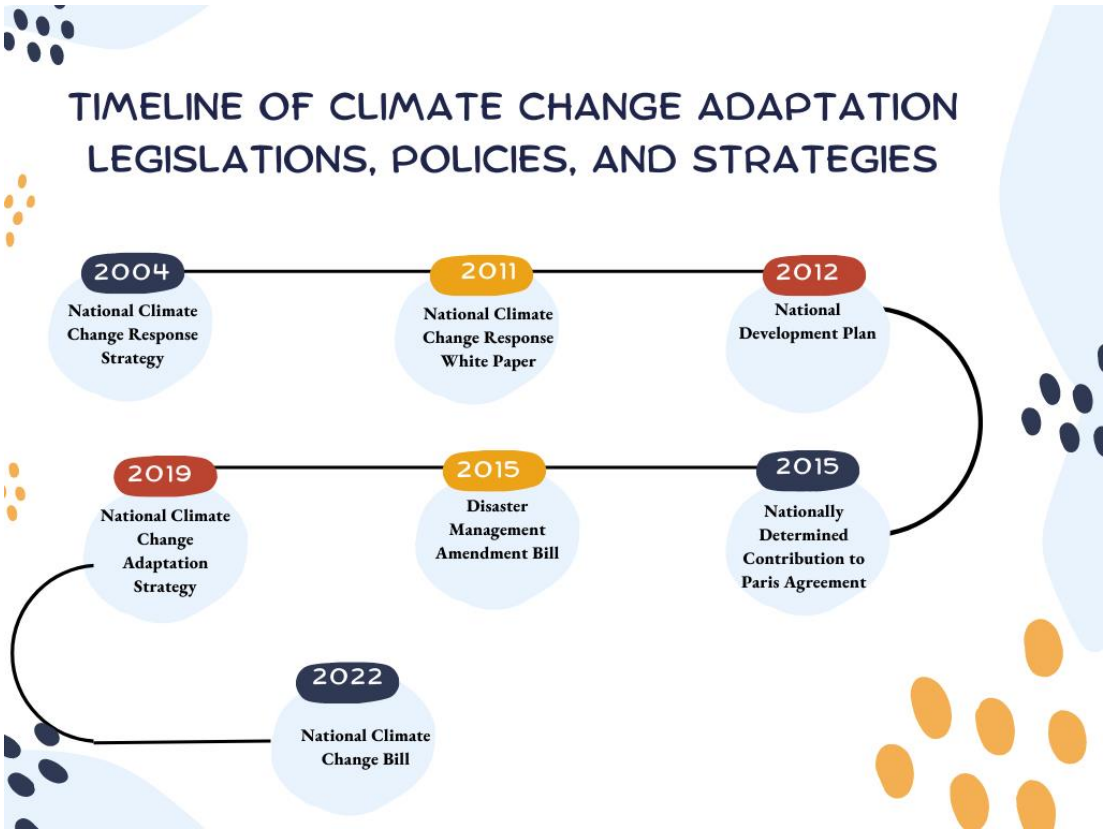

Figure 4. 4: Legislations, policies and strategies for climate change adaptation in South Africa

Source: Adapted from Averchenkova *et al*. (2019)

A comprehensive analysis of each of the climate change adaptation policies, strategies, and bills is provided in Table 4. 2.

Table 4. 2: Climate change instruments for climate change adaptation

Name of Policy/Strategy/Bill	**Framework**	**Year created/adopted**	**Aim**
National Climate Change Response Policy White Paper	Policy	2011	A comprehensive plan to address both mitigation and adaptation in the short, medium, and long term (up to 2050).

Let's Respond Toolkit	Toolkit	2012	Designed to assist the climate change coordinating committee to plan the climate response integration process.
Policy Framework for Disaster Risk management in KwaZulu-Natal	Policy	2010	Provides guidelines for the development of the municipal disaster management frameworks.
KwaZulu-Natal Draft Climate Change Strategy	Strategy	2017	Promotes integration of climate change related issues in the province.
uMkhanyakude District Municipality Climate Change Vulnerability Assessment and Response Plan	Plan	2017 (Not adopted at the time the data was collected)	Enhances implementation of prioritised climate change adaptation options.
National Climate Change Adaptation Strategy	Strategy	2019	Provides a common vision of climate change adaptation and climate resilience for the country.
National Climate Change Bill	Bill	2022	Provides a coordinated and integrated response to climate change.

Source: Based on fieldwork survey (2021) and Secondary data

4.3.2 Evaluation of climate change adaptation policies and strategies

It was important for this study to evaluate the level of effectiveness of the current climate change adaptation policies and strategies. Therefore, drawing from research participants' insights and perceptions, the study evaluated the effectiveness of the climate change policies and strategies used by climate change government officials in facilitating community adaptation. The study first examined the views of key stakeholders in the communities of uMkhanyakude District Municipality. Subsequently, the views of climate change adaptation government officials were sought. These views are illustrated in Table 4. 3.

Table 4. 3: Level of effectiveness of climate change policies and strategies in uMkhanyakude District Municipality by key stakeholders

Level of effectiveness of climate change activities	**Number of cumulative response**	**Percentage (%)**
Not Effective	93	74%
Less Effective	24	19%
Very Effective	9	7%
Total number	**126**	**100**

Source: Based on fieldwork survey (2021)

Notably, Table 4. 3 reveals that 73% of the responses suggest that the current climate change policies and strategies are not effective, while only 7% see them as effective. In light of the above findings, it was important to examine the contributing factors that led to the majority of the research participants indicating that the existing climate change policies and strategies are not effective.

Thus, the data presented below highlights a wide range of views and exemplifies the words of the research participants, who are of the view that the current climate change adaptation policies and

strategies used in uMkhanyakude District Municipality are not effective. A male research participant from uMhlabuyalingana Local Municipality stated that:

> *"There is no positive or urgent response from the municipality after an extreme weather event occurs, so I believe if the policies and strategies were effective, they would put them to good use when we experience extreme weather events."* (Pers.com 2021g).

Whereas a male research participant from Jozini Local Municipality indicated that:

> *"In uMkhanyakude District Municipality, there is no budget allocated to the units responsible for climate change. Therefore, it makes it extremely challenging for the municipality to assist community members to respond efficiently to the impacts of climate change."* (Pers.com 2021h).

A female research participant from Big 5 Hlabisa Local Municipality stated the following:

> *"In most cases, when climate change policies are developed, community members are not contacted, and this leads to valuable information being left out. When valuable information is left out, the policies that are developed do not speak to what's happening on the ground; hence, they are not effective in enabling us to adapt to the impacts of extreme weather events."* (Pers.com 2021i).

The findings displayed above demonstrate that the key stakeholders are of the view that the policies and strategies are ineffective because they lack the input of communities, which results in the policies and strategies not reflecting the situation on the ground and consequently not being adequately implemented.

In addition to the above views, it was also important to examine the views of the climate change government officials with regards to the effectiveness of the policies and strategies they use in facilitating community adaptation to climate change challenges. Officials were thus asked to indicate whether, as government officials, they perceived these policy instruments and strategies to be effective in facilitating the adaptive capacity and resilience of grassroots communities to the impacts of climate change. Their views are illustrated in Table 4. 4.

Table 4. 4: Government officials' responses on level of effectiveness of climate change policies and strategies in uMkhanyakude District Municipality.

Type of response	**Number of cumulative response**	**Percentage (%)**
Yes, instruments are effective for adaptation	13	100%
No, I don't think so	0	0%
I am not sure, maybe they do	0	0%
Total number	**13**	**100**

Source: Based on fieldwork survey (2021)

Table 4. 4 reveals that all (100%) officials indicated that climate change initiatives, policies, and strategies have great potential for influencing community adaptation in a positive way. However, an official from the Department of Environment, Forestry, and Fisheries indicated that:

> *"Policy is written in a far-removed manner away from communities. It is not feasible. However, civil society involved in the discussions should be the ones who say what the problems are, and then national, provincial, and community-based strategies should be formulated."* (Pers.com 2021j).

This view was supported by another official from the Department of Environment, Forestry, and Fisheries who works with grassroots communities, who said:

> *"While the projects have potential benefits to society, they should be co-designed and co-developed with communities. This will be more beneficial in building skills and knowledge within the communities."* (Pers.com 2021k).

From the data presented above, it is suggestive that although South Africa has developed good climate change policies and strategies, their implementation seems to present difficulties, as the majority of those for whom they were developed find them ineffective in helping them build their adaptive capacity and resilience against extreme weather events.

4.3.3 The policy formulation and adoption process

The study sought to understand the climate change adaptation policy landscape in South Africa in terms of its formulation and adoption. Interviews concerning climate change adaptation governance were carried out with climate change adaptation government officials working at the uMkhanyakude District Municipality, the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs, and the Department of Forestry, Fisheries and the Environment. The government officials were engaged in articulating the policy-formulation processes in South Africa. Discussions with government officials revealed that the process of policy formulation starts with conducting a vulnerability risk assessment study to assess the level of risk and vulnerability of communities to climate impacts. Furthermore, the government officials articulated that it is from the findings of the vulnerability risk assessment that a green paper is formulated. In view of this, one of the government officials from the Department of Environment, Forestry, and Fisheries stated the following:

> *"After we conduct and complete a risk and vulnerability risk assessment, we proceed and develop a green paper, which is the document that outlines the key issues that require urgent policy intervention. This process also involves examining evidence that may emerge from new research on climate change adaptation, and this information is then incorporated into the green paper. The purpose is to bridge any gaps that may exist. We then move on and start stakeholder engagement while citing the evidence in the green paper. Stakeholder engagement is meant to garner input and comments."* (Pers.com 2021l).

The overall impression from an official perspective is that the Green Paper is a national government gazette that is published and made available for public comment. In addition, the government officials indicated that, after the public comments are received and necessary revisions are made, the green paper becomes a white paper, which is presented at a technocratic level. An official from the Department of Environment, Forestry, and Fisheries, for example, stated that:

> *"A white paper is a document that is presented at the various intergovernmental forums for approval, the first being Technical Working Group Number 9 (which includes officials from the Department of Forestry, Fisheries and the Environment, universities, and quansi entities like the Council for Scientific and Industrial Research, civil society, the corporate*

world, and other government sectors). Secondly, the white paper is presented to the MINTECH group (which includes government director generals and heads of departments) and then to the Ministers and Members of Executive Councils Meeting (MINMEC). The final policy approval is done by the Presidential Commission on Climate Change." (Pers.com 2021m).

The above assertions demonstrate that the policy formulation process in South Africa is a four-stage one, involving monitoring and evaluation, policy formulation, stakeholder engagement, and policy adoption.

4.3.4 Stakeholder engagement in policy formulation and adoption

Stakeholder engagement is widely recognised as the keystone of policymaking and implementation. Therefore, in view of the strides made in the formulation and implementation of climate change adaptation policy frameworks in South Africa, it was extremely important for this study to carefully examine the stakeholder groups involved in the policy-formulation process. Thus, climate change adaptation government officials were asked to identify the stakeholders that are involved in the climate change adaptation policy-making process and to discuss at which stage of policy formulation they are involved. Their responses are depicted in Figure 4. 5 and the discussion that follows.

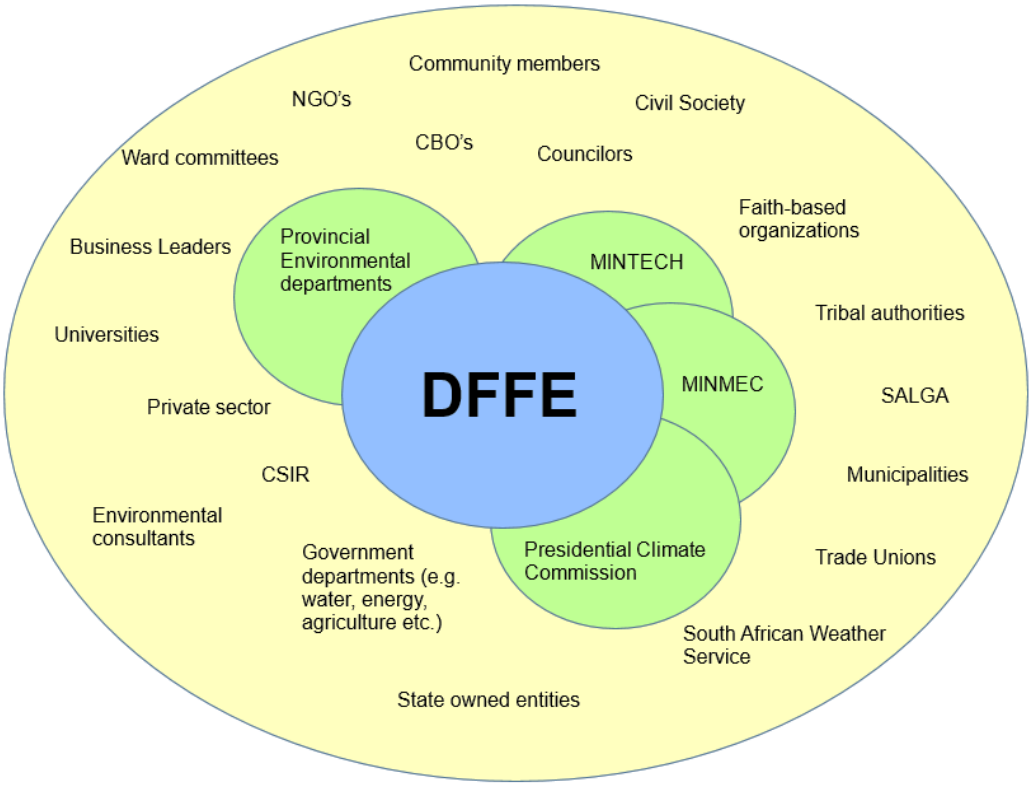

Figure 4. 5: Mapping of Stakeholder groups engaged in the climate change adaptation policy-making process

Source: Based on fieldwork survey (2021)

According to the information illustrated in Figure 4. 5, there is a wide range of stakeholder groups that are invited to participate in climate change policy formulation in South Africa. The stakeholder groups include government departments and representatives, including the Department of Forestry, Fisheries and the Environment, different sector departments, the South African Local Government Association, environmental consultants, state-owned entities, municipalities, the MINMEC group, the MINTECH group, and the Presidential Climate Commission. The stakeholder groups also include business leaders, public entities such as the South African Weather Service, and non-government organizations. Groups representing academia, research, and innovation, including universities, the Council for Scientific and Industrial Research. The government officials further alluded to the fact that there are various stakeholders involved in the different steps of policy formulation. It was stated that the environmental consultants start the process by conducting a risk and vulnerability assessment to identify the risks posed by climate

change. The Department of Environment, Forestry, and Fisheries oversees the entire policy formulation process, while most of the stakeholders represented in Figure 4. 4 are involved in informing policy directives. The high-level intergovernmental forums, such as MINTECH group, MINMEC group, and the Presidential Climate Commission, are involved in policy adoption and approval.

4.4 Grassroots communities involvement in climate change adaptation policy formulation in the study sites

In this section, results on the involvement of grassroots communities in the climate change adaptation policy formulation process are presented. This section comprises data on grassroots communities' level of awareness of climate change adaptation policies and strategies, factors hindering their awareness of climate change adaptation policies and strategies, and their level of participation in the policy formulation process. It was important to examine the grassroots communities' awareness of climate change adaptation policies and strategies, as these initiatives are intended to assist these communities in building their resilience against the impacts of climate change.

4.4.1 Level of grassroots communities awareness on climate change adaptation policies and strategies

The study sought to ascertain the level of grassroots communities awareness of any of the existing climate change policies and strategies used to promote resilience and adaptation to climate change. It is important to examine the level of awareness and understanding of policies and strategies among grassroots communities for whom policies and strategies are developed. Therefore, key stakeholders in the communities of uMkhanyakude District Municipality were asked to rate the level of awareness by indicating whether they were aware of any existing climate change initiatives, policies, and/or strategies for community adaptation. It was important for this study to provide disaggregated data on men's and women's awareness of existing climate change initiatives and strategies. This is because it is widely acknowledged that women are more vulnerable than men when it comes to the impacts of climate change, since they are more dependent on threatened

natural resources. Therefore, it is of particular interest to examine women's level of awareness of climate change initiatives for community adaptation. Figure 4. 6 illustrates these responses.

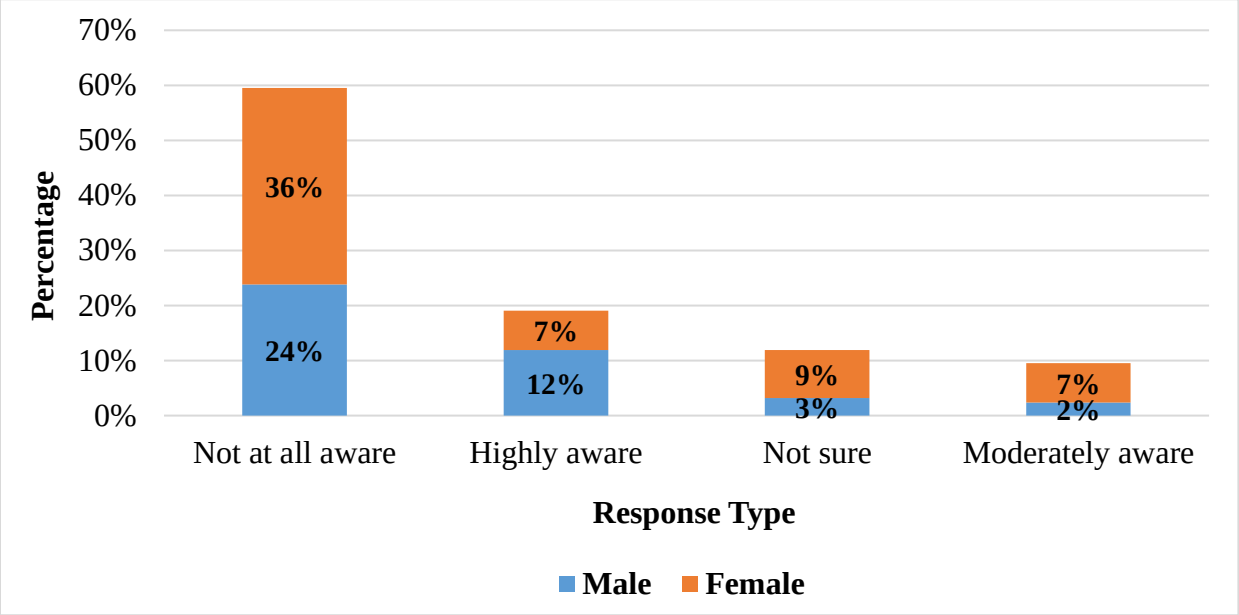

Figure 4. 6: Level of grassroots communities awareness on climate change initiatives, policies & strategies in uMkhanyakude District Municipality

Source: Based on fieldwork survey (2021)

According to the information illustrated in Figure 4. 6 above, an estimated 60% of the responses indicated a lack of knowledge of any climate change policies and strategies for community adaptation to climate change. A further 19% indicated knowledge of climate change initiatives for community adaptation, while 21% expressed a view of being moderately aware, and 12% indicated that they were not sure. What is of particular interest in Figure 4. 6 is that the estimated 36% of responses expressing a lack of knowledge of any climate change initiatives and/or policies were women, and only 7% of the total 19% claimed to have knowledge of climate change policies, strategies, and activities for community adaptation. The overall impression represented in Figure 4. 6 is indicative of the fact that women seem to be a group of people who are generally unaware of any policies and strategies for adaptation to climate change.

4.4.2 Factors hindering grassroots communities awareness of climate change adaptation policies and strategies

In this section, the key stakeholders' views on factors hindering grassroots communities awareness of climate change adaptation policies and strategies are comprehensively contextualised. It was important to comprehend the factors impeding effective community awareness of policies and strategies, as this understanding can be used as an entry point through which the government can improve community awareness and participation. Therefore, in answering this question, key stakeholders were asked to identify the major factors hindering grassroots communities in the uMkhanyakude District Municipality's awareness of climate change adaptation policies and strategies. An array of responses was recorded. The overarching factors alluded to by the key stakeholders are a lack of informative interactions and public engagement. In view of this, a male key stakeholder from Big 5 Hlabisa Local Municipality indicated that:

> *"District or uMkhanyakude never conducted formal workshops for councillors and call public meetings to facilitate climate change workshops or awareness for the public to adhere to policies and bills."* (Pers.com 2021n).

To validate this assertion, a female key stakeholder from Jozini Local Municipality stated:

> *"The Municipality does not educate nor inform us of the existing climate change adaptation plans. The Municipality never asks for the communities' views. In short, I don't think the Municipality knows how to best handle climate change governance."* (Pers.com 2021o).

Another male key stakeholder from Jozini Local Municipality expressed that:

> *"No public engagement or participation was conducted when developing the strategies, I feel like the communities are left out when such strategies are developed, and it becomes difficult for the Municipalities to implement the climate change adaptation strategies."* (Pers.com 2021p).

The above assertions seem to suggest that although there are policies and strategies in place to address the impacts of climate change, due to a lack of informative sessions and public

engagement, the majority of grassroots communities in uMkhanyakude District Municipality are not aware of these initiatives.

Having established the key stakeholders' views on the factors hindering grassroots communities awareness, it was also important to establish the key stakeholders' views on the ways in which these factors can be addressed. A key word extraction method using an online cloud-generating software called Word It Out was used to analyse the data obtained. The views are illustrated in Figure 4. 7.

Figure 4. 7: Possible ways of addressing factors hindering grassroots communities' awareness

Source: Based on fieldwork survey (2021)

Figure 4. 7 demonstrates that the key stakeholders are of the view that the government must educate and train the members of the community, including the youth. The findings also suggest that the community is calling for the government to be a better leader by creating awareness programmes and campaigns. Furthermore, the key stakeholders are of the view that the government must collaborate and work together with the community, particularly in implementing policies and programmes. The findings also reveal that the communities want the government to be transparent. The overall impression from the key stakeholders demonstrates that it is through communication, collaboration, and transparency that the factors hindering grassroots community awareness can be addressed.

4.4.3 Level of participation by grassroots communities in policy formulation

Participation by grassroots communities in policy formulation is critically important because it allows these communities to identify their needs and influence policy direction, formulation, and implementation. Therefore, having established the views of the government officials on the stakeholders engaged in the policy formulation process, it was important for this study to examine the level of participation by grassroots communities in climate change policy formulation in uMkhanyakude District Municipalities. The responses are illustrated in Figure 4. 8.

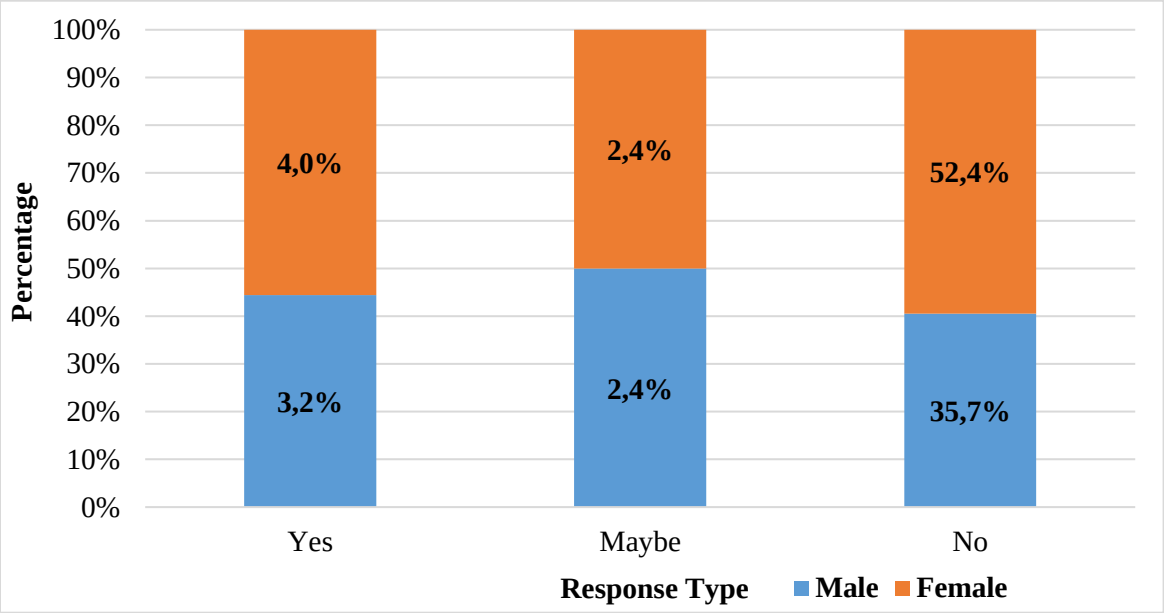

Figure 4. 8: Level of participation by grassroots communities in climate change policy formulation in uMkhanyakude District Municipality

Source: Based on fieldwork survey (2021)

Figure 4. 8 suggests that an estimated 88% (of which 52% are women) of all the responses from the key stakeholders indicated neither participation nor involvement in the formulation of climate change policies and strategies, with only 7% indicating participation in the policy formulation process. A female key stakeholder from Big 5 Hlabisa Local Municipality stated that:

> *"I feel like the communities are left out when such strategies are developed, and it becomes difficult for the Municipalities to implement the climate change adaptation strategies."* (Pers.com 2021q).

The findings presented in Figure 4. 8 are in contradiction with the findings presented in Figure 4. 5, where the government officials indicated that civil society and community members are involved in the policy formulation process. It appears that a top-down approach is being used by the national, provincial, and district governments in the formulation of policies and strategies in South Africa, and this approach is ineffective because grassroots communities are left out of the process. One can argue that the non-involvement of grassroots communities reduces the effectiveness of the policies and strategies that are developed, and this has been evidently proven, as seen in Table 4. 3. In view of this, the findings presented in Figure 4. 8 beg the question: Whose voices are reflected in the climate change adaptation policies and strategies developed in South Africa?

4.5 The role of institutions in climate change adaptation in South Africa

The role of institutions in climate change adaptation in South Africa is examined in the fourth research question of this study. The section comprises four sub-sections, which are: the institutional arrangement of climate change in South Africa; the evaluation of the institutional arrangement of climate change in South Africa; the role of government institutions in climate change adaptation; and the role of government and non-government institutions in facilitating community adaptation in uMkhanyakude District Municipality.

4.5.1 The institutional arrangement of climate change in South Africa

The government, through its various institutional units, plays an important role in driving the climate change adaptation agenda. In view of this assertion, it was of paramount importance to examine the institutions that drive the climate change agenda in South Africa and how these institutions are structured. Figure 4. 9 is a depiction of the institutional arrangement of climate change in South Africa.

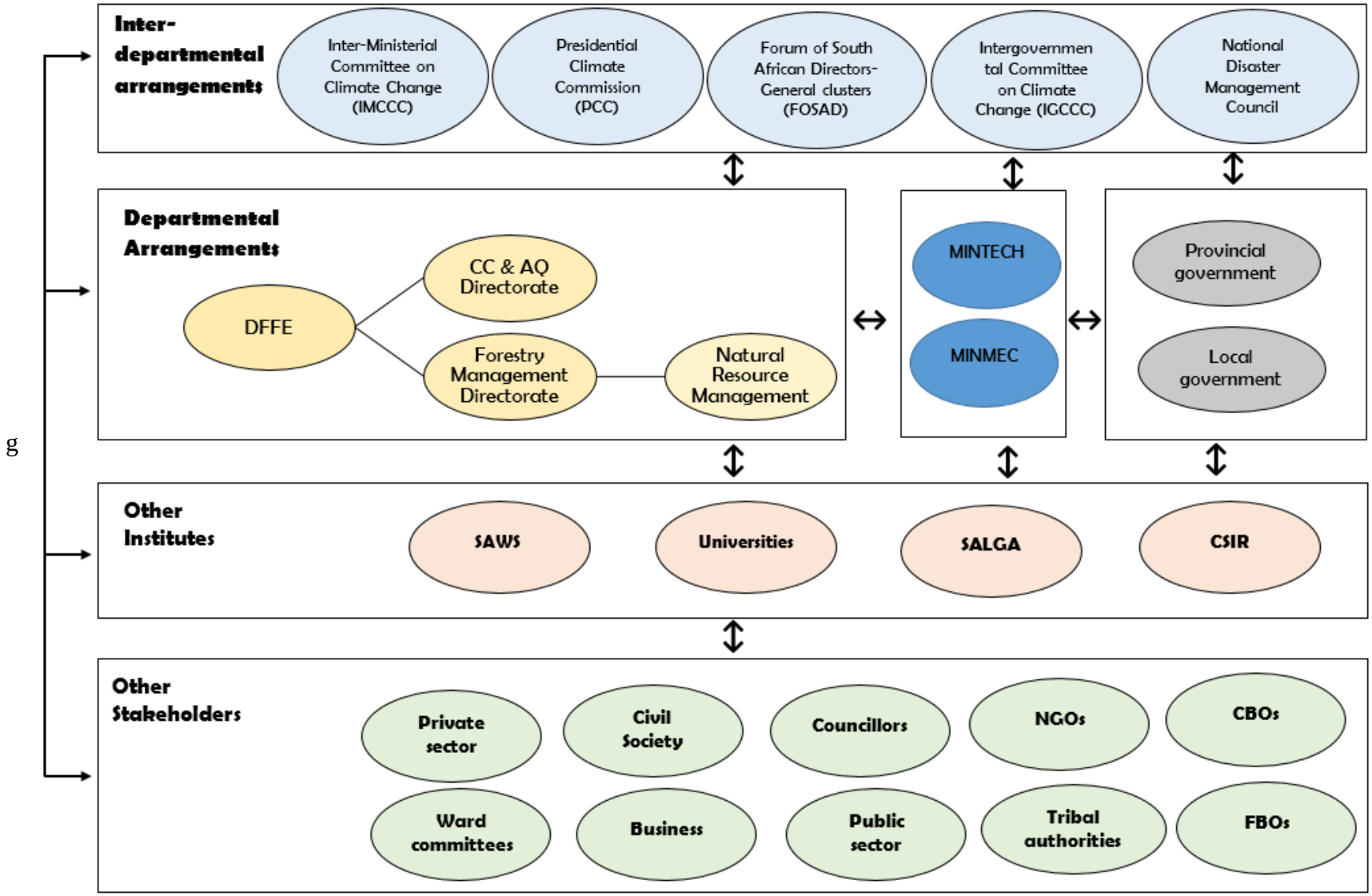

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Figure 4. 9: Institutional arrangement of climate change in South Africa

Source: Adapted from Ortega-Cisneros *et al.* (2021)

A key theme emerging from Figure 4. 9 is that there is a four-tier institutional arrangement for climate change adaptation in South Africa. Further scrutiny of Figure 4. 9 suggests that there is an inter-departmental arrangement within which climate change issues are coordinated across the different government sectors. The inter-departmental arrangement includes the Inter-Ministerial Committee on Climate Change, chaired by the Minister of Environment and is a coordinating body for climate strategy; the Presidential Climate Commission, which is an independent, statutory, multistakeholder body established by President Cyril Ramaphosa to help guide the government's climate policy; the Forum of South African Directors-General Clusters, was established to provide technical support to the Ministerial Clusters and ensure cross-departmental alignment of priorities; the Intergovernmental Committee on Climate Change, coordinated by the Department of Forestry, Fisheries and the Environment which was established to provide an extensive process of consultation with all key government departments in policy implementation and support the alignment of sectoral policies with national climate change policies and commitments; and the National Disaster Management Council. In addition, the MINTECH group, which consists of government Director Generals and Heads of Departments, and the MINMEC group, which consists of Ministers and Members of Executive Councils, form part of the inter-departmental and departmental arrangements.

An examination of Figure 4. 9 demonstrates that government departments for environmental affairs across all three government levels (national, provincial, and local) are found within the departmental arrangements. At the national level, the Department of Forestry, Fisheries and the Environment is the lead department responsible for coordinating the development and implementation of responses to climate change adaptation in South Africa. Within the Department of Forestry, Fisheries and the Environment, climate change issues are dealt with under the climate change and air quality directorate and the forestry management directorate (under the natural resource management unit). Additionally, the findings demonstrate that other institutes form part of the institutional arrangement, such as the South African Weather Service (SAWS), academic institutions in South Africa, the South African Local Government Association (SALGA), and quasi-governmental entities such as the Council for Scientific and Industrial Research (CSIR). Furthermore, stakeholders such as the private sector, public sector, civil society, councillors, non-governmental organisations (NGOs), community-based organisations (CBOs), ward committees, business leaders, tribal authorities, and faith-based organisations (FBOs) form part of the institutional arrangements. The overall impression represented in Figure 4. 9 is indicative of the fact that horizontal coordination is envisioned to

take place across various sectors, institutes, and stakeholders. Whereas vertical coordination on climate change issues across the three government levels (national, provincial, and local) is intended to take place within the departmental arrangement.

4.5.2 The functions of government institutions in climate change adaptation

As a result of a comprehensive institutional arrangement as illustrated in Figure 4. 9 above, it was also important for the study on which this paper is based to examine the functions of the different institutions, particularly in enhancing climate action in South Africa. Using a secondary document analysis, information on key institutions as articulated by the research participants was extracted from inter-departmental and departmental annual reports, national and provincial development plans, integrated development plans for local government, and policy documents. A summary of the functions of the different structures is exemplified in Table 4. 5.

Table 4. 5: The functions of structures that exist in the institutional arrangement

Institutional structure	**Institutional arrangement**	**Functions related to climate change adaptation (CCA)**
The Inter-Ministerial Committee on Climate Change (IMCCC)	**Inter-departmental arrangement**	(i) Executive (Cabinet) level committee that coordinates and aligns climate change (CC) response actions with national policies and legislation. (ii) To oversee all aspects of the implementation of the National Climate Change Adaptation Strategy (NCCAS) (2019) and National Climate Change Response White Paper (NCCR-WP) (2011).
Presidential Climate Commission (PCC)		(i) To manage and facilitate a just and equitable transition towards a low-emissions and climate-resilient economy.

Forum of South African Directors-General clusters (FOSAD)		(i) South African Director-General clusters based on their different mandates will guide NCCAS (2019) and NCCR-WP (2011) actions.
Intergovernmental Committee on Climate Change (IGCCC)		(i) Operationalise cooperative governance. Consists of the relevant national and provincial departments and organised local government represented (by South African Local Government Association).
National Disaster Management Council		(i) Responsible for ensuring that the National Framework for Disaster Risk Management provides clear guidance across all spheres and sectors of government for managing CC related risk. (ii) Ensuring that an effective communications strategy is in place for early warnings to vulnerable communities.
MINMEC (Ministers and Members of Executive Councils) and MINTECH (government Director Generals and Heads of Departments)		(i) Facilitate a high level of policy and strategy coherence among the three spheres of government. (ii) Guide CC work across the three spheres of government.
Department of Forestry, Fisheries and the Environment (Directorate: Climate Change and Air Quality	**Departmental arrangement**	(i) A UNFCCC and IPCC focal point. Lead department responsible for coordinating the implementation of the NCCAS (2019) and NCCR-WP (2011).

and Directorate: Forestry Management under the Natural Resources Management sub-programme)		(ii) Lead and/or support, inform, monitor and report efficient and effective national, provincial, and local CCA responses. (iii) Policy development. (iv) Provide sound environmental management. (v) Facilitates CC mitigation and adaptation, risk, and disaster management, as well as promotes, regulates, and coordinates the sustainable use of natural resources (land and water).
Provincial Environmental Affairs Departments		a. Provinces are tasked with coordinating provincial adaptation and mitigation responses across their own line departments and between municipalities within the province. b. Develop CC response strategy for the province and coordinate adaptation responses across departments.
Local Municipalities		(i) To build climate resilience through planning human settlements and urban development; the provision of municipal infrastructure and services; water and energy demand management; and local disaster response, amongst others.

		(ii) Ensures that CCA actions are integrated into the Integrated Development Plans, and municipal service delivery programmes.
South African Weather Service (SAWS)	**Other Institutes**	(i) Tasked with providing early warning climate information and advisories for different hazards and extreme weather events.
Academic Institutions (Universities)		(i) Tasked with improving understanding of climate science through research.
South African Local Government Association (SALGA)		(i) Tasked with building capacity at local government to manage CC. (ii) Facilitating collaboration in terms of addressing CC.
Council for Scientific and Industrial Research (CSIR)		(i) Tasked with improving understanding of climate science through research.
Private sector, civil society, councillors, non-governmental organisations, community-based organisations, ward committees, business, public sector, tribal authorities, and faith-based organisations	**Other Stakeholders**	(i) Involved in the stakeholder engagement process of the CCA policy development and form part of technical working group number 9 of the DFFE.

Source: Based on secondary data (2021)

As portrayed in Table 4. 5, the inter-departmental arrangement consists of institutions whose role is to coordinate climate change issues across all government sectors affected by climate

change. These institutions are also responsible for guiding the implementation of the National Climate Change Adaptation Strategy (NCCAS) (2019) and the National Climate Change Response White Paper (NCCR-WP) (2011) actions. The MINTECH and MINMEC groups also have a role to play in ensuring coordination across various sectors on climate change issues, particularly in ensuring policy and strategy coherence among the three spheres of government.

Whereas, the departmental arrangement is led by the Department of Forestry, Fisheries and the Environment. As the focal point of the United Nations Framework Convention on Climate Change (UNFCCC), the function of the Department of Forestry, Fisheries and the Environment is to coordinate the implementation of the NCCAS (2019) and NCCR-WP (2011) and ensure efficient and effective vertical coordination between national, provincial, and local governments on climate change adaptation issues. The function of the provincial government is to coordinate provincial adaptation and mitigation responses across their own line departments and between municipalities within the province. The local government plays an important role in ensuring that climate change adaptation actions are integrated into the Integrated Development Plans and in building community resilience against the impacts of climate change.

The function of other institutes primarily involves the provision of early warning climate information, providing evidence of the potential impacts of climate change, and improving understanding of climate science. The other institutes and stakeholders are mainly involved in the stakeholder engagement process of climate change adaptation policy development and form part of technical working group number 9. An important element emerging from Table 4. 5 is that the institutional structures within the institutional arrangement of climate change adaptation play an important role in ensuring that there is policy alignment and coherence.

4.5.3 The role of government and non-government institutions in facilitating community adaptation in the study sites

Empowering communities to adapt to the impacts of climate change is an essential part of climate governance. This study therefore sought to examine the key institutions considered important in facilitating community adaptation in uMkhanyakude District Municipality. To achieve this, a question requiring the key stakeholders to indicate the key institutions that assist

them in building resilience against the impacts of climate change was asked, and their perceptions are illustrated in Figure 4. 10.

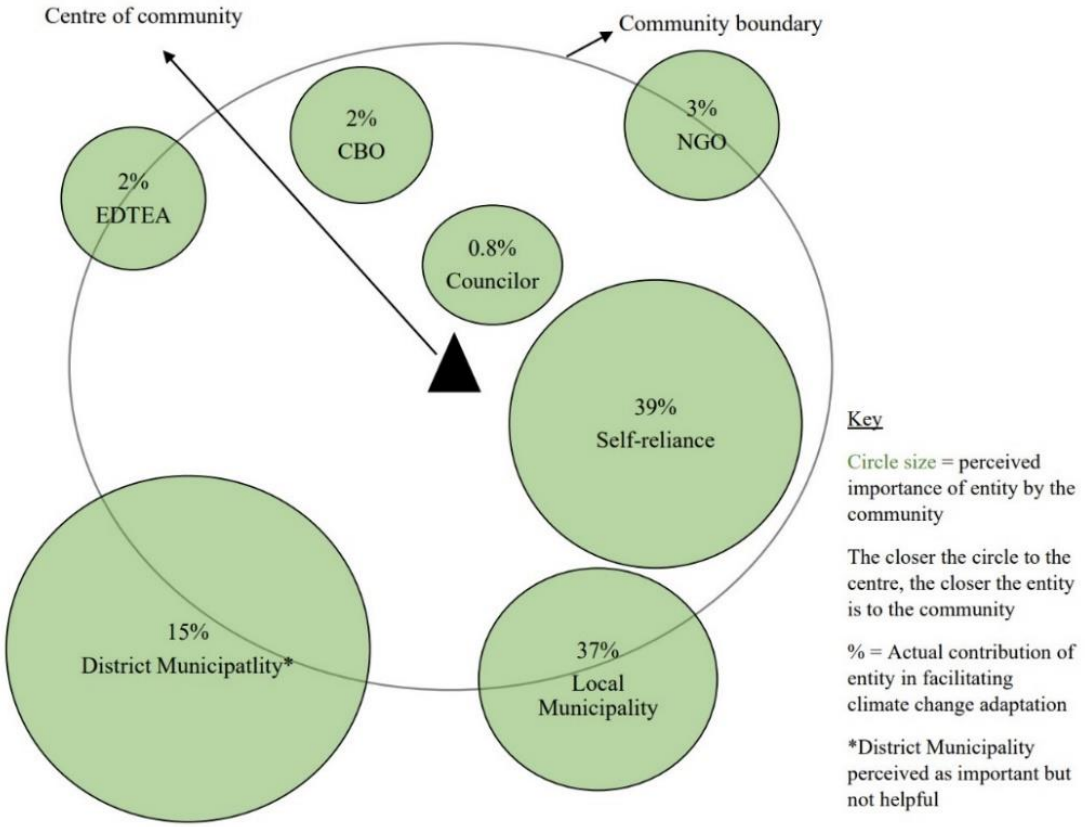

Figure 4. 10: Key institutions that facilitate climate change adaptation in the study sites

Source: Based on fieldwork survey (2021)

As depicted in Figure 4. 10, the key stakeholders consider the district municipality to be the most important official institution or entity (as judged by the size of the circle), which ideally should facilitate adaptation to the impacts of climate change. However, it is important to note that the district municipality is far removed from the centre of the community, and it only provides about 15% of the assistance needed in responding to climate change challenges. Many (39%) key stakeholders seemed to suggest that dealing with climate change challenges rests entirely on the community itself. However, closer scrutiny of Figure 4. 10 suggests that, although the entities identified by the community are represented as being far removed from the centre of the community, they provide a combined 59.8% of the assistance for community responses to climate change.

4.5.4 Evaluation of the institutional arrangement of climate change in South Africa

It was important to establish the climate change adaptation government officials' views on the institutional arrangement of climate change adaptation. Therefore, climate change adaptation government officials at all three government levels were asked, "*Do you find the current institutional arrangement of climate change adaptation in uMkhanyakude District Municipality, KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs, or Department of Forestry, Fisheries and the Environment effective*?" Their views are depicted in Figure 4. 11.

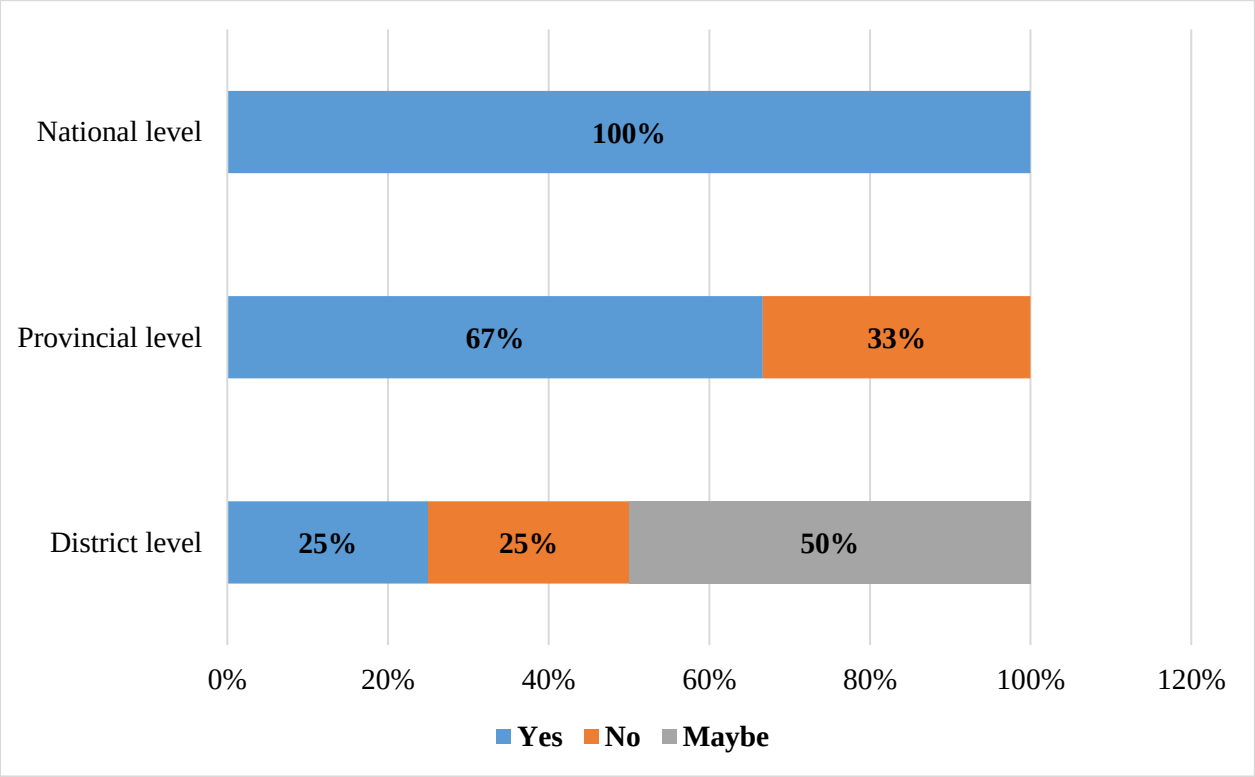

Figure 4. 11: Government officials views on the current institutional arrangement of climate change adaptation in their respective government levels

Source: Based on fieldwork survey (2021)

Figure 4. 11 demonstrates that 100% of the research participants at the national government level are of the view that the current institutional arrangement at the Department of Forestry, Fisheries and the Environment is effective. Furthermore, the climate change adaptation government officials at the Department of Forestry, Fisheries and the Environment cited several reasons in support of their views, some of which include:

> *"The current institutional arrangement enables the interface of different stakeholders (national, provincial, district, local, business community, Academia, civil society movements). Therefore, it is in coherent."* (Pers.com 2021r).

Another climate change adaptation government officials at the Department of Forestry, Fisheries and the Environment alluded that:

> *"The Department of Forestry, Fisheries and the Environment took the issues of climate change seriously that they developed a branch that specifically looks at climate change issues. There's dedicated capacity at different spheres of climate change at national level. However, in other spheres of government such as district and local there's usually one person working in a range of environmental functions instead of a dedicated person looking at only climate change. There's a mismatch when it comes to other spheres. However, I believe the climate change bill will attempt to deal with issues of capacity in other spheres of government."* (Pers.com 2021s).

At the provincial level, 67% of the research participants from the KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs stated that the current institutional arrangement is effective, with 33% stating it is not effective. In view of this, one technocrat from the provincial government stated:

> *"The current institutional arrangement at KZN Department of Economic Development, Tourism and Environmental Affairs is effective, but it is not an institutional arrangement that one would like to have as it has not been a proper institutional arrangement. In 2009, there were only two people working on climate change, in 2018 one of those people retired. Currently there is only one person working on climate change. However, a broader structure is being created now."* (Pers.com 2021t).

At district level, the views varied, with 50% stating that maybe the current institutional arrangement at uMkhanyakude District Municipality is effective, 25% stating it is effective, and 25% stating it is not effective. In view of this, one of the government officials from uMkhanyakude District Municipality indicated that:

> *"The current institutional arrangement at uMkhanyakude District Municipality is not effective because climate change needs to be moved from the Disaster Management Unit to the Department of Environment and Planning because the Disaster Management Unit lacks climate change adaptation capacity."* (Pers.com 2021u).

A similar view was stated by a technocrat from uMkhanyakude District Municipality who said:

> *"Environmental services should be under planning and technical services."* (Pers.com 2021v).

4.6 An assessment of the barriers and opportunities to climate change adaptation in South Africa

The study sought to examine the existing barriers to climate change adaptation in South Africa. It also sought and presents responses on the ways in which the barriers to climate change adaptation could be overcome. The overall aim of this research question is to provide an entry point through which the government can develop and enhance a more enabling environment that promotes effective climate change adaptation in South Africa.

4.6.1 An Analysis of Barriers to Climate Change Adaptation in South Africa

It was imperative for this study to examine the barriers to climate change adaptation. Therefore, government officials working on climate change adaptation were asked, *"What key barriers exist in developing and implementing climate change adaptation policies, strategies, and programmes at the national, provincial, and local government levels?"* The purpose of this question was to understand the barriers encountered by climate change government officials in facilitating climate change adaptation in South Africa. Using the systematic diagnostic framework developed by Moser and Ekstrom (2010), the nature of the barrier and the frequency of the responses received are presented (in percentages) in Figure 4. 12.

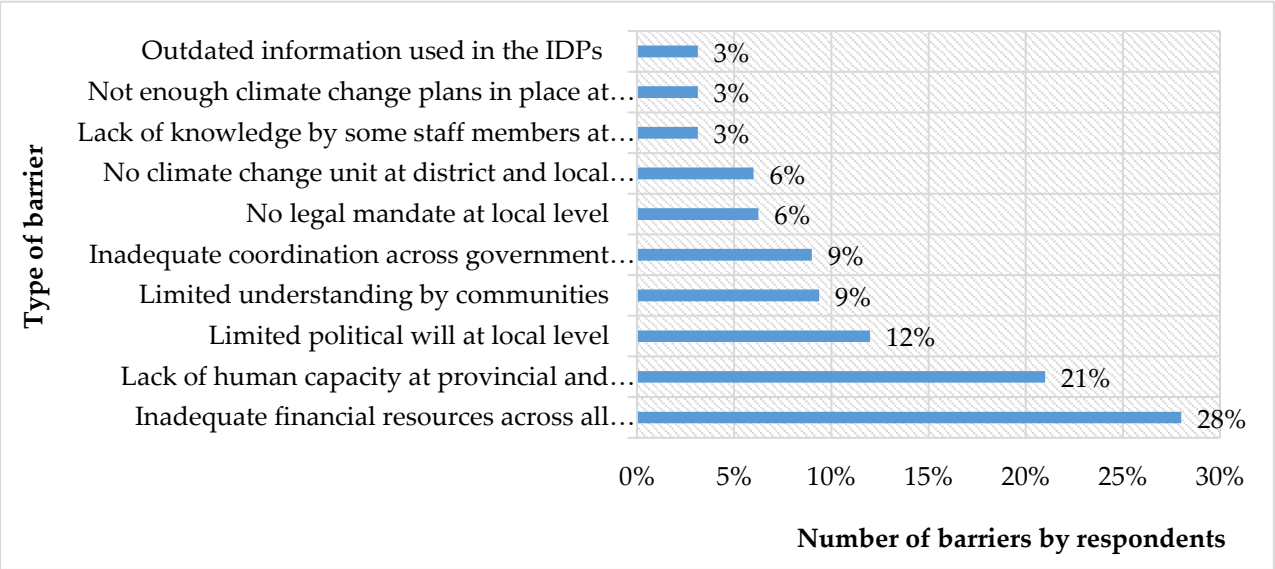

Figure 4. 12: Frequency of different types of barriers encountered at the different government levels

Source: Based on fieldwork survey (2021)

Figure 4. 12 suggests that the major barrier to climate change adaptation is inadequate financial resources across all government levels, which represents 28% of the responses received from government officials working on climate change adaptation. A further 21% indicated that there is a lack of human capacity at the provincial and local government levels. This finding suggests that, in the absence of sufficient fiscal resources and workforce capabilities, government officials face challenges in implementing measures to adapt to climate change at the local level.

An estimated 12% of the responses claimed that there is limited political will at the local government level, whereas 9% expressed that there is ineffective coordination across government officials, and a further 9% indicated a limited understanding of climate change issues by the communities. An estimated 3% of the responses claimed that outdated information on climate change is being used in the municipal Integrated Development Plans (IDPs), whereas 3% expressed that there are not enough climate change plans in place at the local government level, and a further 3% indicated a lack of knowledge by some staff members who are tasked with environmental duties at the district and local government levels.

Secondly, the sources of the barriers were identified by the government officials working on climate change adaptation issues. This data is presented using the systematic diagnostic framework; the data presented in Table 4. 6 and is structured around identifying the

fundamental sources of the barriers under the four phases of adaptation which are understanding, planning, implementation and monitoring the process).

Table 4. 6: A summary of the barriers presented by phase

Understanding	**Planning**	**Implementation and Monitoring**
Limited understanding of climate change issues by communities	Not enough climate change plans in place at the local level	Inadequate financial resources
Limited political will		Lack of human resources
Lack of climate change knowledge by some staff members tasked with environmental duties	Inadequate coordination across government levels and sectors	
	No climate change unit at the local level	
	No legal mandate at the local level	
Outdated information on climate change issues used in the IDPs		

Source: Adapted from Moser and Ekstrom (2010) using fieldwork notes (2021)

Table 4. 6 seems to suggest that four of the barriers have to do with understanding the importance of climate change adaptation. These include limited understanding of climate change issues by communities; lack of climate change knowledge by some staff members tasked with environmental duties; outdated information on climate change issues used in the municipal Integrated Development Plans; and limited political will. In view of this, one of the government officials from the Department of Forestry, Fisheries and the Environment indicated that:

> *"The change in political parties or administration after elections is always problematic be-cause different political parties have different priorities and oftentimes climate*

change is not prioritised. Thus, it is important to note that politics is a reality we must learn to navigate." (Pers.com 2021w).

Furthermore, Table 4. 6 demonstrates that there are four barriers to climate change adaptation in the planning phase, one of which is that there are not enough climate change plans in place at the local level, and the other three overlap between the planning, implementation, and monitoring phases (i.e., no legal mandate at the local level, no climate change unit at the local level, and inadequate coordination across government levels and sectors). To validate the above assertions, a government official from the Department of Forestry, Fisheries and the Environment alluded to the following:

"There isn't a united voice across government levels. It is not because people are in denial, but people are dealing with real-life issues, e.g., human settlements and service delivery. However, we need to work together. We need to find people within the different sectors to take up climate change work and work together using a bottom-up approach. We need to be proactive rather than reactive. We need to continue working at the operational level so that it cascades up." (Pers.com 2021x).

Lastly, inadequate financial resources and a lack of human resources are barriers encountered mainly in the implementation and monitoring phases. A government official from the Department of Forestry, Fisheries and the Environment who was engaged in an interview disclosed that:

"There are not enough funds to implement all climate change plans and projects." (Pers.com 2021y).

Whereas another government official from the Department of Forestry, Fisheries and the Environment indicated that:

"Although we receive external funding from donors, it is never enough." (Pers.com 2021z).

In view of the lack of human resources, a government official from uMkhanyakude District Municipality stated that:

"There is lack of employees who are purely climate change practitioners at local government hinders progress." (Pers.com 2021aa).

Using the second component of the systematic diagnostic framework, the location of influence over the barrier is identified in Table 4. 7.

Table 4. 7: A comparison of the barriers across the different government scales

Barriers	**National level** **DFFE**	**Provincial level** **KZN EDTEA**	**District/local level** **UKDM**
Inadequate financial resources	X	X	X
Lack of human resources		X	X
Limited political will			X
Limited understanding of climate change issues by communities			X
Inadequate Coordination	X	X	X
No legal mandate			X
No climate change unit			X
Lack of climate change knowledge by some staff members tasked with environmental duties			X
Not enough climate change plans			X
Outdated information on climate change issues used in the IDPs			X

Source: Based on fieldwork survey (2021)

An examination of Table 4. 7 suggests that there are inadequate financial resources and inadequate coordination across all three government levels in South Africa. These findings seem to suggest that all the barriers are encountered or felt at the local government level in

South Africa. These barriers are inadequate financial resources, lack of human resources, limited political will, limited understanding of climate change issues by communities, inadequate coordination, no legal mandate, no climate change unit, lack of climate change knowledge by some staff members tasked with environmental duties, not enough climate change plans, and outdated information on climate change issues used in the IDPs.

In view of the above assertions, the overall impression from government officials is that lack of a legally binding mandate, lack of financial resources, lack of political support, and lack of staff members that are expert climate change adaptation practitioners at the local government level are some of the many limitations to facilitating effective climate change adaptation in South Africa. Thus, although South Africa has good policies, their implementation requires change because several barriers exist.

4.6.2 Overcoming the barriers to climate change adaptation

The study sought to investigate some of the origins of the barriers that were identified in this paper. Therefore, using the last component of the systematic diagnostic framework, Figure 4. 13 discloses the origins of the barriers and how this has an influence on overcoming the barriers to climate change adaptation in South Africa.

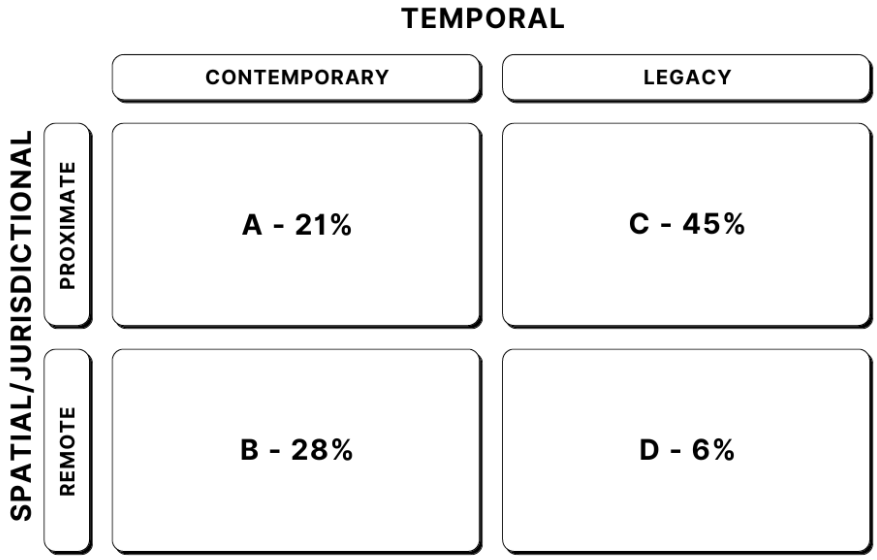

Figure 4. 13: Summary of the origins of the barriers and the contribution (represented as percentages)

Source: Adapted from Moser and Ekstrom (2010) using fieldwork notes (2021)

An examination of Figure 4. 13 shows that a combined total of 21% of the responses to the existing barriers form part of the proximate contemporary barriers. This comprises a limited understanding of climate change issues by communities, representing 9% of the total responses, a lack of climate change knowledge by some staff members tasked with environmental duties (3%), and inadequate coordination across government levels and sectors (9%). These barriers can be overcome by government officials working on climate change adaptation, as they have control over them. The strategies that can be used to overcome these barriers include, but are not limited to:

a) Creating awareness and educating communities on climate change issues.
b) Improving coordination across government levels and sectors.
c) Ensuring that staff members that are tasked with climate change issues are well versed in this area.

A further 28% of the total responses form part of the remote contemporary barriers, which, although they occur now, the government officials working on climate change adaptation have no control over due to inadequate financial resources. The government can:

a) Prioritise climate change adaptation issues to ensure that they are budgeted for appropriately.
b) Source external funding from donors for all government levels in order to implement the strategies and plans that are meant to facilitate climate change adaptation on the ground.

Forty-five percent of the total responses form part of the proximate legacy barriers against which the law prevents action. This comprises no legal mandate at local levels (6%), no climate change unit at district and local levels (6%), a lack of human capacity at provincial and local levels (21%) and limited political will at local levels (12%). However, government officials can have control over initiating changes in the regulations by:

a) Advocating for the need for the government to create a legal mandate at the local government level.
b) Creating a climate change unit at the local government level.
c) Increasing human capacity is necessary to ensure that there are climate change adaptation practitioners on the ground implementing the strategies and plans that have been developed. These practitioners can play a major role in engaging with the communities, educating the communities, and driving change on the ground.

The remaining 6% of the barriers form part of the "remote legacy barriers," which are a legacy of past decisions (i.e., not enough climate change plans in place at the local government level, representing 3%, and the use of outdated information in the IDPs of municipalities, representing 3% of the total responses). Some of these barriers could still be addressed by ensuring that the IDPs have relevant, up-to-date information on environmental issues. This can be achieved by having individuals who are well-versed in this area of expertise who will contribute to such important municipal documents and discussions.

However, a closer scrutiny of Figure 4. 13 suggests that the proximate barriers provide a combined 66% of the barriers over which government officials working on climate change adaptation have control by either providing action to overcome the barriers or initiating changes in the regulations that exist. In view of this assertion, government officials from the three government levels shared the following suggestions:

> *"There is room for creating more climate change adaptation awareness programmes."* (Pers.com 2021ab).

> *"Climate change adaptation strategies, plans, and programmes must be aligned across the three levels of government and across sectors that are affected by climate change."* (Pers.com 2021ac).

> *"There is an opportunity for improved integration between the three levels of government when it comes to climate change governance."* (Pers.com 2021ad).

From the views expressed by government officials, it is evident that there is a need to move beyond the barriers and seize the opportunities that exist in promoting effective climate change adaptation in South Africa. This includes learning from communities' lived experiences, empowering the communities, co-creating knowledge with the communities, improving partnerships, leveraging international funding, improving the institutional arrangements at the district and local government levels by having a dedicated environmental management unit, and improving integration across government levels and across different sectors.

4.7 Summary of key findings

In summary, this chapter presents the empirical evidence of the study, which was guided by the research questions that were identified in Chapter 1 of this thesis. The data was obtained

through online surveys, semi-structured interviews, and secondary data analysis. Several data analysis methods were used to present the data and provide a detailed account of the responses received from key stakeholders from uMkhanyakude District Municipality and the climate change adaptation government officials working at the Department of Forestry, Fisheries and the Environment, KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs, and uMkhanyakude District Municipality. The primary focus was to establish the role of institutions in enabling or hindering the development and implementation of comprehensive policies and strategies for climate change adaptation in South Africa. The imperative findings are summarised as follows:

(i) Key stakeholders in the uMkhanyakude District Municipality are of the view that climate change exists. Furthermore, they have knowledge of the impacts of climate change on livelihood-supporting systems such as water supply, agricultural yields, and livestock farming in uMkhanyakude District Municipality.

(ii) The National Climate Change Response Policy and the National Climate Change Adaptation Strategy are the two policy documents that predominantly guide the climate change adaptation agenda in South Africa.

(iii) Key stakeholders in uMkhanyakude District Municipality are of the view that the policies and strategies used to promote climate change adaptation are not effective.

(iv) The climate change adaptation government officials articulated that the policy-formulation process starts with conducting a risk and vulnerability assessment. The findings from the risk and vulnerability assessment are used to formulate a green paper, which is gazetted for public comment. Subsequently, the document becomes a white paper, which is circulated to MINMEC and MINTECH groups for adoption, with the adoption by the Presidential Climate Commission being the final step in the process.

(v) Grassroots communities in uMkhanyakude District Municipality are unaware of any policies and strategies for adaptation to climate change. Of particular interest was that women seem to be the group of people who are generally unaware.

(vi) The overarching factor hindering grassroots communities awareness of climate change adaptation policies and strategies was the lack of informative interactions and public engagements by government officials.

(vii) The level of participation in climate change policy formulation by grassroots communities in uMkhanyakude District Municipalities is very low. The majority of the

key stakeholders indicated neither participation nor involvement in climate change policy formulation.

(viii) There are several government institutions that are mandated to facilitate climate change adaptation, implement climate change programmes in support of risk and disaster management, and ensure sectoral compliance with the National Climate Change Response White Paper. These institutions include the Department of Forestry, Fisheries, and the Environment; the provincial KwaZulu-Natal Department of Economic Development and Environmental Affairs; and district and local government.

(ix) Several barriers to climate change adaptation were identified. These include inadequate financial resources, a lack of human capacity at the provincial and local levels, limited political will at the local level, limited understanding of climate change adaptation issues by communities, inadequate coordination across government levels and sectors, the absence of a legal mandate at the local level, the absence of a climate change unit at the district and local levels, a lack of knowledge by some staff members tasked with environmental duties at the local level, not enough climate change plans in place at the local level, and outdated information on climate change used in the IDPs.

(x) Various strategies were identified in order to overcome the barriers to climate change adaptation. The strategies include learning from communities' live experiences, empowering communities, co-creating knowledge, improving partnerships, leveraging international funding, improving the institutional arrangements at the district and local government levels by having a dedicated environmental management unit, and improving integration across government levels and across different sectors.

CHAPTER FIVE

ANALYSIS AND DISCUSSION[6]

5.1 Introduction

This study explored the ways in which climate change adaptation policies and strategies are developed in South Africa and the role of institutions in the implementation of these policies and strategies. This chapter discusses and contextualises the empirical evidence presented in Chapter 4. It is important for a study of this nature to interpret and contextualise the findings to demonstrate their significance in relation to the objectives the study sets out to achieve. In view of this, the discussion is structured around the five research objectives of this study, which are: an assessment of the impacts of climate change in uMkhanyakude District Municipality; an appraisal of the policies and strategies towards building climate resilient communities; an evaluation of public awareness and participation in climate change adaptation in South Africa; an assessment of the role of institutions in climate change adaptation; and an analysis of the key barriers and opportunities to climate change adaptation.

5.2 The adverse impacts of climate change in uMkhanyakude District Municipality

One of the objectives of this study was to understand how the communities of uMkhanyakude District Municipality perceive climate change and whether they have any knowledge of the impacts of climate change on their livelihood-supporting systems. The empirical evidence presented in Section 4.2 of this thesis reveals that most of the research participants believe climate change exists, and they were able to give an account of how climate change has affected them and/or members of their communities. It appears from the findings that the communities of uMkhanyakude District Municipality have been greatly affected by the impacts of climate

[6] Part of the discussion included in this chapter has been used to formulate two research articles.
Sibiya, N.; Sithole, M.; Mudau, L.; Simatele, M.D. (2022). Empowering the Voiceless: Securing the Participation of Marginalised Groups in Climate Change Governance in South Africa. *Sustainability*, 14, 7111. https://doi.org/10.3390/su14127111.

[6] Sibiya, N.P.; Das, D.K.; Vogel, C.; Mazinyo, S.P.; Zhou, L.; Kalumba/, M.A.; Sithole, M.; Adom, R.K.; Simatele, M.D. (2023). Overcoming Bureaucratic Resistance: An Analysis of Barriers to Climate Change Adaptation in South Africa. *Climate*, 11, 145. https://doi.org/10.3390/cli11070145.

change, much like communities in other developing countries in the sub-region and globally. This finding reaffirms Ülker *et al.* (2018), who posit that the impacts of climate change on socio-economic and environmental aspects have now become a global concern. In uMkhanyakude District Municipality, climate change has mostly manifested itself as droughts, and this has adversely affected water availability for communities. Additionally, the findings demonstrate how climate change is affecting livelihood-supporting systems (such as water supply, agricultural yields, and livestock farming) for communities in uMkhanyakude District Municipality. It is important to note that, based on the findings, it appears that these communities are heavily reliant on agriculture to sustain their livelihoods. Therefore, this finding speaks to the threat of climate change on water and food security because, for these communities to be able to be food secure, their agricultural practices need to be resilient to changing climatic conditions. Corroborating this finding, the draft IDP (2023) for uMkhanyakude District Municipality states that the key vulnerabilities for the district include increased food and water insecurity, which results in human health impacts, increased isolation of rural communities, and increased impact on strategic infrastructure and houses. Furthermore, the findings confirm the assertion made by Ziervogel *et al.* (2014: 606), who argue that climate change threatens food security, water resources, tourism, ecosystem services, and biodiversity. It also hinders national development because South Africa has high levels of poverty and inequality. In the same terrain of thought, Schilling *et al.* (2020) argue that South Africa is more associated with climate change because of its high dependence on rain-fed agriculture, coupled with poor technical, financial, and institutional capacity. The findings of the present study, as well as previous scholarly investigations, indicate that addressing the impact of climate change in rural communities, particularly those at the grassroots level, necessitates investments that provide support for climate change adaptation.

Furthermore, the key stakeholders who participated in this study cited that the change in climatic conditions results in increased livestock losses due to reduced grazing land, amongst other factors. Livestock losses are a major socio-economic impact of climate change, as some people, particularly in rural areas, depend heavily on livestock for food production and income generation to support themselves and their families. This finding also speaks to food security and the element of reduced income generation for those members of the community of uMkhanyakude District Municipality who practice livestock farming to support themselves and their families. However, these findings are not exclusive to South Africa; they seem to align with those of other studies. Madzwamuse (2010) and UNFCCC (2013), for example,

found that because many people in the sub-Saharan African region depend on farming, climate change prevents the poor from engaging in effective and efficient food production practices. Furthermore, their study argued that climate change significantly affects rural livelihoods and contributes to increased levels of poverty. Similarly, Simatele *et al.* (2012) found that the changes in climatic conditions are increasingly limiting the ability of the poor to actively engage in meaningful agricultural activities owing to the eroding effects of climate change on their asset portfolios. Furthermore, Simatele *et al.* (2012), who worked in the context of Lusaka, Zambia, found that climate change will have significant implications for human health, livelihood assets, and food production. Lastly, it is widely acknowledged that over 844 million people worldwide obtain an income from agriculture, and it is said that the livestock sector contributes about 40% of agricultural value-added (FAOSTAT, 2020; World Bank, 2020). This study, therefore, revealed that the change in weather patterns intensifies poverty levels for rural communities because they are highly dependent on natural resources to sustain their rural livelihoods.

It was also established that a lack of water due to the severity and frequency of droughts results in community members drinking water from unsafe sources. This finding demonstrates the health implications of climate change. Communities end up resorting to contaminated water for domestic purposes. This finding is not unique to uMkhanyakude District Municipality, as it has been previously argued that water scarcity may alter the sources of water used for agriculture and domestic purposes, which will raise exposure to Listeria and other pathogens in South Africa (Jongman and Korsten, 2016). This view is supported by Diffenbaugh and Burke (2019), who observe that there is growing evidence that poorer countries or individuals are more negatively affected by a changing climate, either because they lack the resources for climate protection or because they tend to reside in warmer regions where additional warming would be detrimental to both productivity and health.

In view of the above assertion, it can be argued that the findings of this study demonstrate that climate change has serious repercussions and is undeniably having devastating impacts on the livelihood supporting systems of many poor and rural households in uMkhanyakude District Municipality. Therefore, this study argues that the increase in vulnerability of the poor to climate change requires an urgent and conceited policy response to their dilemma. There is an urgent need for government systems and policies to go beyond simply acknowledging the impacts of climate change and instead move into a space that ensures and enables human and natural systems to adjust to the actual and projected climate stimuli and impacts.

5.3 Appraisal of the policies and strategies used to build climate resilient communities

5.3.1 Evaluation of the current climate change adaptation policies and strategies

Climate change is a cross-cutting issue that requires policies and strategies to be integrated across sectors. The findings of this study align with previous studies, which argue the importance of local government in formulating context-sensitive climate change adaptation initiatives, policies, and strategies. In line with its second objective, the study investigated the policies and strategies used to drive the climate change adaptation agenda in South Africa. One of the issues that emerged from the study was that there are several climate change policy frameworks that drive the climate change adaptation agenda in South Africa. The findings seem to align with previous studies that argue that the first formal document demonstrating policy direction in South Africa was the 2004 National Climate Change Response Strategy (Lukey, 2020; Averchenkova *et al.*, 2019). This document was based on the initial national communication, country studies, and the IPPC's third assessment report. Furthermore, Lukey (2020) notes that the 2004 National Climate Change Response Strategy was not connected with a specific climate change policy. However, the strategy specified that there was an urgent requirement for South Africa to have a national climate change policy. As depicted in Figure 4.13 of this thesis, the climate change adaptation government officials alluded to the National Climate Change Response (NCCR-WP) White Paper (2011) and the National Climate Change Adaptation Strategy (NCCAS) (2019) as being the two fundamental policy frameworks that drive climate change adaptation in South Africa. These policy frameworks guide the formulation of climate change adaptation strategies at the national, provincial, and district/local government levels. The NCCR-WP was approved in 2011 and was based on the stipulations of the Constitution of the Republic of South Africa, the National Environmental Management Act, the Millennium Declaration, and the United Nations Framework Convention on Climate Change (Madondo and Nkwana, 2021). The aim of the 2011 NCCR-WP was to outline South Africa's vision of effective climate change response, short-term, medium-term, and long-term, and of the transition into a lower-carbon economy and society (DEA, 2011).

The use of the above-mentioned climate change instruments in driving climate change adaptation has also been widely recognised in the literature. Therefore, these findings confirm the assertion made by Madondo and Nkwana (2021), who posit that the NCCR-WP is currently the pillar of South Africa's response to climate change. Furthermore, Ziervogel *et al.* (2014) are of the view that the NCCR-WP ensures equity through reasonable allocation of efforts,

costs, and benefits in the context of the need to address disproportionate vulnerability, responsibilities, capabilities, disparities, and inequalities. However, Smith (2013) (49–57) posits that the NCCR-WP lacks provisions for how the government will integrate climate change into training and education or establish methods of raising public awareness. Averchenkova *et al.* (2019) argue that the NCCR-WP establishes a requirement for all government departments and state-owned enterprises to harmonise their policies, strategies, and regulations with the contents of the White Paper. One of the goals of the NCCR-WP is to effectively manage the inevitable impacts of climate change through interventions that foster and maintain South Africa's social, economic, and environmental resilience and capacity for emergency response. (NCCR-WP, 2019). According to the DFFE (2020), the National Climate Change Adaptation Strategy was approved in 2019. The National Climate Change Adaptation Strategy draws from the National Development Plan, the National Strategy for Sustainable Development, and the adaptation commitments included in its Nationally Determined Contributions, sector, provincial, and municipality adaptation plans (DFFE, 2020). The role of the National Climate Change Adaptation Strategy is to "guide South Africa towards a common vision of creating a climate-resilient economy and society" (Madondo and Nkwana, 2021:196). Furthermore, the National Climate Change Adaptation Strategy acknowledges the significance of a bottom-up approach in adaptation interventions, the role of the local government as a leading body, and the inclusion and cooperation of businesses, civil societies, academia, and technological organisations in building a climate-resilient economy and society (DFFE, 2020). The Department of Forestry, Fisheries, and the Environment is of the view that the NCCAS acknowledges that historical injustices and social inequalities of apartheid are the foundations of vulnerabilities. In light of this, climate adaptation solutions that are developed must consider the situations and factors that make people more vulnerable to the impacts of climate change. Sowman and Rebelo (2022) state that the NCCAS provides essential guidance to government actors across national, provincial, and municipal scales in response to climate change. He further argues that the NCCAS serves as South Africa's national adaptation plan in terms of the country's international obligations, as adopted in the Paris Agreement under the UNFCCC.

This study also established that the Climate Change Bill of 2022 is one of the instruments that guides the formulation of climate change adaptation strategies. The purpose of the Climate Change Bill of 2022 is to craft and implement an effective national climate change response, including mitigation and adaptation actions, that represent the Republic's fair contribution to the global climate change response (Republic of South Africa, 2022: 167). According to the

same source, the Bill is expected to create financial obligations for the government in the form of implementation costs in relation to: the development of climate change response and implementation plans by spheres of government; the sector adaptation strategy and plan by relevant ministers; the amendment of existing policies and plans to take sectoral emissions targets into account; the development of a national adaptation strategy and plan; human resource capacity for supporting the development and implementation of all plans, strategies, and frameworks under the Bill; and human resource capacity for compliance monitoring and enforcement.

The government officials also alluded to the Let's Respond Toolkit as an instrument that is aimed at assisting South African municipalities to mainstream climate change into their Integrated Development Plans. Furthermore, the government officials identified the 2017 KwaZulu-Natal Draft Climate Change Strategy and the Disaster Management Plan as some of the other instruments that are used to guide the formulation of climate change adaptation strategies. They cited that the Disaster Management Plan aims to provide methods for disaster risk reduction through adaptation to climate change and the development of early warning systems. Lastly, at the time when the data was collected, the government officials alluded to the fact that, although the uMkhanyakude District Municipality has drafted a climate change response plan, it has not been adopted.

It appears that South Africa has good policies and strategies aimed at facilitating the climate change adaptation agenda. However, the findings of this study demonstrate that the majority of the key stakeholders that participated in this study find the existing climate change adaptation policies and strategies ineffective. The main reason for this was that the policies and strategies lacked the input of communities, which resulted in the initiatives not reflecting the situation on the ground and consequently not being adequately implemented. These findings suggest that the implementation of climate change adaptation policies and strategies at the community level is hindered by their inherent complexity.

On the contrary, the findings demonstrate that all the government officials who participated in this study are of the view that climate change adaptation policies and strategies are effective. But the question is: Effective for who? Is it for those who formulate them or for those who are the end-users? What good are these policies for end users? Nevertheless, this argument is greatly articulated by Mueller (2020), who states that what is a failure to one person might be a success to another because different people have different policy preferences and policies

often lead to winners and losers. Unfortunately, in this case, the losers are the communities that are most vulnerable to the impacts of climate change and most in need of climate change policies and strategies that work for them. Nonetheless, some of the government officials were cognizant of the fact that policies are written in a far-removed manner, away from communities. This finding aligns with the UNFCCC (2002), which argues that those who shape and define policy processes often appear self-conscious about the need to take a participatory approach and involve communities, as demanded by the UNFCCC guideline itself.

In view of the above, the findings demonstrate that the views of the key stakeholders and those of government officials are disjointed. Thus, it becomes evident from this study and other related research that a shift is required from mere acknowledgment of policy formulation towards advocating for climate change adaptation policies and strategies that prioritise the needs of the impoverished. These policies and strategies should be grounded in the actual realities faced by the underprivileged. Furthermore, there is an urgent need for climate change adaptation policies and strategies that are easily understood and applicable at community levels. To achieve this, climate change adaptation policies and strategies must be translated into the different languages indigenous to South Africa. It can be argued that all the existing climate change instruments have significance in guiding the formulation of climate change adaptation strategies at the national, provincial, district, and local scales. However, it is important to note that while developing good climate change adaptation policies and strategies is important, it is only when they produce the positive results for which they are intended that we can say they are good and effective.

5.3.2 Evaluation of the policy formulation and adoption process

The findings of this study revealed through semi-structured interviews that climate change adaptation policies and strategies in South Africa are developed through a four-stage process that involves monitoring and evaluations, policy formulation, stakeholder engagement, and policy adoption. It is at the first step, monitoring and evaluation, that the risk and vulnerability assessment study is conducted by environmental consultants to assess the level of risk and vulnerability of communities to climate impacts. Secondly, the results from the risk and vulnerability assessment inform the formulation of the Green Paper by climate change adaptation government officials. The green paper provides a basis for developing a policy. The third step involves stakeholder engagement. At this stage, the green paper is gazetted to garner

public comments. Once the public comments have been incorporated into the green paper, the document becomes a white paper that is presented at the various inter-governmental forums. It is at this step that the stakeholders represented in Figure 4. 4 are involved in the policy formulation process. These stakeholder groups are also involved in the fourth step of policy formulation, where they provide the first approval of the white paper under Technical Working Group number 9 (which includes officials from the Department of Environment, Forestry, and Fisheries, universities, and quasi-governmental entities like the Council for Scientific and Industrial Research, civil society, the corporate world, and other government sectors). After approval has been granted by Technical Working Group number 9, the white paper is presented to the MINTECH group (which includes government director generals and heads of departments) and then to the MINMEC group (which includes ministers and members of the executive councils) before it is finally approved by the Presidential Commission on Climate Change. According to Shaxson *et al*. (2016), the MINMECH group is where the technical aspects of policy development and reporting are discussed. While the MINMEC group focuses more on enforcing coordination between national and provincial levels and between departments (Shaxson *et al*., 2016). It is evident that at each step of policy formulation, the group of stakeholders and actors involved varies, as does their scope of involvement. It appears from the findings that in South Africa, there is a comprehensive policy formulation process in place. A summary of how climate change adaptation policies and strategies are developed in South Africa is depicted in Figure 5. 1.

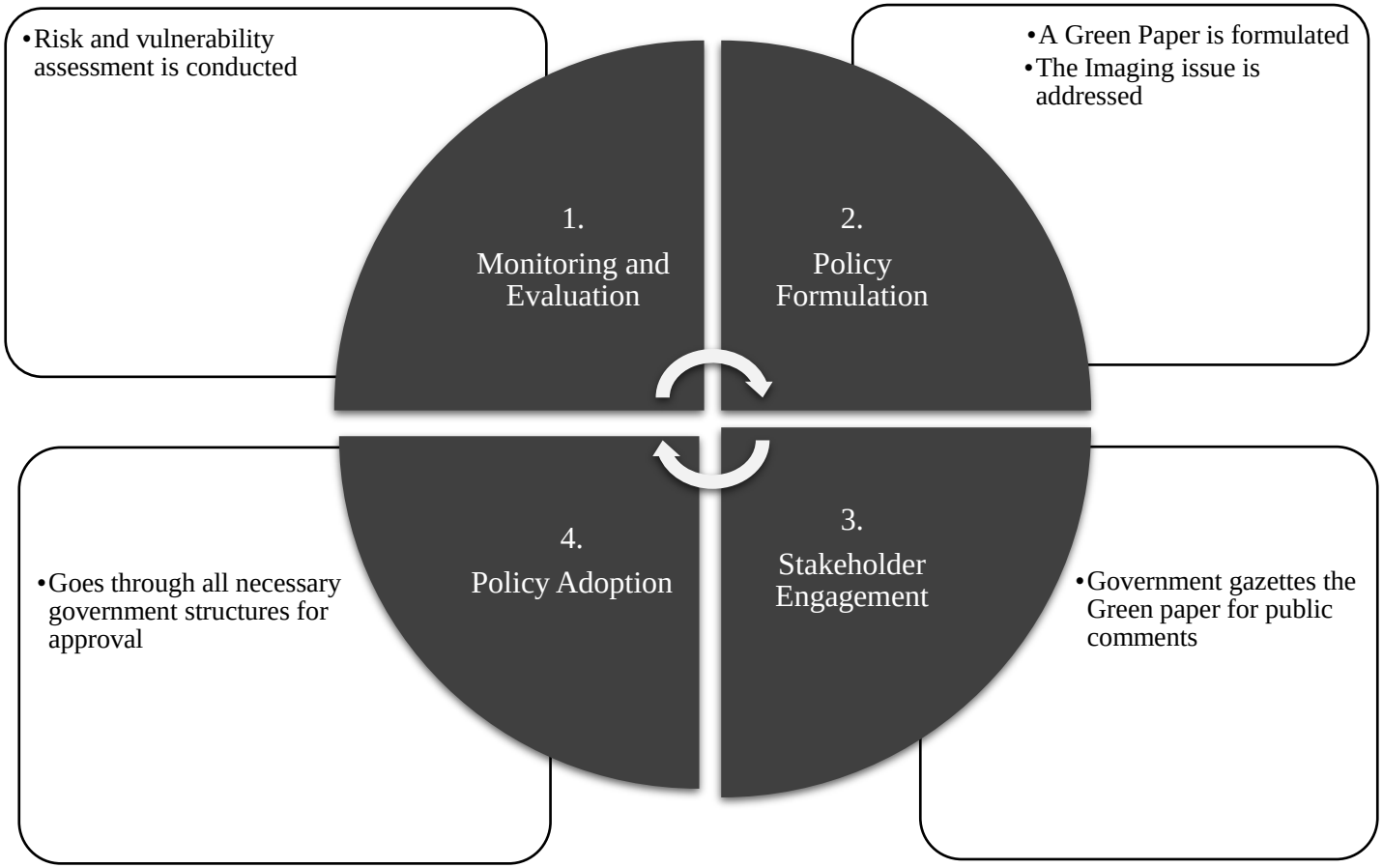

Figure 5. 1: The South African Climate Change Adaptation Policy-Making Cycle

Source: Sibiya *et al*. (2022)

The findings of this study thus demonstrate that policy development in South Africa takes an issue-based approach and is driven by identified risks arising from climate change. This finding aligns with Adger *et al.* (2018), who are of the view that, in a government setting, many policy-making decisions have to do with risk management and prioritisation through the development of standard rules and guidance to reduce the prospect of adverse consequences. However, this approach does not guarantee the development of effective policies and strategies. In line with this, Geyer and Rihani (2010) argue that, while assessing risks produces an immense wealth of knowledge, more information about risks and vulnerabilities does not automatically lead to enhanced policies, especially concerning a complex issue such as climate change adaptation.

The findings of this study are not unique to South Africa; they seem to align with findings from other regions. Ojha *et al.* (2016), for example, in their study of climate policy development in Nepal, argue that, while climate policy involves multi-scalar processes of understanding and responding to vulnerability in which diverse actors are recognised, disadvantaged communities are unlikely to be recognised by the policy actors. Essegbey *et al.* (2016) found that policy formulation in Ghana involves four steps: the initiation of policy formulation, stakeholder consultation, revision of policy, and adoption of policy. On the contrary, Howlett (2009) argues that the policy cycle includes five steps, namely, agenda setting, policy formulation, decision-making, policy implementation, and monitoring and evaluation. They are of the view that policy formulation is rather evidence-based (Howlett, 2009).

In view of the above discussion, the findings of this study demonstrate that although the policy formulation process in South Africa was intended to engage stakeholders, it is rather a top-down approach that does not reach the inclusion of grassroots communities. The findings of this study are consistent with those of other scholars who advocate for all-inclusiveness and multiple-scale engagement in policy decision-making if positive changes at the grassroots are expected (Cochrane *et al.*, 2017; Parry *et al.*, 2013). Thus, it is important that when intervention measures are put in place, human perceptions, particularly those of civil society, are considered, as they provide the right entry points into the nature and quality of the policies and strategies that are developed. Therefore, I argue that the existing policy formulation process has some weaknesses. There is, thus, an urgent need to shift the paradigm of policy engagement from a top-down narrative to one that promotes and is based on a strong, grassroots-grown, and driven process.

5.4 Public awareness and participation in climate change adaptation policy formulation

5.4.1 Public awareness on policies and strategies for community adaptation

One of the most critical issues that this study explored is the level of awareness of climate change adaptation policies and strategies among grassroots communities. The study found that, although the communities of uMkhanyakude District Municipality have knowledge of the existence of climate change and its impacts on their life-support systems, the majority of them are unaware of the existing climate change adaptation policies, strategies, and initiatives. In large part, these findings reflect the fact that the communities of uMkhanyakude District Municipality do not comprehend the implications of the existing climate change adaptation policies, strategies, and initiatives on their lives. Furthermore, it can be argued that there is a lack of awareness programmes and informative sessions that are aimed at educating and informing the communities of uMkhanyakude District Municipality on what the climate change adaptation policies, strategies, and initiatives denote for them.

Furthermore, the findings of this study demonstrate how women are less knowledgeable about existing climate change adaptation initiatives. This finding corresponds with CCC (2009), who argues that the cultural traditions of developing countries make women more vulnerable to the impacts of climate change because, most often, they are not permitted to participate in the public sphere and have limited access to critical information for emergency preparedness. Similarly, Thomas *et al.* (2019) assert that women have poor access to training, extension services, and technology necessary for effective adaptation to the impacts of climate change. Having established this, this study argues that the climate change departments (national, provincial, and local) must make climate change information on policies and strategies accessible to civil society, and this must be communicated using the various official South African languages. This study argues that it is important that information be delivered in a manner that is tailor-made for those who are meant to receive and understand it. This argument is supported by Tall *et al.* (2014), for example, who found that women in Senegal preferred climate information delivered via SMS messages in the local language, community radio, forecasting boards, and broadcasting at public places such as boreholes and mosques. Moser (2010) posits that the inherent characteristics of information channels, forms, and formats affect how the information is received and used by those it is intended for. The provision of climate information is intended to help citizens and society at large understand and respond to

risks, such as heat waves, floods, and extreme weather events, that arise because of a changing climate (Visbeck, 2007).

Additionally, the empirical evidence presented in this study supports previous studies that argue that when climate information is communicated to local communities in official national but not local languages, it is difficult for communities to understand and relate to the communicated information (Muchunku *et al.*, 2014; Mamun *et al.*, 2013; Simelton *et al.*, 2013; Roncoli *et al.*, 2010). Mabon and Shih (2018) argue that the provision of climate information has an important role to play in making urban citizens "resilient" by helping them to understand changes and risks in the environment around them. This is done in a way that will reduce harm from the very real and tangible effects of climate change, such as heatwaves, flooding, and extreme weather events. It is thus important to consider the methods of delivering climate change information and soliciting civil society views in the policies and strategies that are developed. In a society where some are more privileged than others, it is important to ensure that the communication methods used by the government are all-encompassing and do not exclude other groups due to their literacy levels and/or lack of access to resources. Thus, this study proposes the following methods:

(i) Print media (newspapers, pamphlets, posters, magazines, billboards) in all official South African languages,
(ii) Broadcast (radio, TV) in all official South African languages,
(iii) Intercom/Audio-broadcast in the various community gatherings (where the communities collect water – dam, borehole, halls, sports grounds, churches, mosques, schools),
(iv) Hold face-to-face interactions,
(v)Create Community WhatsApp Groups

Therefore, I argue that, to increase the accessibility of climate change information and for climate change adaptation policies to bear fruit, it is crucial to pursue strategic communication and robust dissemination programmes that target rural populations. It is important to provide communities with awareness, which involves explaining what the existing climate change adaptation policies, strategies, and initiatives mean and how these contribute to helping them build their adaptive capacities and resilience against the impacts of climate change.

5.4.2 Public participation in climate change adaptation policy formulation and adoption

The findings of this study demonstrate that the majority of the key stakeholders in uMkhanyakude District Municipality have not participated in the policy formulation of climate change adaptation policies and strategies. Of particular interest was that the majority (52.4%) of those who had not participated in the policy formulation process were women. This finding therefore suggests that women in rural northern KwaZulu-Natal are marginalised with no voice and are underrepresented in decision-making on climate change, both at the community and national government levels. This finding affirms previous studies such as Alam *et al*. (2017) and McKinney and Fulkerson (2015), which posit that policy areas for climate security tend to be male-dominated and women are underrepresented in areas of policy frameworks for climate change. The Gender Action Plan recognises that women's empowerment is central to climate policy and action and notes that "full, meaningful, and equal participation and leadership of women in all aspects of the UNFCCC process and in national and local government levels of climate policy and action is vital for achieving long-term climate goals" (UNFCCC, 2019). This argument also corroborates that of Ylipaa *et al*. (2019), who argue that women who are left behind without alternative opportunities are further devalued by not being listened to, resulting in invisibility and fewer possibilities to adapt to climate change. However, one can argue that women are not static actors. They have some degree of mobility and individuals can be very successful (Fröcklin *et al*., 2018; Msuya and Hurtado, 2017). In view of this, it is argued that adaptation to climate change is more pressing for women than men because women shoulder a double mission for their own adaptation and ability to provide primary care to both their dependents and their men (Nyahunda and Tirivangasi, 2022).

The findings of this study support previous studies that promote gender equality and inclusiveness in climate change decision-making discussions to develop efficient climate change policies and strategies. The concurrence of this study with previous research suggests that the formulation of pro-poor policies and strategies that promote gender equality in issues of climate change must be prioritised. This is because they have the potential to facilitate the identification of appropriate intervention measures that can contribute to building the adaptive capacity and resilience of the most vulnerable in society. In view of this, Etale and Simatele (2021) argue that the involvement of women and achieving a gender balance in climate change discussions is a good starting point for formulating and implementing comprehensive and successful adaptation interventions.

Whereas Andrijevic *et al.* (2020) are of the view that, to address inequalities and ensure inclusiveness, there is a need to ensure that gender equality is part and parcel of the interventions to address the effects of climate change. The South African Bill of Rights guarantees equal treatment for all South Africans. It prohibits discrimination based on race, gender, or sex. In view of this, therefore, this study argues that it is legally binding that climate change policies that are developed and implemented in South Africa provide gender equality. In fact, the importance of gender mainstreaming in climate change policies and interventions is sanctioned by international instruments to which many countries around the world are signatories. Examples of these are the United Nations Framework Convention on Climate Change, the Kyoto Protocol, and the Paris Agreement (Nyahunda *et al.*, 2020). Within climate action, empowering women to ensure their active participation is instrumental to developing the most effective climate solutions (Winthrop and Kajumba, 2018). Women and girls can be important agents of change within climate action. This is due to their vulnerability to climate consequences and their unique knowledge of and perspectives on adaptation techniques (Pereznieto *et al.*, 2020; Winthrop and Kajumba, 2018). Research has also highlighted missed opportunities for action when women's agency in policy and decision-making is not fully seized (Olsson *et al.*, 2014).

One can thus argue that the civil society groups that are cited in the policy-making process involve the elite group of civil society and not grassroots civil society. This finding corroborates Noor *et al.* (2022), who found that the participation process is extremely restricted and frequently fake in developing countries. Poor people and disregarded grassroots communities are still outside the area of governance and participatory processes. This argument is supported by Rigon (2014), who is of the view that grassroots communities living in poverty participating in policy formulation exercises are taken to have extraordinary sympathy towards governments and different practitioners. A study conducted in Nigeria by Abiona and Niyi (2013) argues that grassroots communities' participation in the development of policies and programmes and the decision-making process play a crucial role in community development programmes. This study, therefore, argues that climate change adaptation policies reflect the voices of government officials and the elite group of civil society rather than the voices of those most affected by climate change. Therefore, the findings suggest that it is the agenda of government officials that influences the adaptation policies that are developed in South Africa because the majority of civil society is locked out of participating in the policy-formulation

process. The research carried out by Islam and Walkerden (2017) is in line with this study; they found that in Bangladesh, disaster management policies are devised through a top-down approach by the government and political elites, implemented by bureaucrats and service provider organisations, and grassroots participation is absent. Cheru (2002) argues that institutional and policy bureaucracy oftentimes impede the formulation of progressive policies to change the misery in which the poor live. Therefore, formal governance structures need to be transformed through the co-production of knowledge via bottom-up learning, beyond the formal organisational structures (Yazar *et al.*, 2022). Flato *et al.* (2017) and Cheru (2002) posit that African governments must create a climate of equity, cooperation, and accountability in which the talents of all their citizens can be applied to solving the climate change problems they face. This study argues that grassroots communities should be at the centre of South Africa's climate change governance system. The findings of this study confirm the assertion made by Averchenkova *et al.* (2019), who argue that the most vulnerable groups to climate change lack a voice to influence and participate in any policy-making processes. Their lived experiences and the barriers associated with extreme weather events are often unconsidered and unrepresented in many climate change intervention measures implemented by governments (Adger *et al.*, 2003). Graham *et al.* (2018) explored how understanding the lived values of residents can help inform the development of fairer local climate change adaptation plans. Their work suggests that, for adaptation planning and policy to be successful, decision-makers must consider how climate change will interact with the lived values of those who are vulnerable to its impacts.

From the empirical data presented in this study, it can be argued that the importance of public participation, particularly that of women, should be at the centre of policy and action on climate change adaptation. In view of the above assertions, this study affirms the need for a radical shift towards designing gender-sensitive climate change responses and policies that incorporate the voices of the poor and powerless as well as taking into consideration their local practices, including their Indigenous knowledge. Previous studies support this assertion by arguing that the success of democracy hinges principally on rural dwellers' capacity to gain power and achieve greater possibilities to participate in policy and decision-making processes (Abiona and Bello, 2013). Furthermore, Abiona and Bello (2013) are of the view that there is a relationship between grassroots communities' participation in the decision-making process and the development of sustainable community development programmes. There is, therefore, a

need to promote robust and sincere grassroots-grown community participation in natural resources management decision-making (Hernandez *et al*., 2018; Mahon *et al*., 2017; Musavengane and Simatele, 2016). Community participation is at the heart of environmental governance, as it facilitates and promotes a sense of ownership in any decision-making and social development issues of a society (Reddy *et al*., 2017; Musavengane and Simatele, 2016).

In view of the above assertions, there is an urgent need to move away from instrumentalist approaches to participation, towards a system that helps in identifying conduits for realising participatory rights for different groups of the voiceless, highlighting opportunities and exposing barriers to participation at multiple scales. In support of this, Watson (2020) posits that community participation in policy is guided by shared values, an understanding of "the rules of the game," trust between its members, and an acceptance that cooperation is the best way to achieve common goals. A system that helps identify conduits for realising participatory rights would bring adaptation decision-making closer to those most negatively impacted by climate change (Perez *et al*., 2015; IPCC, 2014). Holistic policymaking is centred on the participation of grassroots communities in the implementation of policies and strategies (Pollitt and Bouckaert, 2009).

5.4.3 The relationship between public awareness, participation and the quality of policies and strategies

The findings of this study demonstrate that there is a relationship between public awareness, public participation, and the effectiveness of policies and strategies that are developed with the aim of achieving climate change adaptation. The preceding discussion shows that, when the emphasis on public awareness and public participation is ignored, it has negative impacts on the policies and strategies that are developed and subsequently results in complex policies and strategies that are not applicable to grassroots communities. Corroborating this finding, a study by Gaventa and Barrett (2010) argues that the participation of grassroots communities is crucial to public policy formulation and implementation as well as the actualization of improved development outcomes. Furthermore, Bahauddin *et al.* (2016) and Ernst and van Riemsdijk (2013) argue that public engagement is vital to improving the decision-making process during climate change adaptation; however, appropriate public knowledge and awareness are important in creating public support for climate policies and plans. This finding is also in line

with those of Khatibi *et al.* (2021), who found that public awareness and knowledge of climate change can contribute to their engagement in decision-making, and, in turn, increased engagement can influence the community's level of awareness and knowledge. A study conducted by Essegbey *et al.* (2016) in Ghana found that the exclusion of stakeholders such as traditional authorities, agricultural extension officers, and farmers from the policy formulation process led to poor buy-in of policy at the grassroots or district levels and therefore little impact of policy at the grassroots.

Furthermore, the findings seem to suggest that the key stakeholders are receptive to engaging with government officials in developing and implementing climate change adaptation policies and initiatives. Therefore, it is important that government officials working on climate change adaptation engage with communities in co-designing and co-implementing climate change adaptation initiatives and policies. Thus, the importance of co-designing climate change policies and strategies with communities cannot be overemphasised, particularly because the communities represent the voices of the most vulnerable and marginalised groups in South Africa. To achieve successful public participation in climate change adaptation policy development, there must be an all-inclusive system that incorporates all stakeholders, including vulnerable groups. This argument is supported by Ali and Ariffin (2017), who argue that the contributions of grassroots communities in policy formulation can be aimed at cultivating participation as a procedure for enabling local people to raise their voices and concerns or even attempt to create a public approach for the general population's cravings and improvement activities. This study supports the argument made by Bahauddin *et al.* (2016) that there must be strong relationships and collaboration between the government and different stakeholders if comprehensive climate change adaptation policies are to be developed. This requires significant reforms in governance systems in terms of the representativeness of society in decision-making processes. The engagement of civil society in fair and transparent policymaking and promoting ethos in partnerships with local authorities, community-based organisations (CBOs), traditional leaders, and the private sector can make the difference between formulating a good, pro-poor climate change adaptation agenda and one that has misplaced priorities. In building strong partnerships between civil society and the public-private and public-public sectors, the author is of the view that such partnerships may trigger the achievement of effective and transformative systems of climate change governance and build the resilience of the poor. To this end, Figure 5. 2 is the visual representation of the

interrelationship between public awareness, participation, and the quality of policies and strategies.

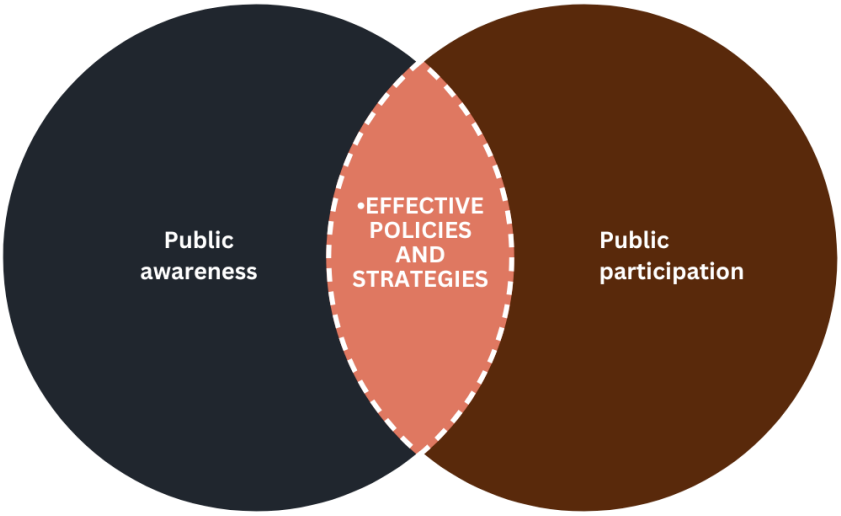

Figure 5. 2: The interrelationship between public awareness, participation and the quality of policies and strategies

Source: Author

5.5 Assessment of the institutional frameworks for climate change adaptation in South Africa

5.5.1 The role of institutions in climate change adaptation

The fourth objective of this study was to understand the role of institutions in driving the climate change adaptation agenda in South Africa. It was established that there are structures in place that are assigned to coordinating climate change issues across all government sectors affected by climate change. These structures fall under the inter-departmental and departmental arrangements, as do other institutes and stakeholders. Firstly, under the inter-departmental arrangement, there exist various forums whose role is to ensure inter-sectoral coordination of climate change issues. These forums include the Inter-Ministerial Committee on Climate Change, the Presidential Climate Commission, the Forum of South African Directors-General Clusters, the Intergovernmental Committee on Climate Change, and the National Disaster Management Council. It is important to note that the Forum of South African Directors-General

Clusters offers technical support to the Ministerial Clusters. This finding is supported by the DEA (2011), where it is noted that there are a considerable number of structures and mechanisms responsible for inter-sectoral coordination of climate change issues in South Africa. These structures and mechanisms include the Inter-Ministerial Committee on Climate Change, the Forum of South African Directors General, the Intergovernmental Committee on Climate Change, and the Presidential Climate Change Coordinating Commission. It was also established that the MINTECH and MINMEC groups are involved in ensuring that there is coordination across the various sectors on issues related to climate change. These findings seem to suggest evidence of mainstreaming climate change issues across all government sectors affected by climate change.

The empirical evidence presented in Section 4.5 of this thesis also revealed that there is a departmental arrangement under which the national Department of Forestry, Fisheries, and the Environment is mandated to lead and coordinate the development and implementation of responses to climate change adaptation in South Africa. The findings largely corroborate those of Giordano *et al.* (2011), who are of the view that the Department of Forestry, Fisheries, and the Environment is responsible for facilitating vertical coordination to support the implementation of climate policy at municipal and provincial government levels. This is supported by Averchenkova *et al.* (2019), who state that the Department of Forestry, Fisheries, and the Environment is the lead department of climate change adaptation efforts in South Africa and is responsible for coordinating the implementation of the 2019 National Climate Change Adaptation Strategy.

As far as the institutional arrangement at the provincial level is concerned, this study established that the KwaZulu-Natal Department of Economic Development and Environmental Affairs is mandated to work with the Department of Forestry, Fisheries, and the Environment in developing climate change responses for the KwaZulu-Natal province and coordinating adaptation responses across departments and/or sectors affected by climate change. However, it was interesting to see that the KwaZulu-Natal Department of Economic Development and Environmental Affairs lacks legislative backing on climate change policy. Furthermore, with the department being both an environmental and economic department, one would have expected that there would be a clear rationalisation of the relationship between climate change and economic development. This finding demonstrates that there is ineffective inter-sectoral coordination within the KwaZulu-Natal Department of Economic Development and

Environmental Affairs. It was also interesting to hear from government officials that, although there are several Departments of Economic Development and Environmental Affairs offices across districts in KwaZulu-Natal, there are no standalone climate change units in these district offices. This is even though districts or local municipalities are to ensure that climate change adaptation actions are integrated into the Integrated Development Plans of municipalities. They have a role in public education and awareness of climate change.

In addition, the study evaluated the perceptions of government officials on the effectiveness of the institutional arrangements for climate change adaptation. The findings demonstrate that government officials from the Department of Forestry, Fisheries, and the Environment believe that the institutional arrangement of climate change at the national level is effective in driving the climate change agenda. However, the empirical evidence presented in this study seems to suggest that there is an inadequate institutional arrangement for dealing with climate change adaptation at the district or local government level. Government officials alluded to the fact that climate change in uMkhanyakude District Municipality falls under the Disaster Management Unit, and they stated that they believe moving climate change to the Department of Environment and Planning would improve the institutional arrangement of climate change adaptation at the district level. In view of this, the findings of this study demonstrate what is stated in DEA (2018): that climate change functions are shared by the environment, risk management, and planning directorates in other sector departments with environmental functions. Celliers *et al.* (2015) further articulate that the current institutional structures at most municipalities are mainly borne out of political motives, while sector departments are arranged for governance expediency rather than optimised for service delivery and productivity.

In view of this assertion, the findings on the effectiveness of the institutional arrangement across all government levels are disjointed. Therefore, one can argue that some of these findings are biassed, as there is no substantial tool in place that can measure the effectiveness of institutional structures. In view of this, the study recommends that there is a need to design an assessment tool to measure the effectiveness of the existing institutional structures tasked with facilitating climate change adaptation in South Africa (see Table 5. 1). The proposed assessment framework will ensure that there is no partiality in the views received and that what is being said is truly reflected on the ground. The rating score is divided into three level groups, with level 1 ranking signifying that a particular indicator is not in place; level 2–3 ranking

signifying that the indicator is in place but is not being effectively applied; and level 4–5 ranking denoting that the indicator is in place and is being effectively applied and reflected.

Table 5. 1: Assessment tool for measuring the level of effectiveness of the institutional arrangement and climate change governance system

Category	Indicator	Rating score				
		1	2	3	4	5
POLITICAL WILL AND COMMITMENT	- Quality of Leadership					
	- Quality of Decision-making					
	- Financial commitment and investment					
	- People-centred					
	- Accountability and Transparency					
INSTITUTIONAL FRAMEWORK	- Technical relevance					
	- Institutional Commitment					
	- Coordination and alignment					
	- Capacity building					
	- Adequate resources					
POLICY FRAMEWORK	- Policy coherence and alignment					
	- Active Implementation					
	- Effectiveness of policies and strategies					
	- Adaptive capacity of individuals/ communities and livelihoods					
	- Ongoing evaluation and support					
STAKEHOLDER ENGAGEMENT AND PARTNERSHIPS	- Awareness					
	- Participation					
	- Inclusion of Indigenous Knowledge					
	- Science communication					

	- Quality of partnerships between private and public sector, government, civil society, academia					
FINAL SCORE						

Poor **< 29%**	• This rating indicates that the governance of climate change adaptation in South Africa is very poor. This is call for an urgent and concerted effort.
Poor **30% - 49%**	• This rating indicates that there is a limited level willingness to effectively manage climate change adaptation in South Africa. This is call for an urgent and concerted effort.
Neutral **50% - 69%**	• This rating indicates that there is some level of willingness to effectively manage climate change adaptation in South Africa. However, there is a need for improvement.
Good **70% - 84%**	• This rating indicates that the governance of climate change adaptation in South Africa is effective
Very Good **> 85%**	• This rating indicates that climate change adaptation is managed very well in South Africa.

Source: Author

5.5.2 The role of institutions in building resilience against the impacts of climate change

This study found it extremely important to also examine the key institutions that assist communities in uMkhanyakude District Municipality in building resilience against the impacts of climate change. The findings demonstrate that the communities consider the District Municipality the most important key institution in uMkhanyakude. However, it was appalling to see that the District Municipality was far removed from the communities and made a trivial contribution to building the communities' resilience against the impacts of climate change. This finding seems to suggest that the District Municipality is not invested in facilitating

climate change adaptation for the communities of uMkhanyakude District Municipality. One can, however, argue that the district municipality's reluctance to act is because it is not mandated to act on issues of climate change adaptation. Be that as it may, it is important to note that whatever the reason behind this limited action, this has a negative effect on communities' ability to adapt to the impacts of climate change and further exacerbates their vulnerability.

Furthermore, the key stakeholders also identified the local municipalities as one of the institutions that are important at a level lower than that of the district municipality. Nonetheless, the findings of this study seem to suggest that the local municipalities in uMkhanyakude play a greater role in facilitating community adaptation to the impacts of climate change. This finding supports previous ones that argue that local municipalities are better positioned to facilitate climate change adaptation for communities. Corfee-Morlot *et al.* (2009), supported by Mukheibir *et al.* (2013), for example, are of the view that climate adaptation is context-dependent and distinctively linked to location, making it predominantly a local government and community level of action.

The empirical evidence suggests that at the local government level, no active forums dedicated to ensuring that climate change adaptation responses are streamlined and implemented exist. Therefore, it can be argued that there is a need for local governments to formulate forums like the ones that exist at national and provincial government levels to ensure that climate change adaptation is effectively facilitated on the ground. The establishment of such forums will be important, particularly because the Climate Change Bill of 2022 positions provincial and local governments as key players in developing and implementing climate change plans (Reddy *et al.*, 2021). This view also came out of discussions with climate change adaptation government officials, who stated that the Climate Change Bill of 2022 will assist in improving the institutional arrangement of climate change adaptation at district and local government levels. In view of this, one can argue that South Africa currently has a weak institutional arrangement for dealing with climate change adaptation, particularly at local and district government levels. Thus, this study argues that there is an urgent need for South Africa as a country to establish working institutions that are invested in fulfilling their mandates and supporting communities. The success of any adaptation plans and strategies among the rural poor is highly dependent on the nature and support of existing formal and informal institutions and their connections with local and vulnerable communities (Chhetri, 2012). Therefore, if South Africa is to adapt

effectively to climate change, the case for institutional reformation and strengthening in ways that embrace the voices of marginalised groups is an important ingredient.

5.6 An assessment of the barriers to climate change adaptation in South Africa

The empirical evidence presented in Table 4. 6 of this thesis demonstrates that there are several barriers to climate change adaptation. These include inadequate financial resources, lack of human capacity at the provincial and local levels, limited political will at the local level, limited understanding of climate change adaptation issues by communities, inadequate coordination across government levels and sectors, absence of legal mandate at the local level, absence of climate change units at the district and local levels, lack of knowledge by some staff members tasked with environmental duties at the local level, not enough climate change plans in place at the local level, and outdated information on climate change used in the IDPs. However, the two predominant barriers to climate change adaptation in South Africa, which are cross-cutting across all three government levels, are inadequate financial resources and a lack of human capacity at the provincial and local levels.

It has been observed that the lack of human resources at the local level further exacerbates the vulnerability of communities that are most vulnerable to climate change, as there is no dedicated climate change department they can engage with when they require assistance or information. The results presented in this study are consistent with previous findings from other studies. Goebel (2007), for example, argues that a human resources crisis exists within South African municipalities, is compromising policy implementation, and will take time to overcome. Hemson *et al.* (2009:151), however, observe that there is an increasing realisation that South Africa is faced with grave challenges with respect to the capacity of the state that relate to skills, the number of professionals, the ability to manage complex systems, and, in the final analysis, the ability to deliver on its mandate. The DEAT (2016) validates the findings of this study as they identify limited capacity and skills in the climate change field as key challenges faced by government officials in responding to climate change in South Africa. In addition, the South African National Development Plan 2030, "Our Future, Make It Work," takes cognizance of the fact that there is a lack of human resources and skills at the local government level. This study, therefore, reinforces the importance of enhancing suitably skilled climate change adaptation human resources in South Africa if wicked problems such as climate

change are to be tackled. However, this finding was not unique; Mukheibir *et al.* (2013), working in Australia, found that smaller and more remote municipalities struggled with inadequate technical and human resources. In view of this, Klein *et al.* (2014) found that there is an interrelationship between the strength of human resources and the adaptive capacity of a community. Communities with strong leadership and organisational environments tend to be able to adapt to climate change more successfully (Klein *et al.*, 2014). In view of the above discussion, it can be argued that, although climate change adaptation policies and strategies developed in South Africa demonstrate ambition, it is not until the local government level is capacitated that effective climate change adaptation can be achieved; otherwise, these policies will remain largely aspirational.

The findings of this study indicate that the national, provincial, and district climate change adaptation departments in South Africa rely on external donor funding to be able to fulfil their duties and mandate. However, this is generally inadequate for implementing and facilitating climate change adaptation initiatives. This finding aligns with Roberts (2008), who notes that there are limited financial resources available locally to fund climate change adaptation initiatives at the national, provincial, or municipal levels in South Africa. It has been observed that in South Africa, the current municipal fiscal mechanisms do not incentivize the mainstreaming of climate change responses into local government activities (Government of the Republic of South Africa, 2011). This has forced institutions in different spheres of government as well as non-state actors to seek international donor funding (Roberts and O'Donoghue, 2013). This view is supported by South Africa's National Treasury (2016), where it is estimated that approximately 80% of district municipal revenue is from the national government, and, because of competing socio-economic demands, little of this revenue is allocated to climate change response. Additionally, the empirical evidence presented in this study supports previous studies that argue that financial barriers limit municipal adaptation mainstreaming (Ziervogel and Parnell, 2012; Measham *et al.*, 2011). This is partly due to the many responsibilities they must perform as well as their lack of institutional autonomy (Measham *et al.*, 2011). These findings seem to align with those of other studies, such as Tan *et al.* (2022), who found that current efforts in climate adaptation investment and financing are generally weak globally. Hooli (2016), for example, found that in Namibia, the government has limited financial support for local or informal adaptation responses. Furthermore, the findings of this study indicate that the climate change adaptation unit in South Africa receives

external donor funding; however, this is inadequate for implementing and facilitating climate change adaptation. Kiratu (2011) argues that external funding for adaptation in developing countries often results in project-type investments, leading to a lack of continuity for good programmes, a lack of domestic investment and buy-in, and the overlooking of local models or ways of doing things (Kiratu, 2011). As observed by Pressend (2011), oftentimes there is an inadequate commitment of international funding for climate change adaptation action, and, when available, it is difficult to access owing to excessive red tape.

Furthermore, Ngwenya and Simatele (2020) argue that, at the national, provincial, and municipal government levels, lack of financial resources and knowledge prevents and "locks out" people and institutions from solving problems and managing change. Having established this, I argue that the South African government must "put their money where their mouth is" and invest greatly in climate change to build a transformative climate change governance system. In addition, it is important to have a thought process on how South Africa will best utilise climate change adaptation finance for the benefit of all. Achieving this requires a radical shift towards enhancing investments in climate change funding for adaptation in South Africa.

Furthermore, the findings demonstrate that there is limited political will at the local government level, and this is because of poor understanding of climate change issues by politicians. This finding aligns with several previous studies. CoGTA (2009), for example, acknowledged that lack of policy coherence, skills scarcity, lack of political leadership, and corruption are some of the major barriers encountered in promoting effective climate change adaptation in South Africa. In support of this, Thompson *et al.* (2010) argue that one of the barriers to climate change adaptation is that it usually requires both financial capital and a willingness to change a historically and culturally engrained way of life. Khambule (2018) further argues that weakening institutional ability and arrangements within municipalities takes place through political interference, a lack of efficient bureaucracy, and gross corruption. Scoville-Simonds *et al.* (2020: 1) are of the view that there are three major political adaptation difficulties, "related to differential responsibility, the global uneven production of vulnerability, and unequal relations of power in adaptation decision-making." Mapfumo *et al.* (2017) suggest that political will and political probability are important factors in undertaking structured measures that are transformational in response to climate change.

There is a need for South African political representatives to demonstrate political will for climate change adaptation when they make their national, provincial, and district or local budgets. Although there are conflicting priorities such as service delivery through water provision, housing, and energy supply, as well as infrastructure, climate change adaptation must be featured at the top of the list, particularly because it has and will continue to have dire impacts on all subsectors of the economy.

It was established that the lack of a legal mandate at local and district government levels is a major institutional barrier to climate change adaptation in South Africa. Again, this finding speaks to the inadequate institutional arrangements that exist for dealing with climate change adaptation in South Africa. This has consequently harmed the implementation of climate change adaptation on the ground. In addition, this further exacerbates the vulnerability of communities that are most vulnerable to the impacts of climate change. The establishment of a legal mandate will ensure that it is legally binding for local and district municipalities to carry out their mandates related to climate change adaptation issues. Therefore, it is not an exaggeration to argue that the establishment of a legal mandate at the local and district levels will address several existing institutional and capacity barriers identified in this study. Although this finding is not new, it does, however, reinforce Du Plessis and Kotzé's (2014: 173) statement that the absence of a climate change mandate in South African municipalities has not helped matters as it has "downplayed the seriousness of the need for climate governance and action," making municipal authorities reluctant to act.

The findings also demonstrate evidence of a silo mentality, as the government officials alluded to inadequate coordination across government levels and sectors. Similarly, Pasquini *et al.* (2013) found that the silo mentality that is prevalent within municipalities poses a huge barrier to facilitating effective climate change adaptation. This finding also aligns with Ziervogel *et al.* (2014), who are of the view that there are weak relationships between several different stakeholder groups in South Africa, which are government, civil society, researchers, practitioners, and the private sector.

I argue that the key element to tackling the silo mentality is improving integration as well as stakeholder engagement across all government levels and sectors that are meant to deal with climate change adaptation issues in South Africa. Burch (2010a, 2010b) argues that the silo mentality is an omnipresent problem and suggests that it could be partially addressed at the

same time by widening the mandate for local governments to mainstream adaptation and mandating the inclusion of climate change deliberations within all departments of a municipality rather than creating a specialised and isolated climate change unit.

The findings also demonstrated that understanding is a barrier to climate change adaptation. There is a limited understanding of climate change adaptation issues among communities. There is also a lack of knowledge by some staff members tasked with environmental duties at the local level, as well as outdated information used by politicians in the municipal IDPs. Therefore, it can be argued that climate change adaptation requires shared understanding. This finding largely corroborates that of Ross *et al.* (2015), who argue that efficient and collective adaptation to climate change requires shared understandings of the possible impacts and risks, gained through informed presentation and discussion with other participants. Kirchhoff *et al.* (2013) and Roncoli *et al.* (2009) argue that relations between knowledge producers and those who could use it can often overcome the cognitive and social divisions that weaken information usability through building trust, improving awareness, and improving understanding around issues of accuracy and reliability of climate information. Alemaw and Simatele (2020) further argue that, at all levels of government, a lack of resources and knowledge is inclined to prevent people and institutions from solving problems and mapping change triggered by climate change. Natural resource management literature maintains that “barriers to community or individual action do not lie primarily in a lack of information or understanding alone but in social, cultural, and institutional factors" (Tompkins and Adger, 2004: 15). In view of this, therefore, this study argues that the government of South Africa must educate all citizens on climate change adaptation to improve understanding, increase awareness, and build trust.

The findings of this study also demonstrate that two of the barriers to climate change adaptation alluded to by government officials had a negative impact on the planning, implementation, and monitoring phases of the adaptation process. These barriers include the lack of a legal mandate at the local government level and the fact that there is no climate change unit at the district and local levels. This finding seems to align with Du Plessis and Kotzé (2014: 173), who are of the view that the absence of a climate change mandate in South African municipalities has not helped matters as it has “downplayed the seriousness of the need for climate governance and action,” making municipal authorities reluctant to act.

This study suggests that it is time for South Africa to tackle the long-standing barriers and move towards a governance system that will build the resilience and adaptive capacity of societies in times of changing climatic conditions. It is suggestive that the one barrier arises due to poor planning because there are not enough climate change plans at the local level. Without proper adaptation planning and the necessary investments in social safety nets, climate risks can adversely affect efforts to achieve the UN Sustainable Development Goals (SDGs) in sub-Saharan Africa (Alemaw, 2020; Baarsch *et al.*, 2020; Cacho *et al.*, 2020).

5.7 Conclusion

In this chapter, the findings of this study are contextualised and comprehensively discussed. The discussion was structured around the five objectives of this study. The first objective was to investigate the communities' perceptions of the impacts of climate change in uMkhanyakude District Municipality. The second was to identify current climate change adaptation policies and strategies. The third objective was to explore the extent to which grassroots communities are involved in the formulation of policies, while the fourth objective was to examine the role of institutions in driving the climate change adaptation agenda in South Africa. The fifth and final objective was to investigate the key barriers and opportunities to climate change adaptation in South Africa.

The emerging findings demonstrated how South Africa's climate governance system locks out many of the marginalised groups in the policy development and implementation processes. It was also evident from the findings that the existing policy frameworks are ineffective in building communities' resilience to the impacts of climate change. Therefore, this study yielded supporting evidence that it is not the inability of vulnerable communities to adapt to changing climatic conditions that exacerbates their vulnerability, but the poor governance systems that are oftentimes subjected to several barriers. The findings confirm the assertion made by Averchenkova *et al.* (2019: 2) that, while South Africa has progressive climate change policies, implementation has been hindered by various issues such as the lack of policy alignment, coherence, and coordination; policy complexity and continuity; issues with public-private engagement and consultation; gaps and constraints in information and data; and limited staff capacity at the municipal level. One can argue that, although the National Climate Change Adaptation Strategy's fourth objective is to ensure resources and systems are in place to enable

implementation of climate change responses, as it stands, this objective has not materialised, as there is a lack of human and financial resources at local and district levels where the implementation process is meant to take place. This study therefore argues that it is time for South Africa to tackle the long-standing governance barriers and move towards a transformative climate change governance system that will build the resilience and adaptive capacity of societies in times of changing climatic conditions.

If South Africa is to comprehensively respond to the barriers of climate change, it will require the theoretical sharpness and practical abilities of both state and local authorities to adapt formal institutions to new and changing climate-induced realities. If we address the various barriers that those mandated to drive climate change adaptation in South Africa face, we may be able to be in the right direction towards a transformative governance system that will foster effective climate change adaptation for vulnerable communities and cities in South Africa. In the absence of this deep shift, South Africa will not be able to break through the resistance that exists to facilitating effective climate change adaptation, and thus it will remain a myth. In view of the above discussion, the present study makes noteworthy contributions to a growing body of literature on climate change governance.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter is dedicated to presenting the conclusions and recommendations of this study. The first section provides a summary of the key findings. The findings that are summarised in this chapter demonstrate how the research questions outlined in Chapter 1 of this thesis have been answered or addressed. Based on the findings of this study, the second section provides the key recommendations for policymakers, technocrats, and academia. These recommendations should be considered in order to improve the way in which climate change adaptation is facilitated in South Africa.

6.2 Key conclusions of the study

Objective I

The first objective of this study was to assess community perceptions of the impacts of climate change in uMkhanyakude District Municipality. This objective was achieved by conducting an online survey in the four local municipalities of uMkhanyakude District Municipality.

This study ascertained that the communities residing in the uMkhanyakude District Municipality firmly believe in the existence of climate change. Furthermore, these communities possess knowledge regarding the effects of climate change on themselves and/or their communities. The key stakeholders acknowledged that climate change has predominantly manifested as droughts and floods in the uMkhanyakude District Municipality. It was determined that, due to the frequency and intensity of droughts in this region, there is a scarcity of water resources and agricultural yields. Additionally, this study demonstrated that reduced agricultural yields indirectly impact food security, as the communities in the uMkhanyakude District Municipality heavily rely on subsistence farming to sustain their livelihoods. Moreover, it was established that the consequences of climate change lead to losses in livestock. This is attributed to diminished grazing land and the absence of drinking water for livestock, as rivers have dried up. Various other consequences of climate change were

identified, including a decline in employment opportunities, negative health implications, and adverse effects on the socio-economic status of communities in the uMkhanyakude District Municipality. Consequently, in order for these communities to develop resilience against the consequences of climate change, adaptation measures are imperative and should be given priority. Hence, these findings provide empirical evidence of how diverse communities are impacted by climate change, underscoring the necessity to enhance efforts to improve adaptation strategies for vulnerable groups.

Objective II

The second objective was to identify the current climate change adaptation policy landscape and how climate change adaptation policies are developed in South Africa. This objective was achieved by conducting semi-structured interviews with climate change adaptation technocrats from the national, provincial and local governments.

The study established that the National Climate Change Response (NCCR) White Paper (2011) and the National Climate Change Adaptation Strategy (NCCAS) (2019) are the two fundamental policy frameworks that drive climate change adaptation in South Africa. In addition, other policy frameworks also exist. These include the Climate Change Bill of 2022, the Let's Respond Toolkit, the 2017 KwaZulu-Natal Draft Climate Change Strategy, the Disaster Management Plan, and lastly, the uMkhanyakude District Municipality Climate Change Response Plan, which was not yet adopted at the time when the data for this study was collected.

The findings revealed that climate change adaptation policies and strategies in South Africa are developed through a four-stage process. The policy-formulation process takes an issue-based approach and is driven by identified risks arising from climate change. The findings demonstrate that government organisations, non-government organisations, civil society, community-based organisations, and faith-based organisations are represented when stakeholders are engaged. The findings also show that most of the key stakeholders that participated in this study have not participated in the policy-formulation process.

It was further established that the key stakeholders felt that the existing climate change adaptation policies and strategies were ineffective. In contrast, the government officials felt

that they were effective in facilitating community adaptation. This demonstrates that there are disjointed views of the effectiveness of climate change policies and strategies. It also demonstrates that, although South Africa has good climate change policies and strategies, the communities for whom they are developed do not find them effective in building their resilience against the impacts of climate change.

Objective III

This study explored the extent to which grassroots communities are involved in the formulation of policies and strategies. The findings demonstrate that the level of participation in climate change policy formulation by grassroots communities in uMkhanyakude District Municipalities is very low. The majority of the key stakeholders indicated neither participation nor involvement in climate change policy formulation. Of particular interest was that the majority (52.4%) of those who had not participated in the policy formulation process were women. This finding therefore suggests that women in rural northern KwaZulu-Natal are marginalised with no voice and are underrepresented in decision-making on climate change, both at the community and national government levels. The findings demonstrate that it is mostly the voices of government officials and the elite group of civil society that are reflected in the climate change adaptation initiatives that are developed in South Africa. Therefore, this denotes that marginalised and disregarded grassroots communities are still outside the area of governance and participatory processes in South Africa.

Objective IV

The fourth objective of this study encompassed examining the role of institutions in driving the climate change adaptation agenda in South Africa. This was achieved through examining the institutional arrangements of climate change in South Africa in order to fully understand what institutions exist and what role they play in enhancing adaptation efforts in South Africa.

The findings demonstrate that there are structures in place that are assigned to coordinating climate change issues across all government sectors affected by climate change. These fall under the inter-departmental and departmental arrangements, as well as those of other institutes and stakeholders. The inter-departmental arrangement includes the Inter-Ministerial

Committee on Climate Change, the Presidential Climate Commission, the Forum of South African Directors-General Clusters, the Intergovernmental Committee on Climate Change, and the National Disaster Management Council. It is important to note that the Forum of South African Directors-General Clusters offers technical support to the Ministerial Clusters. The role of the institutions in the inter-departmental arrangement is to ensure inter-sectoral coordination of climate change issues. The national Department of Forestry, Fisheries and the Environment leads and coordinates the development and implementation of responses to climate change adaptation in South Africa.

At the provincial level, the KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs is mandated to work with the Department of Forestry, Fisheries and the Environment in developing climate change responses for the KwaZulu-Natal province. The role of district and local municipalities is to build climate resilience through planning human settlements and urban development, the provision of municipal infrastructure and services, water and energy demand management, and local disaster response, amongst others. Climate change considerations and constraints will be integrated into municipal development planning tools such as integrated development plans and municipal service delivery programmes.

It was also established that the communities consider the District Municipality to be the most important key institution in uMkhanyakude. However, the findings demonstrated that the district municipality's contribution to building the communities' resilience against the impacts of climate change was small. The local municipalities in uMkhanyakude were the ones that played a greater role in facilitating community adaptation to the impacts of climate change.

Objective V

This study investigated the key barriers and opportunities that exist for driving the climate change adaptation agenda in South Africa. This was achieved by using the systematic diagnostic framework devised by Moser and Ekstrom (2010). The framework enabled this study to demonstrate the barriers that exist, explicitly show where these barriers originate from, and lastly, identify the opportunities that exist for addressing these barriers.

The study found that there are a plethora of barriers that exist to facilitating effective climate change adaptation in South Africa. These barriers include inadequate financial resources, a lack

of human capacity at the provincial and local levels, limited political will at the local level, a limited understanding of climate change adaptation issues by communities, inadequate coordination across government levels and sectors, the absence of a legal mandate at the local level, the absence of a climate change unit at the district and local levels, a lack of knowledge by some staff members tasked with environmental duties at the local level, not enough climate change plans in place at the local level, and outdated information used in the IDPs on climate change. Furthermore, the lack of human and financial resources that was alluded to by the research participants also causes significant challenges to the governance of climate change adaptation. Without skilled human resources on the ground, it was found that facilitating climate change adaptation was difficult. Thus, although climate change adaptation policies and strategies exist, communities find them inefficient in building their resilience against the impacts of climate change. The lack of financial resources to do tangible projects related to climate change adaptation was another identified problem.

6.3 Contributions and implications of the study

This study has presented an understanding of the significance of governance in the advancement of effective climate change adaptation. As emphasised in Chapter One, there is limited empirical evidence that characterises adaptation governance and the effectiveness of institutional structures that drive the climate change adaptation agenda. The main new contribution of this study is that it builds on the ways in which adaptation policy and action are being understood, framed, made, enacted, and implemented across a range of scales in South Africa. The study demonstrates "whose voice and knowledge count." Furthermore, through the utilisation of the systematic diagnostic framework in scrutinising the barriers to the governance of climate change adaptation, this study has contributed to expanding the knowledge-based information, applicability, and reliability of the framework within a South African context. The findings and recommendations thus enhance the existing body of knowledge on the governance of climate change adaptation. The recommendations provided will be advantageous to society, especially the rural underprivileged, in the sense that the government can employ the findings to ameliorate their processes of governing climate change adaptation, particularly at the local government level where the need for effective climate change adaptation is needed.

6.4 Recommendations

It is evident from the findings of this study that climate change is having devastating impacts on the life-supporting systems of the communities of uMkhanyakude District Municipality. Although there is an institutional arrangement and policy frameworks, these appear to be good theoretically and fail to build the adaptive capacity of communities. Therefore, based on the findings of this study, several policy recommendations are proposed:

(i) Government systems and policies should go beyond the syndrome of simply acknowledging the impacts of climate change on communities and move into a space that ensures and enables human and natural systems to adjust to the actual and projected climate stimuli and impacts.

(ii) Working institutions that are invested in fulfilling their mandate and supporting communities should be established, and strong partnerships between civil society and the public and private sectors should be built.

(iii) The study recommends that an assessment tool to measure the effectiveness of the existing institutional structures tasked with facilitating climate change adaptation in South Africa be designed *(see* Table 5. 1*)*.

(iv) The study also recommends that a tool be designed to assess the level of effectiveness of the existing climate change adaptation policies and strategies.

(v) The government must ensure that a legal mandate for climate change is developed at the district and local government levels, as this will facilitate effective climate change adaptation for communities on the ground.

(vi) The formulation of pro-poor policies and strategies that promote gender equality in issues of climate change must be prioritised, as they have the potential to facilitate the identification of appropriate intervention measures that can contribute to building the adaptive capacity and resilience of the most vulnerable in society.

(vii) It is important that, when intervention measures are put in place, human perceptions, particularly those of civil society, are considered, as they provide the right entry points into the nature and quality of the policies and strategies that are developed.

(viii) There is a need for climate change adaptation policies and strategies that are easily understood and applicable at community levels.

(ix) South African political representatives should demonstrate political will for climate change adaptation when they do their national, provincial, and district/local budgets.

(x) It is important for local municipalities to strengthen their role on issues related to climate change adaptation. Thus, climate change must also be a standing item in the Integrated Development Plan for local government that will ensure that climate change is budgeted for appropriately. This will thus ensure that there are funds to hire more climate change adaptation practitioners.

(xi) To achieve transformative climate change adaptation in South Africa, policies must be co-designed and co-implemented with vulnerable groups. These policies must be based on local knowledge and tailored to the local needs of those most impacted by climate change.

(xii) There is a need for a governance system that is willing to consider the voices and participation of vulnerable groups, thus empowering them.

(xiii) If South Africa is to adapt effectively to climate change, it should rope in institutional reformation and strengthening in ways that embrace the voices of marginalised groups.

In addition, several future research areas are proposed:

(i) Future studies could investigate individual household members' views and perceptions on climate change governance in South Africa.

(ii) Future studies must ensure that the data collection instrument used allows for equal and fair opportunities for all groups and individuals to participate.

REFERENCES

Aall, C., Thorsen Norland, I. 2005. The use of the ecological footprint in local politics and administration: results and implications from Norway. *Local Environment*, 10, 159–172. https://doi.org/10.1080/1354983052000330752.

Abbas, Q., Han, J., Bakhsh, K., Ullah, R., Kousar, R., Adeel, A., Akhtar, A. 2022. Adaptation to climate change risks among dairy farmers in Punjab, Pakistan. *Land Use Policy*, 119, 106184. https://doi.org/10.1016/j.landusepol.2022.106184.

Abbott, K.W. 2017. Orchestration: Strategic ordering in polycentric climate governance. https://doi.org/10.2139/ssrn.2983512.

Abegunde, V.O., Sibanda, M., Obi, A. 2019. The Dynamics of Climate Change Adaptation in sub-Saharan Africa: A Review of Climate-Smart Agriculture among Small-Scale Farmers. *Climate*, 7, 132. https://doi.org/10.3390/cli7110132.

Abiona, I.A., Bello, W.N. 2013. Grassroots Participation in Decision-Making Process and Development Programmes as Correlate of Sustainability of Community Development Programmes in Nigeria. *Journal of Sustainable Development*, 6, 47-57. http://dx.doi.org/10.5539/jsd.v6n3p47.

Abrams, A.L., Carden, K., Teta, C., Wågsæther, K. 2021. Water, Sanitation, and Hygiene Vulnerability among Rural Areas and Small Towns in South Africa: Exploring the Role of Climate Change, Marginalization, and Inequality. *Water*, 13, 2810. https://doi.org/10.3390/w13202810.

Adams, W.C. 2015. Conducting Semi-Structured Interviews. In: Handbook of Practical Program Evaluation. John Wiley & Sons, Ltd. 492–505. https://doi.org/10.1002/9781119171386.ch19.

Adger, W.N., Brown, I., Surminski, S. 2018. Advances in risk assessment for climate change adaptation policy. *Philosophical Transactions: Mathematical, Physical and Engineering Sciences*, 376, 20180106. https://doi.org/10.1098/rsta.2018.0106.

Adger, W.N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D.R., Naess, L.O., Wolf, J., Wreford, A. 2009. Are there social limits to adaptation to climate change? *Climate Change*, 93, 335–354. https://doi.org/10.1007/s10584-008-9520-z.

Adger, W.N., Agrawala, S., Mirza, M.M.Q., Conde, C., O'Brien, K., Pulhin, J., Pulwarty, R., Smit, B., Takahashi, K. 2007. Assessment of adaptation practices, options, constraints and capacity. In: *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J., Hanson, C.E. Eds. Cambridge University Press, Cambridge, UK, 717-743.

Adger, W.N., Jouni, P., Saleemul, H., and Mace, M.J., (eds.). 2006. Fairness in Adaptation to Climate Change. MIT Press, Cambridge, Massachusetts.

Adger, W.N., Arnell, N.W., Tompkins, E.L. 2005. Successful adaptation to climate change across scales. *Global Environmental Change*, 15, 77–86. https://doi.org/10.1016/j.gloenvcha.2004.12.005.

Adger, W.N., Huq, S., Brown, K., Conway, D., Hulme, M. 2003. Adaptation to climate change in the developing world. *Progress in Development Studies*, 3, 179–195. https://doi.org/10.1191/1464993403ps060oa.

Adzawla, W., Baumüller, H. 2021. Effects of livelihood diversification on gendered climate vulnerability in Northern Ghana. *Environment, Development and Sustainability*, 23, 923–946. https://doi.org/10.1007/s10668-020-00614-3.

Afrifa, G.A., Tingbani, I., Yamoah, F., Appiah, G. 2020. Innovation input, governance and climate change: Evidence from emerging countries. *Technological Forecasting and Social Change*, 161. https://doi.org/10.1016/j.techfore.2020.120256.

Agrawal, S. 2008. The role of local institutions in adaptation to climate change [paper presentation]. Social Dimensions of Climate Change, Social Development Department, The World Bank, Washington DC, US. https://doi.org/10.1596/28274.

Agrawal, A., Perrin, N. 2008. Climate adaptation, local institutions, and rural livelihoods. Working Paper No. W081-6.

Ahmad, H., Halim, H. 2017. Determining Sample Size for Research Activities. *Selangor Business Review*, 2(1), 20-34.

Akamani, K., Wilson, P.I. 2011. Toward the adaptive governance of transboundary water resources. *Conservation Letters*, 4, 409–416. https://doi.org/10.1111/j.1755-263X.2011.00188.x.

Alam, G.M.M., Alam, K., Mushtaq, S. 2017. Climate change perceptions and local adaptation strategies of hazard-prone rural households in Bangladesh. *Climate Risk Management*, 17, 52–63. https://doi.org/10.1016/j.crm.2017.06.006.

Al-Ababneh, M. 2020. Linking Ontology, Epistemology and Research Methodology. *Science & Philosophy*, 8(1), 75-91.

Albers, M.W., Gilmore, G.C., Kaye, J., Murphy, C., Wingfield, A., Bennett, D.A., Boxer, A.L., Buchman, A.S., Cruickshanks, K.J., Devanand, D.P., Duffy, C.J., Gall, C.M., Gates, G.A., Granholm, A.-C., Hensch, T., Holtzer, R., Hyman, B.T., Lin, F.R., McKee, A.C., Morris, J.C., Petersen, R.C., Silbert, L.C., Struble, R.G., Trojanowski, J.Q., Verghese, J., Wilson, D.A., Xu, S., Zhang, L.I. 2015. At the interface of sensory and motor dysfunctions and Alzheimer's disease. *Alzheimer's & Dementia*, 11, 70–98. https://doi.org/10.1016/j.jalz.2014.04.514.

Alemaw, B., Simatele, M. 2020. Integrating Climate Change Adaptation and Mitigation into Sustainable Development Planning: The Policy Dimension. In: *Climate Variability and change in Africa: Perspectives, Experiences and Sustainability.* Matond, J.I., Alemaw, B.F., Sandwidi, W.J.P. (eds). Springer International Publishing, Cham. 191–208. https://doi.org/10.1007/978-3-030-31543-6_15.

Alemaw, B.F. 2020. Framework of Best Practice for Climate Change Adaptation in Africa: The Water–Development Nexus. In: *Climate Variability and Change in Africa: Perspectives, Experiences and Sustainability.* Matondo, J.I., Alemaw, B.F., Sandwidi, W.J.P. (Eds.). Springer International Publishing, Cham. 71–90. https://doi.org/10.1007/978-3-030-31543-6_7.

Alessa, L., Kliskey, A., Gamble, J., Fidel, M., Beaujean, G., Gosz, J. 2016. The role of Indigenous science and local knowledge in integrated observing systems: moving toward adaptive capacity indices and early warning systems. *Sustainability Science*, 11, 91–102. https://doi.org/10.1007/s11625-015-0295-7.

Alessi, E.J., Martin, J.I. 2010. Conducting an Internet-based survey: Benefits, pitfalls, and lessons learned. *Social Work Research*, 34, 122–128. https://doi.org/10.1093/swr/34.2.122.

Ali, S., Ariffin, A. 2017. Grassroots Participation in Policy Formulation: Gaps and Challenges in the Developing Countries: Case of Malaysia and Zanzibar Grassroots. *Mediterranean Journal of Social Sciences*, 8. https://doi.org/10.5901/mjss.2017.v8n2p237.

Al-Saadi, H. 2014. Demystifying Ontology and Epistemology in Research Methods. *ResearchGate*, 1(1), 1-10.

Alvesson, M., Skoldberg, K. 2009. Reflexive Methodology: New Vistas for Qualitative Research (2nd ed.). London: Sage.

Amaratunga, D., Baldry, D., Sarshar, M., Newton, R. 2002. Quantitative and qualitative research in the built environment: application of "mixed" research approach. *Work Study*, 51, 17–31. https://doi.org/10.1108/00438020210415488.

Amoah, L.N.A., Simatele, M.D. 2021. Food Security and Coping Strategies of Rural Household Livelihoods to Climate Change in the Eastern Cape of South Africa. *Frontiers in Sustainable Food Systems*, 5, 692185.

Amundsen, H., Berglund, F., Westskog, H. 2010. Overcoming Barriers to Climate Change Adaptation—A Question of Multilevel Governance? *Environment and Planning C: Government and Policy*, 28, 276–289. https://doi.org/10.1068/c0941.

Amundsen, H., Hovelsrud, G.K., Aall, C., Karlsson, M., Westskog, H. 2018. Local governments as drivers for societal transformation: towards the 1.5°C ambition. *Current Opinion in Environmental Sustainability*, 31, 23–29. https://doi.org/10.1016/j.cosust.2017.12.004.

Andersson, K., Ostrom, E. 2008. Analyzing Decentralized Resource Regimes from a Polycentric Perspective. *Policy Sciences*, 41, 71–93. https://doi.org/10.1007/s11077-007-9055-6.

Andrews, L., Higgins, A., Andrews, M.W., Lalor, J.G. 2012. Classic Grounded Theory to Analyse Secondary Data: Reality and Reflections. Grounded Theory Review.

https://groundedtheoryreview.com/2012/06/01/classic-grounded-theory-to-analyse-secondary-data-reality-and-reflections/. [Accessed 12 May 2022].

Andrijevic, M., Crespo Cuaresma, J., Lissner, T., Thomas, A., Schleussner, C.-F. 2020. Overcoming gender inequality for climate resilient development. *Nature Communications*, 11, 6261. https://doi.org/10.1038/s41467-020-19856-w.

Angelsen, A., Dokken, T. 2018. Climate exposure, vulnerability and environmental reliance: a cross-section analysis of structural and stochastic poverty. *Environment and Development Economics*, 23, 257–278. https://doi.org/10.1017/S1355770X18000013.

Angelsen, A., Dokken, T. 2015. Environmental Reliance, Climate Exposure, and Vulnerability: A Cross-Section Analysis of Structural and Stochastic Poverty. Policy Research Working Paper. 7474.

Angrosino, M.V., Mays de Perez, K.A. 2000. Rethinking Observation: From Method to Context. In: *Handbook of Qualitative Research*. 2nd Edition. Denzin, N.K. and Lincoln, Y.S., Eds. 673–702.

Anguelovski, I., Carmin, J. 2011. Something borrowed, everything new: innovation and institutionalization in urban climate governance. *Current Opinion in Environmental Sustainability*, 3, 169–175. https://doi.org/10.1016/j.cosust.2010.12.017.

Antwi-Agyei, P., Quinn, C.H., Adiku, S.G.K., Codjoe, S.N.A., Dougill, A.J., Lamboll, R., Dovie, D.B.K. 2017. Perceived stressors of climate vulnerability across scales in the Savannah zone of Ghana: a participatory approach. *Regional Environmental Change*, 17, 213–227. https://doi.org/10.1007/s10113-016-0993-4.

Arbuckle, J.G., Morton, L.W., Hobbs, J. 2015. Understanding Farmer Perspectives on Climate Change Adaptation and Mitigation: The Roles of Trust in Sources of Climate Information, Climate Change Beliefs, and Perceived Risk. *Environment and Behavior*, 47, 205–234. https://doi.org/10.1177/0013916513503832.

Ateeq-Ur-Rehman, S., Bui, M.D., Rutschmann, P. 2018. Variability and Trend Detection in the Sediment Load of the Upper Indus River. *Water*, 10, 16. https://doi.org/10.3390/w10010016.

Audefroy, J.F., Sánchez, B.N.C. 2017. Integrating local knowledge for climate change adaptation in Yucatán, Mexico. *International Journal of Sustainable Built Environment*, 6, 228–237. https://doi.org/10.1016/j.ijsbe.2017.03.007.

Averchenkova, A., Gannon, K.E. Curran, P. 2019. Governance of Climate Change Policy: A Case Study of South Africa. Policy Report. London: Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London School of Economics and Political Science. https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2019/06/GRI_Governance-of-climate-change-policy_SA-case-study_policy-report_40pp.pdf. [Accessed 20 April 2020].

Ayers, J.M., Huq, S. 2009. Supporting Adaptation to Climate Change: What Role for Official Development Assistance? *Development Policy Review*, 27, 675–692. https://doi.org/10.1111/j.1467-7679.2009.00465.x.

Aylett, A. 2015. Institutionalizing the urban governance of climate change adaptation: Results of an international survey. *Urban Climate*, 14, 4–16. https://doi.org/10.1016/j.uclim.2015.06.005.

Baarsch, F., Granadillos, J.R., Hare, W., Knaus, M., Krapp, M., Schaeffer, M., Lotze-Campen, H. 2020. The impact of climate change on incomes and convergence in Africa. *World Development*, 126, 104699. https://doi.org/10.1016/j.worlddev.2019.104699.

Babbie, E. 2004. The practice of social research. Belmont, CA: Wadsworth Publishing Company.

Bahauddin, K., Rahman, N., Hasnine, M.T. 2016. Environmental Reviews and Case Studies: Public Perception, Knowledge, and Participation in Climate Change Adaptation Governance in the Coastal Region of Bangladesh Using the Social Ecological Inventory (SEI) Tool. *Environmental Practice*, 1, 1–12. https://doi.org/10.1017/S1466046615000393.

Bailey, K.D. 1994. Methods of Social Research. New York: The Free Press.

Bailey, K.D. 1982. Methods of Social Research. New York: The Free Press.

Baker, D.J., Hartley, A.J., Pearce-Higgins, J.W., Jones, R.G., Willis, S.G. 2017. Neglected issues in using weather and climate information in ecology and biogeography. *Diversity and Distributions*, 23, 329–340. https://doi.org/10.1111/ddi.12527.

Balica, S., Douben, N., Wright, N. 2009. Flood vulnerability indices at varying spatial scales. *Water Science and Technology: A Journal of the International Association on Water Pollution Research*, 60, 2571–80. https://doi.org/10.2166/wst.2009.183.

Balikoowa, K., Nabanoga, G., Tumusiime, D.M., Mbogga, M.S. 2019. Gender differentiated vulnerability to climate change in Eastern Uganda. *Climate and Development*, 11, 839–849. https://doi.org/10.1080/17565529.2019.1580555.

Balint, P., Stewart, R., Desai, A., Walters, L. 2011. Managing Wicked Environmental Problems. In: *Wicked Environmental Problems*. Island Press, Washington, DC. 207–217. https://doi.org/10.5822/978-1-61091-047-7_10.

Barnett, J., Evans, L.S., Gross, C., Kiem, A.S., Kingsford, R.T., Palutikof, J.P., Pickering, C.M., Smithers, S.G. 2015. From barriers to limits to climate change adaptation: Path dependency and the speed of change. *Ecology and Society*, 20(3), 5.

Barrett, C. 2008. Food policy, Smallholder market participation: Concepts and evidence from eastern and southern Africa. *Food Policy*, 33, 299-317.

Bates, A.E., Barrett, N.S., Stuart-Smith, R.D., Holbrook, N.J., Thompson, P.A., Edgar, G.J. 2014. Resilience and signatures of tropicalization in protected reef fish communities. *Nature Climate Change*, 4, 62–67. https://doi.org/10.1038/nclimate2062.

Bauer, A., Feichtinger, J., Steurer, R. 2012. The Governance of Climate Change Adaptation in 10 OECD Countries: Challenges and Approaches. *Journal of Environmental Policy & Planning*, 14, 279–304. https://doi.org/10.1080/1523908X.2012.707406.

Bednar, D., Henstra, D. 2018. Applying a Typology of Governance Modes to Climate Change Adaptation. *Politics and Governance*, 6, 147–158. https://doi.org/10.17645/pag.v6i3.1432.

Begum, R., Sarkar, Md.S.K., Jaafar, A., Pereira, J. 2014. Toward conceptual frameworks for linking disaster risk reduction and climate change adaptation. *International Journal of Disaster Risk Reduction*, 10. https://doi.org/10.1016/j.ijdrr.2014.10.011.

Bekhet, A.K., Zauszniewski, J.A. 2012. Methodological triangulation: an approach to understanding data. *Nurse Researcher*, 20(2), 40–43. https://doi.org/10.7748/nr2012.11.20.2.40.c9442.

Bele, M.Y., Tiani, A.M., Somorin, O.A., Sonwa, D.J. 2013. Exploring vulnerability and adaptation to climate change of communities in the forest zone of Cameroon. *Climatic. Change*, 119, 875–889. https://doi.org/10.1007/s10584-013-0738-z.

Belynda, P., Wolpe, P., Reddy, Y., Adriázola, P., Gerhard, M., Landesman, T., Strauch, L., Marie, A. 2018. Multi-level climate governance in South Africa. Catalysing finance for local climate action. Berlin and Cape Town: OneWorld, Sustainable Energy Africa and Adelphi. 60.

Berkhout, F. 2005. Rationales for adaptation in EU climate change policies. *Climate Policy*, 5, 377–391. https://doi.org/10.1080/14693062.2005.9685564.

Bernard, H. 2002. Research methods in anthropology: Qualitative and quantitative approaches., 3rd ed. ed. Walnut Creek, CA: Alta Mira Press.

Bernauer, T., Gampfer, R. 2013. Effects of civil society involvement on popular legitimacy of global environmental governance. *Global Environmental Change*, 23, 439–449. https://doi.org/10.1016/j.gloenvcha.2013.01.001.

Berrang-Ford, L., Ford, J.D., Paterson, J. 2011. Are we adapting to climate change? *Global Environmental Change*, 21, 25–33. https://doi.org/10.1016/j.gloenvcha.2010.09.012.

Beunen, R., Van Assche, K., Duineveld, M. (Eds.), 2015. Evolutionary Governance Theory: Theory and Applications. Springer International Publishing, Cham. https://doi.org/10.1007/978-3-319-12274-8.

Bewket, W. 2012. Climate change perceptions and adaptive responses of smallholder farmers in central highlands of Ethiopia. *International Journal of Environmental Studies*, 69, 507–523. https://doi.org/10.1080/00207233.2012.683328.

Bhandari, P. 2023. Ethical Considerations in Research: Types & Examples. Scribbr. https://www.scribbr.com/methodology/research-ethics/. [Accessed 15 August 2023].

Bibu, N., Lisetchi, M., Brancu, L. 2013. Particularities of Non-governmental Organizations' Financing. The Case of Romania. *Procedia - Social and Behavioral Sciences*, 92, 480–489.

Biermann, F. 2014. The Anthropocene: A governance perspective. *Anthropocene Review*, 1, 57–61. https://doi.org/10.1177/2053019613516289.

Biermann, F. 2007. 'Earth system governance' as a crosscutting theme of global change research. *Global Environmental Change*, 17, 326–337. https://doi.org/10.1016/j.gloenvcha.2006.11.010.

Biermann, F., Pattberg, P., van Asselt, H., Zelli, F. 2009. The Fragmentation of Global Governance Architectures: a Framework for Analysis. *Global Environmental Politics*, 9, 14.

Biesbroek, G.R., Swart, R.J., Carter, T.R., Cowan, C., Henrichs, T., Mela, H., Morecroft, M.D., Rey, D. 2010. Europe adapts to climate change: Comparing National Adaptation Strategies. *Global Environmental Change*, 20, 440–450. https://doi.org/10.1016/j.gloenvcha.2010.03.005.

Biesbroek, R., Klostermann, J., Termeer, C.J.A.M., Kabat, P. 2013. On the nature of barriers to climate change adaptation. *Regional Environmental Change*, 13. https://doi.org/10.1007/s10113-013-0421-y.

Biesbroek, R., Lesnikowski, A. 2018. Adaptation: The Neglected Dimension of Polycentric Climate Governance? In: *Governing Climate Change: Polycentricity in Action?* Jordan, A., Huitema, D., van Asselt, H., Forster, J. (Eds.). Cambridge University Press, Cambridge, 303–319. https://doi.org/10.1017/9781108284646.018.

Big 5 Hlabisa Local Municipality, 2021. Big 5 Hlabisa Local Municipality. https://www.big5hlabisa.gov.za/index.php/en/. [Accessed 19 January 2021].

Bihu, R. 2020. Using unstructured interviews in educational and social science research: The process, opportunity and difficulty. *Global Scientific Journals*, 8 (10), 712-721.

Birkmann, J. 2007. Risk and vulnerability indicators at different scales: Applicability, usefulness and policy implications. *Environmental Hazards*, 7, 20–31. https://doi.org/10.1016/j.envhaz.2007.04.002.

Bizikova, L., Pintér, L., Tubiello, N. 2015. Normative scenario approach: a vehicle to connect adaptation planning and development needs in developing countries. *Regional Environmental Change*, 15, 1433–1446. https://doi.org/10.1007/s10113-014-0705-x.

Blanco, H., Alberti, M., Forsyth, A., Krizek, KJ., Rodríguez, D.A., Talen, E., Ellis, C. 2009. Hot, Congested, Crowded and Diverse: Emerging Research Agendas in Planning. *Progress in Planning*, 71, 153–205. http://dx.doi.org/10.1016/j.progress.2009.03.001.

Blicharska, M., Smithers, R.J., Kuchler, M., Agrawal, G.K., Gutiérrez, J.M., Hassanali, A., Huq, S., Koller, S.H., Marjit, S., Mshinda, H.M., Masjuki, H.H., Solomons, N.W., Staden, J.V., Mikusiński, G. 2017. Steps to overcome the North–South divide in research relevant to climate change policy and practice. *Nature Climate Change*, 7, 21–27. https://doi.org/10.1038/nclimate3163.

Blomquist, W., Schlager, E. 2005. Political Pitfalls of Integrated Watershed Management. *Society & Natural Resources*, 18, 101–117. https://doi.org/10.1080/08941920590894435.

Bousquet, F., A. Botta, L. Alinovi, O. Barreteau, D. Bossio, K. Brown, P. Caron, P. Cury, et al. 2016. Resilience and development: Mobilizing for transformation. *Ecology and Society*, 21(3), 40. http://dx.doi.org/10.5751/ES-08754-210340.

Bowen, K.J., Alexander, D., Miller, F., Dany, V. 2014. Using social network analysis to evaluate health-related adaptation decision-making in Cambodia. *International Journal of Environmental Research and Public Health*, 11(2), 1605-1625. https://doi.org/10.3390/ijerph110201605.

Boyce, C., Neale, P. 2006. Conducting In-Depth Interview: A Guide for Designing and Conducting In-Depth Interviews for Evaluation Input. Pathfinder International Tool Series, Monitoring and Evaluation.

Boyd, E., Cornforth, R.J., Lamb, P.J., Tarhule, A., Lélé, M.I., Brouder, A. 2013. Building resilience to face recurring environmental crisis in African Sahel. *Nature Climate Change*, 3, 631–637. https://doi.org/10.1038/nclimate1856.

Braun, V., Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77–101. https://doi.org/10.1191/1478088706qp063oa.

Bretschneider, P.J., Cirilli, S., Jones, T., Lynch, S., Wilson, N.A. 2017. Document Review as a Qualitative Research Data Collection Method for Teacher Research. SAGE Publications Ltd. https://doi.org/10.4135/9781473957435.

Bryan, E., Behrman, J. 2013. Community-Based Adaptation to Climate Change: A Theoretical Framework, Overview of Key Issues and Discussion Of Gender Differentiated Priorities and Participation. International Food Policy Research Institute, Washington, DC. https://doi.org/10.2499/CAPRiWP109.

Bulkeley, H. 2015. Accomplishing Climate Governance. Cambridge University Press. https://doi.org/10.1017/CBO9781139839204.

Bulkey, H., Newell, P. 2015. Governing Climate Change, 2nd ed. Routledge, London. https://doi.org/10.4324/9781315758237.

Bulkeley, H., Schroeder, H., Janda, K., Zhao, J., Armstrong, A., Yi Chu, S., Gosh, S. 2009. Cities and Climate Change: The role of institutions, governance and urban planning. Report prepared for the World Bank Urban Research Symposium on Climate Change, 28-30 June 2009, Marseille.

Burch, S., S.R.J. Sheppard, A. Shaw, and D. Flanders. 2010. Planning for climate change in a flood-prone community: Municipal barriers to policy action and the use of visualizations as decision support tools. *Journal of Flood Risk Management*, 3(2), 126-139.

Burch, S. 2010b. Transforming barriers into enablers of action on climate change: Insights from three municipal case studies in British Columbia, Canada. *Global Environmental Change*, 20, 287–297. https://doi.org/10.1016/j.gloenvcha.2009.11.009.

Burch, S. 2010a. In pursuit of resilient, low carbon communities: An examination of barriers to action in three Canadian cities. *Energy Policy*, 38, 7575–7585. https://doi.org/10.1016/j.enpol.2009.06.070.

Burnside-Lawry, J., Carvalho, L. 2016. A stakeholder approach to building community resilience: awareness to implementation. *International Journal of Disaster Resilience in the Built Environment*, 7, 4–25. https://doi.org/10.1108/IJDRBE-07-2013-0028.

Burrell, G., Morgan, G. 2017. Sociological Paradigms and Organisational Analysis: Elements of the Sociology of Corporate Life. Routledge, London. https://doi.org/10.4324/9781315242804.

Byers, E., Gidden, M., Leclère, D., Balkovic, J., Burek, P., Ebi, K., Greve, P., Grey, D., Havlik, P., Hillers, A., Johnson, N., Kahil, T., Krey, V., Langan, S., Nakicenovic, N., Novak, R., Obersteiner, M., Pachauri, S., Palazzo, A., Parkinson, S., Rao, N.D., Rogelj, J., Satoh, Y., Wada, Y., Willaarts, B., Riahi, K. 2018. Global exposure and vulnerability to multi-sector development and climate change hotspots. *Environmental Research Letters*, 13, 055012. https://doi.org/10.1088/1748-9326/aabf45.

Cabral, J., Vidaurre, D., Marques, P., Magalhães, R., Silva Moreira, P., Miguel Soares, J., Deco, G., Sousa, N., Kringelbach, M.L. 2017. Cognitive performance in healthy older adults relates to spontaneous switching between states of functional connectivity during rest. *Scientific Reports*, 7, 5135. https://doi.org/10.1038/s41598-017-05425-7.

Cacho, O.J., Moss, J., Thornton, P.K., Herrero, M., Henderson, B., Bodirsky, B.L., Humpenöder, F., Popp, A., Lipper, L. 2020. The value of climate-resilient seeds for smallholder adaptation in sub-Saharan Africa. *Climate Change*, 162, 1213–1229. https://doi.org/10.1007/s10584-020-02817-z.

Callegaro, M., Manfreda, K., Vehovar, V. 2015. Web Survey Methodology. Research Methods for Social Scientists. SAGE Publications Ltd. https://doi.org/10.4135/9781529799651.

Caluser, M., Salagean, M., (eds), 2007. Good governance in multi-ethnic communities: Conditions, instruments, best practices, ways to achieve and measure good governance at the local level. King Baudouin Foundation and Ethnocultural Diversity Resource Center. http://www.edrc.ro/docs/docs/1-9.pdf. [Accessed 9 January 2021].

Camargo, B., Justo, A. 2013. IRAMUTEQ: Free software for textual data analysis. *Temas em Psicologia*, 21, 513–518. https://doi.org/10.9788/TP2013.2-16.

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., Walker, K. 2020. Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing*, 25, 652–661. https://doi.org/10.1177/1744987120927206.

Campos, S., Doxey, J., Hammond, D. 2011. Nutrition labels on pre-packaged foods: a systematic review. *Public Health Nutrition*, 14, 1496–1506. https://doi.org/10.1017/S1368980010003290.

Carbonaro, M., Bainbridge, J. 2000. Design and Development of a Process for Web-based Survey Research. *Alberta journal of educational research*, 46. https://doi.org/10.11575/ajer.v46i4.54834.

Carlisle, K., Gruby, R.L. 2017. Polycentric Systems of Governance: A Theoretical Model for the Commons. *Policy Studies Journal*, 47, 927–952. https://doi.org/10.1111/psj.12212.

Carmin, J., Anguelovski, I., Roberts, D. 2012. Urban Climate Adaptation in the Global South Planning in an Emerging Policy Domain. *Journal of Planning Education and Research*, 32, 18–32. https://doi.org/10.1177/0739456X11430951.

Carr, E.R., Thompson, M.C. 2014. Gender and Climate Change Adaptation in Agrarian Settings: Current Thinking, New Directions, and Research Frontiers. *Geography Compass*, 8, 182–197. https://doi.org/10.1111/gec3.12121.

Casey, D., Murphy, K. 2009. Issues in using methodological triangulation in research. *Nursing Research*, 16, 40–55. https://doi.org/10.7748/nr2009.07.16.4.40.c7160.

Cashman, S.B., Adeky, S., Allen, A.J., Corburn, J., Israel, B.A., Montaño, J., Rafelito, A., Rhodes, S.D., Swanston, S., Wallerstein, N., Eng, E. 2008. The power and the promise: working with communities to analyze data, interpret findings, and get to outcomes. *American Journal of Public Health*, 98, 1407–1417. https://doi.org/10.2105/AJPH.2007.113571.

Castells-Quintana, D., del Pilar Lopez-Uribe, M., McDermott, T. 2015. Coping with climate risk: the role of institutions, governance and finance in private adaptation decisions of the poor. Centre for Climate Change Economics and Policy, Working Paper No. 225.

Cater, J. K. 2011. Skype a cost-effective method for qualitative research. *Rehabilitation Counselors & Educators Journal*, 4, 10–17.

CCC, 2009. Climate Change, Gender and Vulnerable Groups in Bangladesh. Climate Change Cell, DoE, MoEF; Component 4b, CDMP, MoFDM. Month 2009, Dhaka.

Celliers, L., Colenbrander, D.R., Breetzke, T., Oelofse, G. 2015. Towards increased degrees of integrated coastal management in the City of Cape Town, South Africa. *Ocean & Coastal Management*, 105, 138–153. https://doi.org/10.1016/j.ocecoaman.2014.11.005.

Challinor, A. 2009. Towards a Science of Adaptation that Prioritises the Poor. *IDS Bulletin*, 39, 81–86. https://doi.org/10.1111/j.1759-5436.2008.tb00480.x.

Chalmers, N., Fabricius, C. 2007. Expert and generalist local knowledge about land-cover change on South Africa's Wild Coast: can local ecological knowledge add value to science? *Ecology & Society*, 12, 10.

Chan, S., Falkner, R., van Asselt, H., Goldberg, M. 2015. Strengthening non-state climate action: a progress assessment of commitments launched at the 2014 UN Climate Summit. Grantham Research Institute on Climate Change and the Environment. https://www.lse.ac.uk/granthaminstitute/publication/strengthening-non-state-climate-action-a-progress-assessment-of-commitments-launched-at-the-2014-un-climate-summit/ [Accessed 25 August 2022].

Chen, P., Hinton, S.M. 1999. Realtime Interviewing Using the World Wide Web. *Sociological Research Online*, 4, 63–81. https://doi.org/10.5153/sro.308.

Cheru, F. 2002. African Renaissance: Roadmaps to the Challenge of Globalization. London, New York: Zed Books.

Chhetri, N. 2012. Adapting Agriculture to Climate Variability and Change: Capacity Building Through Technological Innovation. In: *Climate Variability - Some Aspects, Challenges and Prospects*. Hannachi, A. InTech. https://doi.org/10.5772/29757.

Choudhary, C., Neeli, S. 2018. Risk Governance for Improving Urban Disaster Risk Reduction. In: *Disaster Risk Governance in India and Cross Cutting Issues*. Pal, I., Shaw, R. (eds). Disaster Risk Reduction. Springer, Singapore. 211–224. https://doi.org/10.1007/978-981-10-3310-0_11.

Cilliers, L., Viljoen, K. 2021. A framework of ethical issues to consider when conducting internet-based research. *South African Journal of Information Management*, 23, 1–9. https://doi.org/10.4102/sajim.v23i1.1215.

Ciplet, D., Roberts, J., Khan, M. 2015. Power in a Warming World: The New Global Politics of Climate Change and the Remaking of Environmental Inequality. https://doi.org/10.7551/mitpress/9780262029612.001.0001.

Clarke, B., Otto, F., Stuart-Smith, R., Luk, H. 2022. Extreme weather impacts of climate change: an attribution perspective - IOPscience. *Environmental Research: Climate*, 1. https://doi.org/10.1088/2752-5295/ac6e7d.

Clegg, J.W., Slife, B.D. 2009. The Handbook of Social Research Ethics. SAGE Publications, Inc. https://doi.org/10.4135/9781483348971.

Climate Data, 2021. Climate Data. https://www.climatedata.org/. [Accessed 5 April 2021].

Cloutier, G., Joerin, F., Dubois, C., Labarthe, M., Legay, C., Viens, D. 2015. Planning adaptation based on local actors' knowledge and participation: a climate governance experiment. *Climate Policy*, 15, 458–474. https://doi.org/10.1080/14693062.2014.937388.

Cochrane, L., Cundill, G., Ludi, E., New, M., Nicholls, R.J., Wester, P., Cantin, B., Murali, K.S., Leone, M., Kituyi, E., Landry, M.-E. 2017. A reflection on collaborative adaptation research in Africa and Asia. *Regional Environmental Change*, 17, 1553–1561. https://doi.org/10.1007/s10113-017-1140-6.

Cockburn, J., Cundill, G., Shackleton, S., Cele, A., Cornelius, S.F. (Ancia), Koopman, V., le Roux, J.-P., McLeod, N., Rouget, M., Schroder, S., Van den Broeck, D., Wright, D.R., Zwinkels, M. 2020. Relational Hubs for Collaborative Landscape Stewardship. *Society & Natural Resources*, 33, 681–693. https://doi.org/10.1080/08941920.2019.1658141.

Cole, D.H., Epstein, G., McGinnis, M.D. 2019. The Utility of Combining the IAD and SES Frameworks. *International Journal of the Commons*, 13(1), 244-275. https://doi.org/10.18352/ijc.864.

Connaway, L.S., Powell, R.P. 2010. Basic Research Methods for Librarians (5th ed). Santa Barbara, CA: Libraries Unlimited.

Conway, D., Schipper, E.L.F. 2011. Adaptation to climate change in Africa: Challenges and opportunities identified from Ethiopia. *Global Environmental Change*, 21, 227–237. https://doi.org/10.1016/j.gloenvcha.2010.07.013.

Cook, J., Oreskes, N., Doran, P.T., Anderegg, W.R.L., Verheggen, B., Maibach, E.W., Carlton, J.S., Lewandowsky, S., Skuce, A.G., Green, S.A., Nuccitelli, D., Jacobs, P., Richardson, M., Winkler, B., Painting, R., Rice, K. 2016. Consensus on consensus: a synthesis of consensus estimates on human-caused global warming. *Environmental Research Letters*, 11, 048002. https://doi.org/10.1088/1748-9326/11/4/048002.

Corbin, J., Strauss, A. 2008. Basics of qualitative research: Techniques and procedures for developing grounded theory (3rd ed.). Thousand Oaks, CA: Sage. https://doi.org/10.4135/9781452230153.

Corfee-Morlot, J., Kamal-Chaoui, L., Donovan, M.G., Cochran, I., Robert, A., Teasdale, P.J. 2009. Cities, Climate Change and Multilevel Governance OECD Environmental Working Papers, 14: OECD. http://www.oecd.org/env/cc/44242293.pdf. [Accessed 10 September 2022].

Costelloe, T. 2016. Giambattista Vico. In Edward N. Zalta (ed.) The Stanford Encyclopedia of Philosophy. https://plato.stanford.edu/archives/sum2016/entries/vico/ [Accessed 16 July 2023].

Couper, M.P. 2000. Web Surveys: A Review of Issues and Approaches. *Public Opinion Quarterly*. 64, 464–494. https://doi.org/10.1086/318641.

Craige, F., Snijman, P., Fourie, M. 2009a. Dissecting Environmental Compliance and Enforcement. In: Environmental Compliance and Enforcement in South Africa. Paterson, A. and Kotzé, L. (eds). Legal Perspectives, Juta Law: Cape Town. ed.

Craps, M., Vermeesch, I., Dewulf, A., Sips, K., Termeer, K., Bouwen, R. 2019. A Relational Approach to Leadership for Multi-Actor Governance. *Administrative Sciences*, 9, 12. https://doi.org/10.3390/admsci9010012.

Creswell, J.W. 2009. Mapping the field of mixed methods research. *Journal of Mixed Methods Research*, 3, 95–108.

Creswell, J.W. 2007. Qualitative inquiry and research design: Choosing among five approaches, 2nd ed, Qualitative inquiry and research design: Choosing among five approaches, 2nd ed. Sage Publications, Inc, Thousand Oaks, CA, US.

Creswell, J.W., Plano-Clark, V.L. 2011. Designing and Conducting Mixed Methods Research, 2nd ed. ed. Sage Publications, Los Angeles.

Creswell, J.W., Plano-Clark, V.L. 2007. Designing and Conducting Mixed Methods Research. Thousand Oaks Calif SAGE Publ. [Accessed 27 March 2021].

Creswell, J.W., Poth, C.N. 2016. Qualitative Inquiry and Research Design: Choosing Among Five Approaches. SAGE Publications.

Crotty, M. 2003. The Foundations of Social Research: Meaning and Perspectives in the Research Process. London: Sage Publications, 3rd edition, 3-10.

Crotty, M. 1998. Foundations of Social Research Meaning and perspective in the research process. 1st Edition. ed. Routledge.

Cundill, G., Cumming, G.S., Biggs, D., Fabricius, C. 2012. Soft systems thinking and social learning for adaptive management. *Conservation Biology*, 26(1), 13–20. https://doi.org/10.1111/j.1523-1739.2011.01755.x.

Dankelman, I., Fansen, W. 2010. Gender, Environment and Climate Change: understanding the linkages. In: *Gender and Climate Change: An Introduction*. Dankelman, I (eds). Routledge. https://doi.org/10.4324/9781849775274.

Dannevig, H., Rauken, T., Hovelsrud, G. 2012. Implementing adaptation to climate change at the local level. *Local Environment*, 17, 597–611. https://doi.org/10.1080/13549839.2012.678317.

Dany, V., Bowen, K.J., Miller, F. 2015. Assessing the institutional capacity to adapt to climate change: a case study in the Cambodian health and water sectors. *Climate Policy*, 15, 388–409. https://doi.org/10.1080/14693062.2014.937385.

Dasgupta, S., Emmerling, J., Shayegh, S. 2023. Inequality and growth impacts of climate change—insights from South Africa*. *Environmental Research Letters*, 18, 124005. https://doi.org/10.1088/1748-9326/ad0448.

David, A., Guilbert, N., Hamaguchi, N., Higashi, Y., Hino, H., Leibbrandt, M., Potgieter, E., Shifa, M. 2018. Spatial poverty and inequality in South Africa: A municipality level analysis. Work. Pap., Working Paper.

Davis-Reddy, C.L., Vincent, K. 2017. Climate Risk and Vulnerability: A Handbook for Southern Africa (2nd Ed).

De la Sota, C., Ruffato-Ferreira, V.J., Ruiz-García, L., Alvarez, S. 2019. Urban green infrastructure as a strategy of climate change mitigation. A case study in northern Spain. *Urban Forestry & Urban Greening*, 40, 145–151. https://doi.org/10.1016/j.ufug.2018.09.004.

de Vente, J., Reed, M.S., Stringer, L.C., Valente, S., Newig, J. 2016. How does the context and design of participatory decision-making processes affect their outcomes? Evidence from sustainable land management in global drylands. *Ecology & Society*, 21.

Denisova, K.O., Ilyin, A.A., Rumyantsev, R.N., Ilyin, A.P., Volkova, A.V. 2019. Nitrous Oxide: Production, Application, and Protection of the Environment. *Russian Journal of General Chemistry*, 89, 1338–1346. https://doi.org/10.1134/S107036321906032X.

Denzin, N.K. 1978. Triangulation: A Case for Methodological Evaluation and Combination. *Sociological Methods*, 339–357.

Department of Cooperative Governance and Traditional Affairs [CoGTA], 2009. State of Local Government in South Africa: Overview Report. National State of Local Government Assessments. Pretoria, South Africa. http://www.pmg.org.za/files/docs/091017tas.pdf. [Accessed 25 November 2022].

Department of Environmental Affairs, 2018. South Africa: National climate change adaptation strategy. https://www.dffe.gov.za/sites/default/files/docs/nationalclimatechange_adaptationstrategy_ue10november2019.pdf. [Accessed 15 May 2020].

Department of Environmental Affairs and Tourism [DEAT], 2016. Department of Environmental Affairs and Tourism [DEAT]. https://www.dffe.gov.za/sites/default/files/reports/201617annualreport_deptofenvironment_southafrica.pdf. [Accessed 10 May 2020].

Department of Environmental Affairs [DEA], 2013. Long-term Adaption Scenarios Flagship Research Programme (LTAS) for South Africa, Climate change implications for agriculture and forestry.

https://www.dffe.gov.za/sites/default/files/reports/ltasbook7of7_longtermadaptationscenariosforSA.pdf. [Accessed 20 May 2020].

Department of Environmental Affairs [DEA], 2011. National Climate Change Response White paper. Government of the Republic of South Africa. https://www.gov.za/sites/default/files/gcis_document/201409/nationalclimatechangeresponsewhitepaper0.pdf. [Accessed 18 May 2020].

Department of Environmental Affairs [DEA], 2006. South Africa environment outlook: A report of the state of the environment. https://soer.environment.gov.za/soer/ckeditor/UserUploadedDocsorImages/CHAPTER_3_qMxTS.pdf. [Accessed 7 April 2020].

Department of Forestry, Fisheries and the Environment [DFFE], 2020. National Climate Change Adaptation Strategy. https://www.dffe.gov.za/sites/default/files/docs/nationalclimatechange_adaptationstrategy_ue10november2019.pdf. [Accessed 15 May 2020].

Deressa, T. 2007. Measuring the economic impact of climate change on Ethiopian agriculture: Ricardian approach. Policy Research Working Papers. https://doi.org/10.1596/1813-9450-4342.

Dewulf, A., Meijerink, S., Runhaar, H. 2015. Editorial: The governance of adaptation to climate change as a multi-level, multi-sector and multi-actor challenge: A European comparative perspective. *Journal of Water and Climate Change*, 6. https://doi.org/10.2166/wcc.2014.000.

DFID, 2008. Water: An Increasingly Precious Resource; Sanitation: A Matter of Dignity - World. ReliefWeb. https://reliefweb.int/report/world/water-increasingly-precious-resource-sanitation-matter-dignity. [Accessed 29 September 2022].

Dhaoui, I. 2019. Good governance for sustainable development. MPRA Pap., MPRA Paper.

Dhimal, M., Bhandari, D., Dhimal, M.L., Kafle, N., Pyakurel, P., Mahotra, N., Akhtar, S., Ismail, T., Dhiman, R.C., Groneberg, D.A., Shrestha, U.B., Müller, R. 2021. Impact of Climate Change on Health and Well-Being of People in Hindu Kush Himalayan Region: A Narrative Review. *Frontiers in Physiology*, 12.

Di Gregorio, M., Fatorelli, L., Paavola, J., Locatelli, B., Pramova, E., Nurrochmat, D.R., May, P.H., Brockhaus, M., Sari, I.M., Kusumadewi, S.D. 2019. Multi-level governance and power in climate change policy networks. *Global Environmental Change*, 54, 64–77. https://doi.org/10.1016/j.gloenvcha.2018.10.003.

Diffenbaugh, N.S., Burke, M. 2019. Global warming has increased global economic inequality. *Proceedings of the National Academy of Sciences*, 116, 9808–9813. https://doi.org/10.1073/pnas.1816020116.

Dillman, D.A. 2007. Mail and internet surveys: The tailored design method, 2nd ed, Mail and internet surveys: The tailored design method, 2nd ed. John Wiley & Sons Inc, Hoboken, NJ, US.

Dillman D. A., Bowker D. K. 2001. The web questionnaire challenge to survey methodologists. In Reips U. & Bosnjak M. (Eds.), Dimensions in internet science. Lengerich, Germany: Pabst Science Publishers.

Dillman, D. A., Tortora, R. D., Bowker, D. 1998. Technical Report 98-50, Social and Economic Sciences Research Center. Washington State University, Pullman, WA.

Dixit, A., Karki, M., Shukla, A. 2015. Vulnerability and Impacts Assessment for Adaptation Planning in Panchase Mountain Ecological Region, Nepal, Kathmandu, Nepal.

Dixit, A., McGray, H., Gonzales, J. Desmond, M. 2012. Ready or Not: Assessing Institutional Aspects of National Capacity for Climate Change Adaptation. WRI Report, World Resources Institute, Washington, DC. http://pdf.wri.org/working_papers/ready_or_not.pdf. [Accessed 6 August 2022].

Djoudi, H., Locatelli, B., Vaast, C., Asher, K., Brockhaus, M., Basnett Sijapati, B. 2016. Beyond dichotomies: Gender and intersecting inequalities in climate change studies. *Ambio*, 45, 248–262. https://doi.org/10.1007/s13280-016-0825-2.

Dlamini, S.H. 2018. Assessing the capacity of municipalities for water provision within a rural context: A case study of uMkhanyakude District Municipality. University of KwaZulu-Natal, South Africa.

Doolan, D.M., Winters, J., Nouredini, S. 2017. Answering Research Questions Using an Existing Data Set. *Medical Research Archives*, 5(9), 1-14.

Doolan, D.M., Froelicher, E.S. 2009. Using an existing data set to answer new research questions: a methodological review. *Research and Theory for Nursing Practice*, 23, 203–215. https://doi.org/10.1891/1541-6577.23.3.203.

Dörnyei, Z. 2007. Research methods in applied linguistics: quantitative, qualitative, and mixed methodologies. Oxford: Oxford University Press. 336 pages.

Drexhage, J. 2008. Climate change and global governance. Which way ahead? International Institute for Sustainable Development (IISD), Copenhagen. https://www.iisd.org/system/files/publications/geg_climate_gov.pdf. [Accessed 9 March 2022].

Du Plessis, A., Kotzé, L. 2014. The Heat is On: Local Government and Climate Governance in South Africa The Heat is On: Local Government and Climate Governance in South Africa. *Journal of African Law*, 58, 145–174. https://doi.org/10.1017/S0021855314000047.

Duit, A., Galaz, V. 2008. Governance and Complexity—Emerging Issues for Governance Theory. *Governance*, 21, 311–335. https://doi.org/10.1111/j.1468-0491.2008.00402.x.

Dulal, H., Brodnig, G., Thakur, H., Green-Onoriose, C. 2010. Do the poor have what they need to adapt to climate change? A case study of Nepal. *Local Environment*, 15, 621–635. https://doi.org/10.1080/13549839.2010.498814.

Dunn, J. 2015. The Impact of Political Theory. *Political Studies Review*, 13, 494–499.

Dzebo, A., Stripple, J. 2015. Transnational adaptation governance: An emerging fourth era of adaptation. *Global Environmental Change*, 35, 423–435. https://doi.org/10.1016/j.gloenvcha.2015.10.006.

Eastin, J. 2018. Climate change and gender equality in developing states. *World Development*, 107, 289–305. https://doi.org/10.1016/j.worlddev.2018.02.021.

Edvardsson Björnberg, K., Hansson, S.O. 2013. Gendering local climate adaptation. *Local Environment*, 18, 217–232. https://doi.org/10.1080/13549839.2012.729571.

EFDRR, 2013. How does Europe link DRR and CCA? Working paper, Working Group (WG) on Climate Change Adaptation and Disaster Risk Reduction, European Forum for Disaster Risk Reduction.

Eichelberger, R.T. 1989. Disciplined inquiry: Understanding and doing educational research. New York: Longman.

Eisenack, K., Moser, S.C., Hoffmann, E., Klein, R.J.T., Oberlack, C., Pechan, A., Rotter, M., Termeer, C.J.A.M. 2014. Explaining and overcoming barriers to climate change adaptation. *Nature Climate Change*, 4, 867–872. https://doi.org/10.1038/nclimate2350.

Eisenack, K., Stecker, R. 2011. An Action Theory of Adaptation to Climate Change. Earth System Governance Working Paper, No.13. https://www.earthsystemgovernance.org/publication/an-action-theory-of-adaptation-to-climate-change/. [Accessed 8 May 2022].

Ekstrom, J.A., Moser, S.C. 2014. Identifying and overcoming barriers in urban climate adaptation: Case study findings from the San Francisco Bay Area, California, USA. *Urban Climate*, 9, 54–74. https://doi.org/10.1016/j.uclim.2014.06.002.

Elsawah, S., Guillaume, J.H.A., Filatova, T., Rook, J., Jakeman, A.J. 2015. A methodology for eliciting, representing, and analysing stakeholder knowledge for decision making on complex socio-ecological systems: From cognitive maps to agent-based models. *Journal of Environmental Management*, 151, 500–516. https://doi.org/10.1016/j.jenvman.2014.11.028.

El-Taliawi, O.G., Van Der Wal, Z. 2019. Developing administrative capacity: an agenda for research and practice. *Policy Design and Practice*, 2, 243–257. https://doi.org/10.1080/25741292.2019.1595916.

Enfors, E., Gordon, L., Peterson, G., Bossio, D. 2008. Making Investments in Dryland Development Work: Participatory Scenario Planning in the Makanya Catchment, Tanzania. *Ecology & Society*, 13. https://doi.org/10.5751/ES-02649-130242.

Engle, N.L. 2011. Adaptive capacity and its assessment. *Global Environmental Change*, 21, 647–656. https://doi.org/10.1016/j.gloenvcha.2011.01.019.

Engle, N.L., Lemos, M.C. 2010. Unpacking governance: Building adaptive capacity to climate change of river basins in Brazil. *Global Environmental Change*, 20, 4–13. https://doi.org/10.1016/j.gloenvcha.2009.07.001.

Eriksen, S., Aldunce, P., Bahinipati, C.S., Martins, R.D., Molefe, J.I., Nhemachena, C., O'Brien, K., Olorunfemi, F., Park, J., Sygna, L., Ulsrud, K. 2011. When not every response to climate change is a good one: Identifying principles for sustainable adaptation. *Climate and Development*, 3, 7–20. https://doi.org/10.3763/cdev.2010.0060.

Eriksen, S.H., Nightingale, A.J., Eakin, H. 2015a. Reframing adaptation: The political nature of climate change adaptation. *Global Environmental Change*, 35, 523–533. https://doi.org/10.1016/j.gloenvcha.2015.09.014.

Eriksen, S.H., Nightingale, A.J., Eakin, H. 2015b. Reframing adaptation: The political nature of climate change adaptation. *Global Environmental Change*, 35, 523–533. https://doi.org/10.1016/j.gloenvcha.2015.09.014.

Ernst, K.M., van Riemsdijk, M. 2013. Climate change scenario planning in Alaska's National Parks: Stakeholder involvement in the decision-making process. *Applied Geography*, 45, 22–28. https://doi.org/10.1016/j.apgeog.2013.08.004.

Essegbey, G., Totin, E., Karbo, N., Traoré, P.S., Zougmoré, R.B. 2016. Assessment of climate change policy and institutional context: The case of Ghana (Working Paper).

Etale, L., Simatele, M.D. 2021. Climate Change Adaptation for Food Security and Gendered-Land Rights in Western Kenya. *Journal of Asian and African Studies*, 59(1), 3-22. https://doi.org/10.1177/0021909620988302.

European Commission, 2004. Communication from the Commission. European Neighbourhood Policy, Strategy Paper. Commission of the European Communities. https://neighbourhood-enlargement.ec.europa.eu/system/files/2019-01/2004_communication_from_the_commission_-_european_neighbourhood_policy_-_strategy_paper.pdf. [Accessed 30 March 2022].

Evans, J.R., Mathur, A. 2005. The value of online surveys. *Internet Research*, 15, 195–219. https://doi.org/10.1108/10662240510590360.

Fakier, S., Stephens, A., Tholin, J. 2005. Environmental governance. Pretoria, background research paper produced for the South Africa Environment Outlook report on behalf of the Department of Environmental Affairs and Tourism.

http://soer.deat.gov.za/dm_documents/Environmental_Governance__Background_Paper_WU45Q.pdf. [Accessed 29 June 2020].

FAOSTAT. 2020. Statistical Database. Food and Agriculture Organization of the United Nations, Rome. https://www.fao.org/faostat/en/#home. [Accessed 18 September 2020].

Fauchereau, N., Trzaska, S., Rouault, M., Richard, Y. 2003. Rainfall Variability and Changes in Southern Africa during the 20th Century in the Global Warming Context. *Natural Hazards*, 29, 139–154. https://doi.org/10.1023/A:1023630924100.

Feliciano, D., Recha, J., Ambaw, G., MacSween, K., Solomon, D., Wollenberg, E. 2022. Assessment of agricultural emissions, climate change mitigation and adaptation practices in Ethiopia. *Climate Policy*, 22, 427–444. https://doi.org/10.1080/14693062.2022.2028597.

Ferguson, S.K., Hirai, D.M., Copp, S.W., Holdsworth, C.T., Allen, J.D., Jones, A.M., Musch, T.I., Poole, D.C. 2013. Impact of dietary nitrate supplementation via beetroot juice on exercising muscle vascular control in rats. *Journal of Physiology*, 591, 547–557. https://doi.org/10.1113/jphysiol.2012.243121.

Fidelman, P.I.J., Leitch, A.M., Nelson, D.R. 2013. Unpacking multilevel adaptation to climate change in the Great Barrier Reef, Australia. *Global Environmental Change*, 23, 800–812. https://doi.org/10.1016/j.gloenvcha.2013.02.016.

Flato, G., Ananicheva, M., Antonov, E., Atkinson, D., Brown, R., Hamilton, L., Harwood, L., Jia, G., Kattsov, V., Kivva, K., et al. 2017. Regional drivers and projections of regional change., In: *Adaptation Actions for a Changing Arctic: Perspectives from the Bering-Chukchi-Beaufort Region*. Arctic Monitoring and Assessment Programme (AMAP): Oslo, Norway, 89–124.

Flood, S., Cradock-Henry, N.A., Blackett, P., Edwards, P. 2018. Adaptive and interactive climate futures: systematic review of 'serious games' for engagement and decision-making. *Environmental Research Letters*, 13, 063005. https://doi.org/10.1088/1748-9326/aac1c6.

Folke, C., Hahn, T., Olsson, P., Norberg, J. 2005. Adaptive Governance of Social-Ecological Systems. *Annual Review of Environment and Resources*, 30, 441–473. https://doi.org/10.1146/annurev.energy.30.050504.144511.

Food and Agriculture Organisation [FAO]. 2003. World agriculture towards 2015/2030: An FAO perspective. FAO/Earthscan Publishers.

Ford, J., King, D. 2015. A framework for examining adaptation readiness. Mitig. Adapt. Strateg. *Global Change*, 20, 505–526.

Freeman, R., Maybin, J. 2011. Documents, Practices and Policy. *Evidence and Policy*, 7, 155–170. https://doi.org/10.1332/174426411X579207.

Fröcklin, S., Jiddawi, N.S., de la Torre-Castro, M. 2018. Small-scale innovations in coastal communities: shell-handicraft as a way to empower women and decrease poverty. *Ecology & Society*, 23.

Fröhlich, J., Knieling, J. 2013. Conceptualising Climate Change Governance. In: *Climate Change Governance Climate Change Management*. Knieling, J., Leal Filho, W. (Eds.). Springer, Berlin, Heidelberg, 9–26. https://doi.org/10.1007/978-3-642-29831-8_2.

Frommer, B. 2009. Climate change and the resilient society: utopia or realistic option for German regions? *Natural Hazards*, 58.

Fünfgeld, H. 2015. Facilitating local climate change adaptation through transnational municipal networks. *Current Opinion in Environmental Sustainability*, 12, 67–73. https://doi.org/10.1016/j.cosust.2014.10.011.

Gaaloul, N., Eslamian, S., Katlance, R. 2021. Impacts of Climate Change and Water Resources Management in the Southern Mediterranean Countries. *Water Productivity Journal*, 1, 51–72. https://doi.org/10.22034/wpj.2020.119476.

Galaz, V., Olsson, P., Hahn, T., Folke, C., Svedin, U. 2008. The Problem of Fit among Biophysical Systems, Environmental and Resource Regimes, and Broader Governance Systems: Insights and Emerging Challenges. In: *Institutions and Environmental Change: Principal Findings, Applications, and Research Frontiers*, 147–186. https://doi.org/10.7551/mitpress/9780262240574.003.0005.

Gani, A. 2012. The Relationship Between Good Governance And Carbon Dioxide Emissions: Evidence From Developing Economies. *Journal of Development Economics*, 37, 77–93.

Gannon, K.E., Castellano, E., Eskander, S., Agol, D., Diop, M., Conway, D., Sprout, E. 2022. The triple differential vulnerability of female entrepreneurs to climate risk in sub-Saharan Africa: Gendered barriers and enablers to private sector adaptation. *WIREs Climate Change*, 13, e793. https://doi.org/10.1002/wcc.793.

Garcia, A.C., Standlee, A.I., Bechkoff, J., Cui, Y. 2009. Ethnographic Approaches to the Internet and Computer-Mediated Communication. *Journal of Contemporary Ethnography*, 38, 52–84. https://doi.org/10.1177/0891241607310839.

Garrelts, H., Lange, H. 2011. Path dependencies and path change in complex fields of action: climate adaptation policies in Germany in the realm of flood risk management. *Ambio*, 40, 200–209. https://doi.org/10.1007/s13280-010-0131-3.

Gaventa, J., Barrett, G. 2010. So What Difference Does it Make? Mapping the Outcomes of Citizen Engagement. Working Paper 347, Institute of Development Studies (IDS), Brighton. https://gsdrc.org/document-library/so-what-difference-does-it-make-mapping-the-outcomes-of-citizen-engagement/. [Accessed 5 April 2023].

Gemma, R. 2018. Introduction to positivism, interpretivism and critical theory. *Nursing Research*, 25, 41–49.

Gero, A., Méheux, K., Dominey-Howes, D. 2011. Integrating Community Based Disaster Risk Reduction and Climate Change Adaptation: Examples From the Pacific. *Natural Hazards and Earth System Sciences*, 11. https://doi.org/10.5194/nhess-11-101-2011.

Geyer, R., Rihani, S. 2010. Complexity and Public Policy: A New Approach to 21st Century Politics, Policy and Society. Routledge CRC Press. https://www.routledge.com/Complexity-and-Public-Policy-A-New-Approach-to-21st-Century-Politics-Policy/Geyer-Rihani/p/book/9780415556637. [Accessed 4 June 2022].

Giordano, T., Hall, L., Gilder, A., Parramon, M. 2011. Governance of climate change in South Africa. Pretoria: DEA. https://www.dffe.gov.za/sites/default/files/docs/climate_change_governance.pdf. [Accessed 2 May 2021].

Goebel, A. 2007. Sustainable urban development? Low-cost housing challenges in South Africa. *Habitat International*, 31, 291–302. https://doi.org/10.1016/j.habitatint.2007.03.001.

Goldman, M.J., Turner, M.D., Daly, M. 2018. A critical political ecology of human dimensions of climate change: Epistemology, ontology, and ethics. *WIREs Climate Change*, 9, e526. https://doi.org/10.1002/wcc.526.

Gorddard, R., Colloff, M.J., Wise, R.M., Ware, D., Dunlop, M. 2016. Values, rules and knowledge: Adaptation as change in the decision context. *Environmental Science & Policy*, 57, 60–69. https://doi.org/10.1016/j.envsci.2015.12.004.

Government of South Africa. 2022. KZN flood victims to get temporary accommodation by weekend. https://www.sanews.gov.za/south-africa/kzn-flood-victims-get-temporaryaccommodation-weekend. [Accessed 20 November 2022].

Government of the Republic of South Africa, 2011. National climate change response white paper. https://www.gov.za/sites/default/files/gcis_document/201409/nationalclimatechangeresponsewhitepaper0.pdf. [Accessed 18 May 2020].

Graham, N.A.J., Wilson, S.K., Carr, P., Hoey, A.S., Jennings, S., MacNeil, M.A. 2018. Seabirds enhance coral reef productivity and functioning in the absence of invasive rats. *Nature*, 559, 250–253. https://doi.org/10.1038/s41586-018-0202-3.

Granberg, M., Elander, I. 2007. Local Governance and Climate Change: Reflections on the Swedish Experience. *Local Environment*, 12, 537–548. https://doi.org/10.1080/13549830701656911.

Gray, B. 1989. Collaborating: Finding Common Ground for Multiparty Problems. https://www.ojp.gov/ncjrs/virtual-library/abstracts/collaborating-finding-common-ground-multiparty-problems [Accessed 11 July 2022].

Greiving, S., Fleischhauer, M. 2014. National Climate Change Adaptation Strategies of European States from a Spatial Planning and Development Perspective. In: *Climate Change and Sustainable Cities*. Routledge.

Grey, D.E. 2014. Doing Research in the Real World., 3rd ed. ed.

Griffiths, A., Haigh, N., Rassias, J. 2007. A Framework for Understanding Institutional Governance Systems and Climate Change: The Case of Australia. *European Management Journal*, 25, 415–427. https://doi.org/10.1016/j.emj.2007.08.001.

Guba, E.G., Lincoln, Y.S. 1994. Competing paradigms in qualitative research. In: *Handbook of Qualitative Research*. Sage Publications, Inc., Thousand Oaks, 105–117.

Guba, E.G., Lincoln, Y.S. 1982. Epistemological and Methodological Bases of Naturalistic Inquiry. *Educational Communication and Technology*, 30, 233–252.

Gupta, A.K., Singh, S., Wajih, S.A., Mani, N., Singh, A.K. 2017. Urban Resilience and Sustainability through Peri-Urban Ecosystems: Integrating Climate Change Adaptation and Disaster Risk Reduction, Gorakhpur Environmental Action Group, Gorakhpur (U.P.) India.

Hair Jr., J.F., et al. 1998. Multivariate Data Analysis with Readings. Englewood Cliffs, NJ: Prentice-Hall.

Halimani, T., Marandure, T., Chikwanha, O.C., Molotsi, A.H., Abiodun, B.J., Dzama, K., Mapiye, C. 2021. Smallholder sheep farmers' perceived impact of water scarcity in the dry ecozones of South Africa: Determinants and response strategies. *Climate Risk Management*, 34, 100369. https://doi.org/10.1016/j.crm.2021.100369.

Hall, N. 2016. Displacement, Development, and Climate Change: International Organizations Moving Beyond Their Mandates. London: Routledge. https://doi.org/10.4324/9781315639758.

Hallegatte, S. 2009. Strategies to adapt to an uncertain climate change. *Global Environmental Change*, 19, 240–247. https://doi.org/10.1016/j.gloenvcha.2008.12.003.

Head, B.W. 2022. Wicked Problems in Public Policy Understanding and Responding to Complex Challenges. Palgrave Macmillan.

Heale, R., Forbes, D. 2013. Understanding triangulation in research. *Evidence-Based Nursing*, 16, 98. https://doi.org/10.1136/eb-2013-101494.

Hedger, M., et al. 2008. Evaluation of Adaptation to Climate Change from a Development Perspective - GSDRC. https://gsdrc.org/document-library/evaluation-of-adaptation-to-climate-change-from-a-development-perspective/. [Accessed 28 May 2022].

Heidegger, M. 2008. Ontology—The Hermeneutics of Facticity. Indiana University Press.

Heinrichs, D., Krellenberg, K., Fragkias, M. 2013. Urban Responses to Climate Change: Theories and Governance Practice in Cities of the Global South. *International Journal of Urban and Regional Research*, 37, 1865–1878. https://doi.org/10.1111/1468-2427.12031.

Heltberg, R., Jorgenson, S., Seigal, P. 2008. Climate change: challenges for social protection in Africa. World Bank Working Paper Series. SSRN: http://ssrn.com/abstract=1174774. [Accessed 14 January 2022].

Hemson, G., Maclennan, S., Mills, G., Johnson, P., Macdonald, D. 2009. Community, lions, livestock and money: A spatial and social analysis of attitudes to wildlife and the conservation value of tourism in a human–carnivore conflict in Botswana. *Biological Conservation*, 142, 2718–2725. https://doi.org/10.1016/j.biocon.2009.06.024.

Henning, E., van Rensburg, W., Smit, B. 2004. Finding your way in qualitative research. Pretoria: Van Schaik.

Henstra, D. 2016. The tools of climate adaptation policy: analysing instruments and instrument selection. *Climate Policy*, 16, 496–521. https://doi.org/10.1080/14693062.2015.1015946.

Hernandez, J., Meisner, J., Jacobs, L.A., Rabinowitz, P.M. 2022. Re-Centering Indigenous Knowledge in climate change discourse. *PLOS Climate*, 1, e0000032. https://doi.org/10.1371/journal.pclm.0000032.

Hernandez, Y., Guimarães Pereira, Â., Barbosa, P. 2018. Resilient futures of a small island: A participatory approach in Tenerife (Canary Islands) to address climate change. *Environmental Science & Policy*, 80, 28–37. https://doi.org/10.1016/j.envsci.2017.11.008.

Hess, C. 1998. Dilemmas of Building a Sustainable Equitable Information Resource. Workshop in Political Theory and Policy Analysis, Indiana University. Libraries' and Librarians' Publications. 19.

Hill, C., Lynn, J., Laurence, 2004. Is Hierarchical Governance in Decline? Evidence from Empirical Research. *Journal of Public Administration Research and Theory*, 15. https://doi.org/10.1093/jopart/mui011.

Hill, K. 2015. Coastal infrastructure: a typology for the next century of adaptation to sea-level rise. *Frontiers in Ecology a/nd the Environment*, 13, 468–476.

Hinkel, J., Nicholls, R.J., Vafeidis, A.T., Tol, R.S.J., Avagianou, T. 2010. Assessing risk of and adaptation to sea-level rise in the European Union: an application of DIVA. *Mitigation and Adaptation Strategies for Global Change*, 15, 703–719. https://doi.org/10.1007/s11027-010-9237-y.

Hodson, M., Marvin, S. 2009. 'Urban Ecological Security': A New Urban Paradigm? *International Journal of Urban and Regional Research*, 33, 193–215. https://doi.org/10.1111/j.1468-2427.2009.00832.x.

Holden, M., Lynch, P. 2004. Choosing the Appropriate Methodology: Understanding Research Philosophy. *The Marketing Review*, 4(4), 397-409. https://doi.org/10.1362/1469347042772428.

Holgate, C. 2007. Factors and Actors in Climate Change Mitigation: A Tale of Two South African Cities. *Local Environment*, 12, 471–484. https://doi.org/10.1080/13549830701656994.

Holzkämper, A. 2017. Adapting Agricultural Production Systems to Climate Change—What's the Use of Models? *Agriculture*, 7, 86. https://doi.org/10.3390/agriculture7100086.

Honebein, P.C. 1996. Seven goals for the design of constructivist learning environments. In Wilson, Brent. G. (Ed.). (1996) Constructivist learning environments: case studies in instructional design. Educational Technology Publications. New Jersey: Englewood Cliffs.

Hooli, L.J. 2016. Resilience of the poorest: coping strategies and indigenous knowledge of living with the floods in Northern Namibia. *Regional Environmental Change*, 16, 695–707. https://doi.org/10.1007/s10113-015-0782-5.

Hossain, Md.Z., Rahman, Md.A.U. 2017. Pro-poor adaptation for the urban extreme poor in the context of climate change: A study on Dhaka City, Bangladesh. *International Journal of Climate Change Strategies and Management*, 10, 389–406. https://doi.org/10.1108/IJCCSM-08-2016-0117.

Hove, M., Ngwerume, E.T., Muchemwa, C. 2013. Document details - The urban crisis in Sub-Saharan Africa: A threat to human security and sustainable development. *Stability*, 2. https://doi.org/10.5334/sta.ap.

Howlett, M. 2009. Policy Analytical Capacity and Evidence-Based Policy-Making: Lessons from Canada. *Canadian Public Administration*, 52, 153–175. https://doi.org/10.1111/j.1754-7121.2009.00070_1.x.

Hsieh, T.-F., Lee, Y.-M. 2021. Community-Based Adaptation to Climate Change: The Case of a Community University Workshop in Taiwan. *Sustainability*, 13, 1729. https://doi.org/10.3390/su13041729.

Huitema, D., Adger, W.N., Berkhout, F., Massey, E., Mazmanian, D., Munaretto, S., Plummer, R., Termeer, C.C.J.A.M. 2016. The governance of adaptation: choices, reasons, and effects. Introduction to the Special Feature. *Ecology & Society*, 21.

Hulme, M. 2009. Why We Disagree about Climate Change: Understanding Controversy, Inaction and Opportunity. Cambridge University Press, Cambridge. https://doi.org/10.1017/CBO9780511841200.

Hulme, M., Doherty, R., Ngara, T., New, M., Lister, D. 2001. African climate change: 1900–2100. *Climate Research*, 17, 145–168.

Hummel, D. 2016. Climate change, land degradation and migration in Mali and Senegal – some policy implications. *Migration and Development*, 5, 211–233. https://doi.org/10.1080/21632324.2015.1022972.

Hunt, A., Watkiss, P. 2011. Climate change impacts and adaptation in cities: a review of the literature. *Climate Change*, 104, 13–49. https://doi.org/10.1007/s10584-010-9975-6.

Huntjens, P., Lebel, L., Pahl-Wostl, C., Camkin, J., Schulze, R., Kranz, N. 2012. Institutional Design Propositions for the Governance or Adaptation to Climate Change in the Water

Sector. *Global Environmental Change*, 22, 67–81. https://doi.org/10.1016/j.gloenvcha.2011.09.015.

Huxham, Chris, Vangen, S., Huxham, C., Eden, C. 2000. The Challenge of Collaborative Governance. *Public Management: An International Journal of Research and Theory*, 2, 337–358. https://doi.org/10.1080/14719030000000021.

IDS/Tearfund. 2006. Overcoming the barriers. Mainstreaming climate change adaptation in developing countries. http://www.tearfund.org/webdocs/website/Campaigning/Policy%20and%20research/Overcoming%20the%20barriers%20briefing%20paper.pdf. [Accessed 19 October 2022].

Ilieva, J., Baron, S., Healey, N. 2002. Online surveys in marketing research: Pros and cons. *International Journal of Market Research*, 44, 361-382. https://doi.org/10.1177/147078530204400303.

Imperial, M. 1999. Institutional Analysis and Ecosystem-Based Management: The Institutional Analysis and Development Framework. *Environmental Management*, 24, 449–465.

Innes, J. E., Booher, D. E. 2003. Collaborative policymaking: governance through dialogue. In: Wagenaar, H.; Hajer, Maarten A., Deliberative policy analysis: Understanding governance in the network society, Cambridge: Cambridge University Press. pp. 33-59.

Intergovernmental Panel on Climate Change [IPCC]. 2023. Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (Eds.)]. IPCC, Geneva, Switzerland.

Intergovernmental Panel on Climate Change [IPCC]. 2022. Climate Change 2022: Impacts, Adaptation and Vulnerability Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change., H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (Eds.)]. ed. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA.

Intergovernmental Panel on Climate Change [IPCC], 2018. Summary for Policymakers. In: *Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.* Masson-Delmotte, V., Zhai, P., Pörtner, H.O., Roberts, D., Skea, J., Shukla, P.R., Pirani, A., Moufouma-Okia, W., Péan,

Intergovernmental Panel on Climate Change [IPCC]. 2014. AR5 Climate Change 2014: Impacts, Adaptation, and Vulnerability — IPCC. https://www.ipcc.ch/report/ar5/wg2/ [Accessed 1 April 2022].

Intergovernmental Panel on Climate Change [IPCC]. 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

Intergovernmental Panel on Climate Change [IPCC]. 2007a. AR4 Climate Change 2007: The Physical Science Basis — IPCC. https://www.ipcc.ch/report/ar4/wg1/. [Accessed 10 May 2022].

Intergovernmental Panel on Climate Change [IPCC]. 2007b. Climate Change 2007: Impacts, Adaptation and Vulnerability. Working Group II Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

Intergovernmental Panel on Climate Change [IPCC]. 2001. Climate change: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change.

Islam, R., Walkerden, G. 2017. Social networks and challenges in government disaster policies: a case study from Bangladesh. *International Journal of Disaster Risk Reduction*, 22, 325–334. https://doi.org/10.1016/j.ijdrr.2017.02.011.

Ivey, J.L., Smithers, J., de Loë, R.C., Kreutzwiser, R.D. 2004. Community Capacity for Adaptation to Climate-Induced Water Shortages: Linking Institutional Complexity and Local Actors. *Environmental Management*, 33, 36–47. https://doi.org/10.1007/s00267-003-0014-5.

Jabeen, H., Johnson, C., Allen, A. 2010. Built-in resilience: learning from grassroots coping strategies for climate variability. *Environment and Urbanization*, 22, 415–431.

Jänicke, M., Jörgens, H. 2009. New Approaches to Environmental Governance. In: *The Ecological Modernisation Reader*. Routledge.

Jankowski, N.W., van Selm, M. 2005. Epilogue: Methodological concerns and innovations in Internet research. In: *Virtual Methods. Issues in Social Research on the Internet*. 199–207.

Jankowski, T. 1999. Generalization of the Method of Quasilinearization for Differential Problems with a Parameter. *Dynamic Systems and Applications*, 8, 53–72.

Johnson, R., Onwuegbuzie, A., Turner, L. 2007. Toward a Definition of Mixed Methods Research. Journal of Mixed Methods Research, 1, 112-133. *Journal of Mixed Methods Research*, 1, 112–133. https://doi.org/10.1177/1558689806298224.

Joinson, A.N. 2005. Internet Behaviour and the design of virtual methods. In: *Virtual Methods: Issues in Social Research on the Internet*. Oxford: Berg.

Jongman, M., Korsten, L. 2016. Genetic Diversity and Antibiotic Resistance of Escherichia coli Isolates from Different Leafy Green Production Systems. *Journal of Food Protection*, 79, 1846–1853. https://doi.org/10.4315/0362-028X.JFP-16-117.

Jordan, A.J., Huitema, D., Hildén, M., van Asselt, H., Rayner, T.J., Schoenefeld, J.J., Tosun, J., Forster, J., Boasson, E.L. 2015. Emergence of polycentric climate governance and its future prospects. *Nature Climate Change*, 5, 977–982. https://doi.org/10.1038/nclimate2725.

Jordan, M., Kleinsasser, R., Roe, M. 2014. Wicked problems: inescapable wickedity. *Journal of Education for Teaching: International Research and Pedagogy*, 40. https://doi.org/10.1080/02607476.2014.929381.

Jost, C., Kyazze, F., Naab, J., Neelormi, S., et al. 2016. Understanding gender dimensions of agriculture and climate change in smallholder farming communities. *Climate and Development*, 8(2), 133-144. https://doi.org/10.1080/17565529.2015.1050978.

Juhola, S. 2016. Barriers to the implementation of climate change adaptation in land use planning: A multi-level governance problem? *International Journal of Climate Change*

Strategies and Management, 8, 338–355. https://doi.org/10.1108/IJCCSM-03-2014-0030.

Juhola, S., Heikkinen, M., Pietilä, T., Groundstroem, F., Käyhkö, J. 2022. Connecting climate justice and adaptation planning: An adaptation justice index. *Environmental Science & Policy*, 136, 609–619. https://doi.org/10.1016/j.envsci.2022.07.024.

Kalanda-Joshua, M., Ngongondo, C., Chipeta, L., Mpembeka, F. 2011. Integrating indigenous knowledge with conventional science: Enhancing localised climate and weather forecasts in Nessa, Mulanje, Malawi. *Physics and Chemistry of the Earth, Parts A/B/C*, 36, 996–1003. https://doi.org/10.1016/j.pce.2011.08.001.

Kanie, N., Zondervan, R., Stevens, C. 2014. Ideas on Governance 'of' and 'for' Sustainable Development Goals: UNU-IAS/POST2015 Conference Report.

Kates, R.W., Travis, W.R., Wilbanks, T.J. 2012. Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences of the United States of America*, 109, 7156–7161. https://doi.org/10.1073/pnas.1115521109.

Kaufmann, D., Kraay, A., Zoido-Lobaton, P. 1999. Governance matters. Policy Research Working Paper Series 2196, The World Bank.

Kes, A., Swaminathan, H. 2006. Gender and time Poverty in sub-Saharan Africa. In: *Blackden and Wodon*.

Keskitalo, E.C.H., Juhola, S., Baron, N., Fyhn, H., Klein, J. 2016. Implementing Local Climate Change Adaptation and Mitigation Actions: The Role of Various Policy Instruments in a Multi-Level Governance Context. *Climate*, 4, 7. https://doi.org/10.3390/cli4010007.

Keskitalo, E.C.H. 2010. Climate change adaptation in the United Kingdom: England and South-East England. In: *The Development of Adaptation Policy and Practice in Europe: Multi-Level Governance of Climate Change*. Keskitalo, E.C.H., Ed. Springer: Dordrecht, The Netherlands. pp. 97–147.

Keskitalo, E.C.H., Kulyasova, A.A. 2009. The role of governance in community adaptation to climate change. *Polar Research*, 28, 60–70. https://doi.org/10.1111/j.1751-8369.2009.00097.x.

Kettle, N.P., Dow, K., Tuler, S., Webler, T., Whitehead, J., Miller, K.M. 2014. Integrating scientific and local knowledge to inform risk-based management approaches for climate adaptation. *Climate Risk Management*, 4–5, 17–31. https://doi.org/10.1016/j.crm.2014.07.001.

Khambule, I. 2018. The role of Local Economic Development Agencies in South Africa's developmental state ambitions. *Local Economy*, 33, 287–306. https://doi.org/10.1177/0269094218766459.

Khan, M.R. 2016. Climate change, adaptation and international relations theory. In: *Environment, Climate Change and International Relations*. International Relations Publishing, Bristol, 14–28.

Khan, M.R., Roberts, J.T. 2013. Adaptation and international climate policy. *WIREs Climate Change*, 4, 171–189. https://doi.org/10.1002/wcc.212.

Khatibi, F.S., Dedekorkut-Howes, A., Howes, M., Torabi, E. 2021. Can public awareness, knowledge and engagement improve climate change adaptation policies? *Discover Sustainability*, 2, 18. https://doi.org/10.1007/s43621-021-00024-z.

King, N. 2021. Climate Change Implications for SA's Youth. Expert Report Commissioned by CER.

Kiratu, S. 2011. Economic barriers to climate change adaptation implementation in SADC. In: *Overcoming Barriers to Climate Change Adaptation Implementation in Southern Africa*. Pretoria, South Africa: Africa Institute of South Africa, 89–110.

Kirchhoff, C.J., Carmen Lemos, M., Dessai, S. 2013. Actionable Knowledge for Environmental Decision Making: Broadening the Usability of Climate Science. *Annual Review of Environment and Resources*, 38, 393–414. https://doi.org/10.1146/annurev-environ-022112-112828.

Klein, R., Midgley, G., Preston, B., Alam, M., Berkhout, F., Dow, K., Shaw, M. 2014. Adaptation opportunities, constraints, and limits. In: *Climate Change 2014 – Impacts,*

Adaptation and Vulnerability: Part A: Global and Sectoral Aspects: Working Group II Contribution to the IPCC Fifth Assessment Report. Cambridge University Press; 2014:899-944. https://doi.org/10.1017/CBO9781107415379.021.

Klepp, S., Fünfgeld, H. 2021. Tackling knowledge and power: an environmental justice perspective on climate change adaptation in Kiribati. *Climate and Development*, 14, 1–13. https://doi.org/10.1080/17565529.2021.1984866.

Klijn, E.H., Koppenjan, J.M.F. 2000. Public management and policy networks: foundations of a network approach to governance. *Public Management*, 2, 135–158.

Koh, E.T., Owen, W.L. 2000. Descriptive Research and Qualitative Research. In: *Introduction to Nutrition and Health Research*. Koh, E.T., Owen, W.L. (Eds.), Springer US, Boston, MA, 219–248. https://doi.org/10.1007/978-1-4615-1MA, 219.

Köhler, P., Bintanja, R., Fischer, H., Joos, F., Knutti, R., Lohmann, G., Masson-Delmotte, V. 2010. What caused Earth's temperature variations during the last 800,000 years? Data-based evidence on radiative forcing and constraints on climate sensitivity. *Quaternary Science Reviews*, 29, 129–145. https://doi.org/10.1016/j.quascirev.2009.09.026.

Kooiman, J. 2016. Interactive governance and governability. In: *Critical Reflections on Interactive Governance*. Edward Elgar Publishing, 29–50.

Kooiman, J. 1993. Social-Political Governance: Introduction. In: *Modern Governance: New Government-Society Interactions*. Sage, Newbury Park, 1-8.

Koppenjan, J., Klijn, E.-H. 2004. Managing Uncertainties in Networks: Public Private Controversies, 1st ed. ed. Routledge, London. https://doi.org/10.4324/9780203643457.

Kotzé, L.J. 2009. Environmental Governance. In: *Environmental Compliance and Enforcement in South Africa: Legal Perspectives*. Kotze LJ and Paterson AR (eds). 103-379.

Kotzé, L.J. 2006. Improving unsustainable environmental governance in South Africa: the case for holistic governance. *Potchefstroom Electronic Law Journal/Potchefstroomse Elektroniese Regsblad*, 9(1). https://doi.org/10.4314/pelj.v9i1.43452.

Krippendorff, K. 2018. Content Analysis: An Introduction to Its Methodology. SAGE Publications.

Kristjanson, P., Bryan, E., Bernier, Q., Twyman, J., Meinzen-Dick, R., Kieran, C., Ringler, C., Jost C., Doss, C. 2017. Addressing gender in agricultural research for development in the face of a changing climate: where are we and where should we be going? *International Journal of Agricultural Sustainability*, 15(5), 482-500.

Kruger, A.C., Nxumalo, M.P. 2017. Historical rainfall trends in South Africa: 1921–2015. *Water SA,* 43, 285–297. https://doi.org/10.4314/wsa.v43i2.12.

Kumssa, A., Jones, J.F. 2010. Climate change and human security in Africa. *International Journal of Sustainable Development & World Ecology*. 17, 453–461. https://doi.org/10.1080/13504509.2010.520453.

Kuruppu, N., Willie, R. 2015. Barriers to reducing climate enhanced disaster risks in Least Developed Country-Small Islands through anticipatory adaptation. *Weather and Climate Extremes*, 7, 72–83. https://doi.org/10.1016/j.wace.2014.06.001.

Kvale, S. 1996. The 1,000-Page Question. *Qualitative Inquiry,* 2, 275–284. https://doi.org/10.1177/107780049600200302.

Kvale, S., Brinkmann, S. 2009. InterViews: Learning the craft of qualitative research interviewing, 2nd ed. Sage Publications, Inc, Thousand Oaks, CA, US.

Lakoff, G. 1987. Cognitive models and prototype theory. In: *Concepts and Conceptual Development: Ecological and Intellectual Factors in Categorization*. Cambridge University Press. 63–100.

Laskey, N., Wilson, A.M. 2003. Internet based marketing research: a serious alternative to traditional research methods? *Marketing Intelligence & Planning*, 21, 79–84. https://doi.org/10.1108/02634500310465380.

Lau, J.D., Kleiber, D., Lawless, S., Cohen, P.J. 2021. Gender equality in climate policy and practice hindered by assumptions. *Nature Climate Change*, 11, 186–192. https://doi.org/10.1038/s41558-021-00999-7.

Leach M, Stirling A. 2011. Dynamic sustainabilities: a response. *Environment and Planning A: Economy and Space*, 43, 1235–1237.

Leal Filho, W., Raath, S., Lazzarini, B., Vargas, V.R., de Souza, L., Anholon, R., Quelhas, O.L.G., Haddad, R., Klavins, M., Orlovic, V.L. 2018. The role of transformation in

learning and education for sustainability. *Journal of Cleaner Production*, 199, 286–295. https://doi.org/10.1016/j.jclepro.2018.07.017.

Leal Filho, W., Vargas, V.R., Salvia, A.L., Brandli, L.L., Pallant, E., Klavins, M., Ray, S., Moggi, S., Maruna, M., Conticelli, E., Ayanore, M.A., Radovic, V., Gupta, B., Sen, S., Paço, A., Michalopoulou, E., Saikim, F.H., Koh, H.L., Frankenberger, F., Kanchanamukda, W., Cunha, D.A. da, Akib, N.A.M., Clarke, A., Wall, T., Vaccari, M. 2019. The role of higher education institutions in sustainability initiatives at the local level. *Journal of Cleaner Production*, 233, 1004–1015. https://doi.org/10.1016/j.jclepro.2019.06.059.

Leary, N. 2008. For Whom the Bell Tolls: Vulnerabilities in a Changing Climate, in: Climate Change and Vulnerability and Adaptation. Routledge.

Leck, H., Roberts, D. 2015. What lies beneath: understanding the invisible aspects of municipal climate change governance. *Current Opinion in Environmental Sustainability*, 13, 61–67. https://doi.org/10.1016/j.cosust.2015.02.004.

Leck, H., Simon, D. 2018. Local Authority Responses to Climate Change in South Africa: The Challenges of Transboundary Governance. *Sustainability*, 10, 2542. https://doi.org/10.3390/su10072542.

Lefever, S., Dal, M., Matthíasdóttir, Á. 2007. Online data collection in academic research: advantages and limitations. *British Journal of Educational Technology*, 38, 574–582. https://doi.org/10.1111/j.1467-8535.2006.00638.x.

Lemos, M., Agrawal, A., Eakin, H., Nelson, D., Engle, N., Johns, O. 2013. Building Adaptive Capacity in Less Developed Countries. In: *Climate Science for Serving Society*. Asrar, G., Hurrell, J. (eds). Springer, Dordrecht. 437-457. https://doi.org/10.1007/978-94-007-6692-1_16.

Levy, B.S., Patz, J.A. 2015. Climate Change, Human Rights, and Social Justice. *Annals of Global Health*, 81, 310–322. https://doi.org/10.1016/j.aogh.2015.08.008.

Lincoln, Y., Guba, E. 2000. Paradigmatic controversies, contradictions, and emerging confluences. In: *Handbook of Qualitative Research*. 163–188.

Lincoln, Y.S., Denzin, N.K. 2002. The Seventh Moment. In: *Handbook of Qualitative Research* (2nd Ed.). Denzin, N.K. and Lincoln, Y.S. Eds. London: Sage, 1047–1065.

Lloyd, S.J., Kovats, R.S., Chalabi, Z. 2011. Climate change, crop yields, and undernutrition: development of a model to quantify the impact of climate scenarios on child undernutrition. *Environmental Health Perspectives*, 119, 1817–1823. https://doi.org/10.1289/ehp.1003311.

Lobe, B. 2017. Best practices for synchronous online focus groups. In: *A New Era in Focus Group Research: Challenges, Innovation and Practice*. Palgrave Macmillan, 227–250.

Lofthouse, J. K., Herzberg, R.Q. 2023. The continuing case for a polycentric approach for coping with climate change. *Sustainability*, 15, 3770.

Lonsdale, K., Pringle, P., Turner, B. 2015. Transformative adaptation: what it is, why it matters & what is needed. UK Climate Impacts Programme, University of Oxford, Oxford, UK ISBN: 978-1-906360-11-5.

Loring, P.A., Gerlach, S.C., Atkinson, D.E., Murray, M.S. 2011. Ways to Help and Ways to Hinder: Governance for Effective Adaptation to an Uncertain Climate. *ARCTIC*, 64, 73–88. https://doi.org/10.14430/arctic4081.

Lukey, P. 2020. The South African National Climate Change Response Policy – an evidence-based policy-making case study. Department of Environment, Forestry and Fisheries, Pretoria.

Lyall, C., Tait, J. 2004. Foresight in a Multi-level Governance Structure: Policy Integration and Communication. *Science and Public Policy*, 31, 27–37.

Lyles, W., Berke, P., Overstreet, K.H. 2018. Where to begin municipal climate adaptation planning? Evaluating two local choices. *Journal of Environmental Planning and Management*, 61, 1994–2014. https://doi.org/10.1080/09640568.2017.1379958.

Mabelis, A., Maksymiuk, G. 2009. Public participation in green urban policy: two strategies compared. *International Journal of Biodiversity Science & Management*, 5, 63–75.

Mabon, L., Shih, W.-Y. 2018. What might 'just green enough' urban development mean in the context of climate change adaptation? The case of urban greenspace planning in Taipei Metropolis, Taiwan. *World Development*, 107, 224–238.

Macchi, M., Fumagalli, L., Pinto, R., Cavalieri, S. 2011. A Decision Making Framework for Managing Maintenance Spare Parts in Case of Lumpy Demand: Action Research in the Avionic Sector. In: *Service Parts Management: Demand Forecasting and Inventory Control.* Altay, N., Litteral, L.A. (Eds.). Springer, London. 171–202. https://doi.org/10.1007/978-0-85729-039-7_9.

MacMillan, J.H., Schumacher, S. 2001. Research in Education. A Conceptual Introduction., 5th ed. ed. Longman, Boston.

Madhu, P. 2005. What is good governance? *Trade Union,* 1, 1–6.

Madondo, M., Nkwana, H.M. 2021. Exploring South Africa's National Climate Change Response White Paper, 2011: challenges and prospects for public policy.

Madzwamuse, M. 2010. Drowning voices: The climate change discourse in South Africa. Policy Brief. 5, 1–8.

Mahon, R., Fanning, L., McConney, P. 2017. Assessing governance performance in transboundary water systems. *Environmental Development*, 24, 146–155. https://doi.org/10.1016/j.envdev.2017.06.008.

Makondo, C.C., Thomas, D.S.G. 2018. Climate change adaptation: Linking indigenous knowledge with western science for effective adaptation. *Environmental Science & Policy,* 88, 83–91. https://doi.org/10.1016/j.envsci.2018.06.014.

Malhi, G.S., Kaur, M., Kaushik, P. 2021. Impact of Climate Change on Agriculture and Its Mitigation Strategies: A Review. *Sustainability,* 13, 1318. https://doi.org/10.3390/su13031318.

Mamun, S.A., Lownes, N.E., Osleeb, J.P., Bertolaccini. 2013. A method to define public transit opportunity space. *Journal of Transport Geography,* 28, 144-154.

Mann, C., Stewart, F. 2000. Internet Communication and Qualitative Research. SAGE Publications Ltd. https://doi.org/10.4135/9781849209281.

Manuel-Navarrete, D. 2010. Power, realism, and the ideal of human emancipation in a climate of change. *WIREs Climate Change,* 1, 781–785. https://doi.org/10.1002/wcc.87.

Mapfumo, P., Onyango, M., Honkponou, S.K., El Mzouri, E.H., Githeko, A., Rabeharisoa, L., Obando, J., Omolo, N., Majule, A., Denton, F., Ayers, J., Agrawal, A. 2017. Pathways to transformational change in the face of climate impacts: an analytical framework. *Climate and Development*, 9, 439–451. https://doi.org/10.1080/17565529.2015.1040365.

Marks, G. 1993. Structural Policy and Multilevel Governance in the EC. In: *The State of the European Community* (Volume 2). Harlow: Longman.

Marshall, G. R. 2015. Polycentricity and adaptive governance. In a paper presented to the panel "The new polycentricity? Conceptual basis and operationalisation for the study of the commons" convened during the 15th Biennial Global Conference of the International Association for the Study of the Commons, 25–29 May 2015, Edmonton, Canada.

Marston, R.A. 2008. Land, Life, and Environmental Change in Mountains. *Annals of the American Association of Geographers*, 98, 507–520. https://doi.org/10.1080/00045600802118491.

Masipa, T. 2017. The impact of climate change on food security in South Africa : current realities and challenges ahead. *Journal of Disaster Risk Studies: Jàmbá*, 9, 1–7. https://doi.org/10.4102/jamba.v9i1.411.

Massey, D., Chaboyer, W., Aitken, L. 2014. Nurses' perceptions of accessing a Medical Emergency Team: a qualitative study. *Australian Critical Care*, 27, 133–138. https://doi.org/10.1016/j.aucc.2013.11.001.

Massey, E. E., Bergsma, E. J. 2008. Assessing adaptation in 29 European countries. IVM Report; No. W-08/20. Instituut voor Milieuvraagstukken, Vrije Universiteit, Amsterdam.

Mastin, L. 2008. Constructivism. https://www.philosophybasics.com/branch_constructivism.html. [Accessed 6 February 2021].

Matasci, C., Kruse, S., Barawid, N., Thalmann, P. 2014. Exploring barriers to climate change adaptation in the Swiss tourism sector. *Mitigation and Adaptation Strategies for Global Change*, 19, 1239–1254. https://doi.org/10.1007/s11027-013-9471-1.

Matson, P. A., Clark, W. C., Andersson, K. 2016. Pursuing sustainability: a guide to the science and practice. Princeton, NJ: Princeton University Press. pp. 83-104.

May T. 1997. Social research: Issues, methods and process. (2nd ed). Buckingham, Philadelphia: Open University Press. pp. 164.

Mbokodo, I., Bopape, M.-J., Chikoore, H., Engelbrecht, F., Nethengwe, N. 2020. Heatwaves in the Future Warmer Climate of South Africa. *Atmosphere*, 11, 712. https://doi.org/10.3390/atmos11070712.

McCarney, P., Blanco, H., Carmin, J., Colley, M. 2011. Cities and climate change. In: *Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network*. Rosenzweig, C., Solecki, W.D., Hammer, S.A., Mehrotra, S., Eds., Cambridge University Press, Cambridge, UK.

McGranahan, G., Balk, D., Anderson, B. 2007. The rising tide: Assessing the risks of climate change and human settlements in low elevation coastal zones. *Environment and Urbanization*, 19, 17–37.

McKibbin, W.J., Wilcoxen, P.J. 2002. The Role of Economics in Climate Change Policy. *Journal of Economic Perspectives*, 6, 107–129. https://doi.org/10.1257/0895330027283.

McKinney, L.A., Fulkerson, G.M. 2015. Gender Equality and Climate Justice: A Cross-National Analysis. *Social Justice Research*, 28, 293–317. https://doi.org/10.1007/s11211-015-0241-y.

McNall, S.G. 2010. Rapid Climate Change: What Is to Be Done? *Contemporary Sociology*, 39, 406–411.

McNeeley, S.M. 2012. Examining barriers and opportunities for sustainable adaptation to climate change in Interior Alaska. *Climate Change*, 111, 835–857. https://doi.org/10.1007/s10584-011-0158-x.

Meadowcroft, J. 2009. Climate Change Governance. Policy Research Working Paper Series 4941. Washington DC: The World Bank. https://doi.org/10.1596/1813-9450-4941.

Measham, T.G., Preston, B.L., Smith, T.F., Brooke, C., Gorddard, R., Withycombe, G., Morrison, C. 2011. Adapting to climate change through local municipal planning:

barriers and challenges. *Mitigation and Adaptation Strategies for Global Change*, 16, 889–909. https://doi.org/10.1007/s11027-011-9301-2.

Mees, H. 2017. Local governments in the driving seat? A comparative analysis of public and private responsibilities for adaptation to climate change in European and North American cities. *Journal of Environmental Policy & Planning*, 19, 374–390. https://doi.org/10.1080/1523908X.2016.1223540.

Meijerink, S., Stiller, S. 2013. What Kind of Leadership Do We Need for Climate Adaptation? A Framework for Analyzing Leadership Objectives, Functions, and Tasks in Climate Change Adaptation. *Environment and Planning C: Government and Policy*, 31, 240–256. https://doi.org/10.1068/c11129.

Melgarejo, L.-F., Lakes, T. 2014. Urban adaptation planning and climate-related disasters: An integrated assessment of public infrastructure serving as temporary shelter during river floods in Colombia. *International Journal of Disaster Risk Reduction*, 9, 147–158. https://doi.org/10.1016/j.ijdrr.2014.05.002.

Merriam, S. B. 1988. Case study research in education: A qualitative approach. Jossey-Bass, San Francis-co. pp. 118.

Midgley, G.F., Rutherford, M.C., Bond, W.J., Bernard, P. (2008). The heat is on…Impacts of climate change on plant diversity in South Africa. Cape Town: National Botanical Research Unit. http://www.sanbi.org/sites/default/files/documents/documents/theheatison.pdf. [Accessed 29 April 2020].

Morchain, D. 2018. Rethinking the framing of climate change adaptation: Knowledge, power, and politics, in: A Critical Approach to Climate Change Adaptation. Routledge.

Morgan, D., Lobe, B. 2011. Online Focus Groups. In: *The Handbook of Emergent Technologies in Social Research*. Hesse-Biber, S.N (Eds.). 199-230. Oxford University Press.

Moser, S., Boykoff, M. 2013. Climate change and successful adaptation: the scope of the challenge. In: *Successful adaptation to climate change*. Routledge, Routledge, Oxford, UK, pp. 25–58.

Moser, S.C. 2010. Communicating climate change: history, challenges, process and future directions. *WIREs Climate Change*, 1, 31–53. https://doi.org/10.1002/wcc.11.

Moser, S.C., Ekstrom, J.A. 2010. A framework to diagnose barriers to climate change adaptation. *Proceedings of the National Academy of Sciences*, 107, 22026–22031. https://doi.org/10.1073/pnas.1007887107.

Moser, C., Satterthwaite, D. 2008a. Towards pro-poor adaptation to climate change in the urban centres of low- and middle-income countries. In: *Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World.* Mearns, R. and A Norton (eds). World Bank, Washington, DC, USA. pp. 231-258.

Moser, S.C., Dilling, L. (Eds.), 2007. Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change. Cambridge University Press, Cambridge. https://doi.org/10.1017/CBO9780511535871.

Mpanza, D., Govender, P. 2017. Rural realities in service provision for substance abuse: a qualitative study in uMkhanyakude district, KwaZulu-Natal, South Africa. *South African Family Practice*, 1, 1–6. https://doi.org/10.1080/20786190.2016.1272232.

Msuya, F.E., Hurtado, A.Q. 2017. The role of women in seaweed aquaculture in the Western Indian Ocean and South-East Asia. *European Journal of Phycology*, 52, 482–494. https://doi.org/10.1080/09670262.2017.1357084.

Mthembu, A., Hlophe, S. 2020. Building resilience to climate change in vulnerable communities: A case study of uMkhanyakude district municipality. *Town and Regional Planning*, 77, 42–56. https://doi.org/10.18820/2415-0495/trp77i1.4.

Mtubatuba Local Municipality, 2021. Mtubatuba Local Municipality. https://www.mtubatuba.gov.za/. [Accessed 10 February 2021].

Mubaya, C.P., Mafongoya, P. 2017. The role of institutions in managing local level climate change adaptation in semi-arid Zimbabwe. *Climate Risk Management*, 16, 93–105. https://doi.org/10.1016/j.crm.2017.03.003.

Muchunku, I. G., Mberia, H. K., Ndati, N. 2014. Evaluating Opinion Leadership Strategies Used to Communicate Adaptive Climate Change Information to Residents of Arid and

Semi-Arid Areas in Kenya. *International Journal of Scientific and Research Publications*, 4(12), 6.

Mueller, B. 2020. Why public policies fail: Policymaking under complexity. *EconomiA 21*, 311–323. https://doi.org/10.1016/j.econ.2019.11.002.

Mukheibir, P., Mitchell, C., Boyle, T. 2013. End-use forecasting in the context of building adaptive water services. *Water Utility Journal*, 29–39.

Mukonza, C., Mukonza, R. 2014. An analysis of responses to climate change by local government in South Africa: The case of Capricorn District Municipality. *International Journal of African Renaissance Studies*, 9, 173–196. https://doi.org/10.1080/18186874.2014.987962.

Muluneh, M.G. 2021. Impact of climate change on biodiversity and food security: a global perspective—a review article. *Agriculture & Food Security*, 10, 36. https://doi.org/10.1186/s40066-021-00318-5.

Musavengane, R., Simatele, D.M. 2016. Community-based natural resource management: The role of social capital in collaborative environmental management of tribal resources in KwaZulu-Natal, South Africa. *Development Southern Africa*, 33, 806–821. https://doi.org/10.1080/0376835X.2016.1231054.

Muyambo, F., Belle, J., Nyam, Y.S., Orimoloye, I.R. 2023. Climate-Change-Induced Weather Events and Implications for Urban Water Resource Management in the Free State Province of South Africa. *Environmental Management*, 71, 40–54. https://doi.org/10.1007/s00267-022-01726-4.

Nagoda, S., Nightingale, A.J. 2017. Participation and Power in Climate Change Adaptation Policies: Vulnerability in Food Security Programs in Nepal. *World Development*, 100, 85–93. https://doi.org/10.1016/j.worlddev.2017.07.022.

Natow, R.S. 2020. The use of triangulation in qualitative studies employing elite interviews. *Qualitative Research*, 20, 160–173. https://doi.org/10.1177/1468794119830077.

Nelson, G.C., Valin, H., Sands, R.D., Havlík, P., Ahammad, H., Deryng, D., Elliott, J., Fujimori, S., Hasegawa, T., Heyhoe, E., Kyle, P., Von Lampe, M., Lotze-Campen, H., Mason d'Croz, D., Van Meijl, H., Van Der Mensbrugghe, D., Müller, C., Popp, A.,

Robertson, R., Robinson, S., Schmid, E., Schmitz, C., Tabeau, A., Willenbockel, D. 2014. Climate change effects on agriculture: Economic responses to biophysical shocks. *Proceedings of the National Academy of Sciences,* 111, 3274–3279. https://doi.org/10.1073/pnas.1222465110.

Nelson, R., Kokic, P., Crimp, S., Meinke, H., Howden, S.M. 2010. The vulnerability of Australian rural communities to climate variability and change: Part I—Conceptualising and measuring vulnerability. *Environmental Science & Policy,* 13, 8–17. https://doi.org/10.1016/j.envsci.2009.09.006.

Newig, J., Pahl-Wostl, C., Sigel, K. 2005. The role of public participation in managing uncertainty in the implementation of the Water Framework Directive. *European Environment*, 15, 333–343.

Ngcamu, B.S. 2023. Climate change effects on vulnerable populations in the Global South: a systematic review. *Natural Hazards*, 118, 977–991. https://doi.org/10.1007/s11069-023-06070-2.

Ngobese, A.C.N., Msweli, P. 2013. A framework for tracking Millennium Poverty Reduction at local government level: a case of KwaZulu-Natal. *Journal of Public Administration*, 48.

Ngwenya, N., Simatele, M.D. 2020. The emergence of green bonds as an integral component of climate finance in South Africa. *South African Journal of Science*, 116. https://doi.org/10.17159/sajs.2020/6522.

Nhamo, G. 2014. Addressing women in climate change policies: A focus on selected east and southern African countries. *Agenda,* 28(3), 156–167. https://doi.org/10.1080/10130950.2014.946734.

Nhamo, G., Agyepong, A.O. 2019. Climate change adaptation and local government: Institutional complexities surrounding Cape Town's Day Zero. *Jamba Potchefstroom South Africa,* 11, 717. https://doi.org/10.4102/jamba.v11i3.717.

Niang, I., Ruppel, O.C., Abdrabo, M.A., Essel, A., Lennard, C., Padgham, J., Urquhart, P. 2014. Africa. In: *Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects.* Contribution of Working Group II to the Fifth Assessment Report of the

Intergovernmental Panel on Climate Change. Barros, V.R., Field, C.B., Dokken, D.J., Mastrandrea, M.D., Mach, K.J., Bilir, T.E., Chatterjee, M., Ebi, K.L., Estrada, Y.O., Genova, R.C., Girma, B., Kissel, E.S., Levy, A.N., MacCracken, S., Mastrandrea, P.R. and White, L.L., (Eds). Cambridge University Press, Cambridge, UK. 1199-1265. https://doi.org/10.2134/agronj2010.0303.

Nicoson, C., von Uexkull, N. 2019. Humanitarian Consequences of Climate Change., in: Overlapping Vulnerabilities: The Impact of Climate Change on Humanitarian NeEds. Norwegian Red Cross, Oslo.

Nielsen, J.Ø., Reenberg, A. 2010. Cultural barriers to climate change adaptation: A case study from Northern Burkina Faso. *Global Environmental Change*, 20, 142–152. https://doi.org/10.1016/j.gloenvcha.2009.10.002.

Nightingale, A.J. 2017. Power and politics in climate change adaptation efforts: Struggles over authority and recognition in the context of political instability. *Geoforum*, 84, 11–20. https://doi.org/10.1016/j.geoforum.2017.05.011.

Nightingale, A.J., Eriksen, S., Taylor, M., Forsyth, T., Pelling, M., Newsham, A., Boyd, E., Brown, K., Harvey, B., Jones, L., Bezner Kerr, R., Mehta, L., Naess, L.O., Ockwell, D., Scoones, I., Tanner, T., Whitfield, S. 2020. Beyond Technical Fixes: climate solutions and the great derangement. *Climate and Development*, 12, 343–352. https://doi.org/10.1080/17565529.2019.1624495.

Nilsson, M., Hillman, K., Magnusson, T. 2012. How do we govern sustainable innovations? Mapping patterns of governance for biofuels and hybrid-electric vehicle technologies. *Environmental Innovation and Societal Transitions*, 3, 50–66. https://doi.org/10.1016/j.eist.2012.04.002.

Nkhonjera, G.K. 2017. Understanding the impact of climate change on the dwindling water resources of South Africa, focusing mainly on Olifants River basin: A review. *Environmental Science & Policy*, 71, 19–29.

Noble, H., Heale, R. 2019. Triangulation in research, with examples. *Evidence-Based Nursing*, 22, 67–68. https://doi.org/10.1136/ebnurs-2019-103145.

Noor, R., Inam, A., Zahra, S.M., Shoaib, M., Riaz, R., Sarwar, A., Asif, M., Ahmad, S. 2022. A methodological framework for modeling sustainability visions: A case study of groundwater management in Faizpur distributary, Pakistan. *Agricultural Water Management*, 271, 107822. https://doi.org/10.1016/j.agwat.2022.107822.

Novak, T.P. 1996. Secondary Data Analysis Lecture Notes. Marketing Research, Vanderbilt University.

Nowell, L.S., Norris, J.M., White, D.E., Moules, N.J. 2017. Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods*, 16, 1609406917733847. https://doi.org/10.1177/1609406917733847.

Nthambi, M., Markova-Nenova, N., Wätzold, F. 2021. Quantifying Loss of Benefits from Poor Governance of Climate Change Adaptation Projects: A Discrete Choice Experiment with Farmers in Kenya. *Ecological Economics*, 179, 106831. https://doi.org/10.1016/j.ecolecon.2020.106831.

Nyahunda, L., Makhubele, J.C., Mathlakala, F.K., Mabvurira, V. 2020. Resilience strategies of rural people in the face of climate change in Mazungunye Community, Ward 4, Bikita District, Masvingo Province Zimbabwe: A social work perspective. *Gender and Behaviour*, 18, 15511–15520.

Nyahunda, L., Tirivangasi, H.M. 2022. Adaptation strategies employed by rural women in the face of climate change impacts in Vhembe district, Limpopo province, South Africa. *Management of Environmental Quality*, 33, 1061–1075. https://doi.org/10.1108/MEQ-09-2021-0207.

Nyseth, T., Viken, A. 2016. Communities of practice in the management of an Arctic environment: monitoring knowledge as complementary to scientific knowledge and the precautionary principle? *Polar Record*, 52, 66–75. https://doi.org/10.1017/S003224741500039X.

O'Brien, K., Leichenko, R., Kelkar, U., Venema, H., Aandahl, G., Tompkins, H., Javed, A., Bhadwal, S., Barg, S., Nygaard, L., West, J. 2004. Mapping vulnerability to multiple stressors: climate change and globalization in India. *Global Environmental Change*, 14, 303–313. https://doi.org/10.1016/j.gloenvcha.2004.01.001.

O'Connor, H., Madge, C. 2003. "Focus groups in cyberspace": using the Internet for qualitative research. *Qualitative Market Research: An International Journal*, 6, 133–143. https://doi.org/10.1108/13522750310470190.

OECD. 2008. Annual report on sustainable development work in the OECD. https://www.oecd.org/greengrowth/42177377.pdf. [Accessed 5 July 2022].

Ofoegbu, C., Chirwa, P., Francis, J., Babalola, F. 2017. Assessing vulnerability of rural communities to climate change: A review of implications for forest-based livelihoods in South Africa.*International Journal of Climate Change Strategies and Management*, 9, 374–386. https://doi.org/10.1108/IJCCSM-04-2016-0044.

Ojha, H.R., Ghimire, S., Pain, A., Nightingale, A., Khatri, D.B., Dhungana, H. 2016. Policy without politics: technocratic control of climate change adaptation policy making in Nepal. *Climate Policy*, 16, 415–433. https://doi.org/10.1080/14693062.2014.1003775.

Ojwang, L., Rosendo, S., Celliers, L., Obura, D., Muiti, A., Kamula, J., Mwangi, M. 2017. Assessment of Coastal Governance for Climate Change Adaptation in Kenya. *Earths Future*, 5, 1119–1132. https://doi.org/10.1002/2017EF000595.

Okereke, C., Bulkeley, H., Schroeder, H. 2009. Conceptualizing Climate Governance beyond the International Regime. *Global Environmental Politics*, 9 (1), 58–78.

Olsson, P., Galaz, V., Boonstra, W.J. 2014. Sustainability transformations: a resilience perspective. *Ecology & Society*, 19.

O'Neill, S.J., Hulme, M., Turnpenny, J., Screen, J.A. 2010. Disciplines, Geography, and Gender in the Framing of Climate Change. *Bulletin of the American Meteorological Society*, 91, 997–1002. https://doi.org/10.1175/2010BAMS2973.1.

Ongong'a, J.J., Akaranga, S. 2013. Work ethics for lecturers an example of Nairobi and Kenyatta universities. *International Journal of Arts and Commerce*, 2(8): 8-22.

Onwuegbuzie, A.J., Leech, N.L. 2006. Linking Research Questions to Mixed Methods Data Analysis Procedures. *The Qualitative Report*, 11, 474–498.

Onwutuebe, C.J. 2019. Patriarchy and Women Vulnerability to Adverse Climate Change in Nigeria. *SAGE Open*, 9, 2158244019825914. https://doi.org/10.1177/2158244019825914.

Oringderff, J. 2004. “My Way”: Piloting an Online Focus Group. *International Journal of Qualitative Methods*, 3, 69–75. https://doi.org/10.1177/160940690400300305.

Ortega-Cisneros, K., Cochrane, K.L., Rivers, N., Sauer, W.H.H. 2021. Assessing South Africa’s Potential to Address Climate Change Impacts and Adaptation in the Fisheries Sector. *Frontiers in Marine Science*, 8, 1–20.

Ostrom, E. 2014. A Polycentric Approach For Coping With Climate Change. *Annals of Economics and Finance*, 15, 97–134.

Ostrom, E. 2010. Beyond Markets and States: Polycentric Governance of Complex Economic Systems. *American Economic Review*, 100, 641–672. https://doi.org/10.1257/aer.100.3.641.

Ostrom, E. 2007. A diagnostic approach for going beyond panaceas. *Proceedings of the National Academy of Sciences*, 104, 15181–15187. https://doi.org/10.1073/pnas.0702288104.

Ostrom, E. 2000. Collective Action and the Evolution of Social Norms. *Journal of Economic Perspectives*, 14, 137–158. https://doi.org/10.1257/jep.14.3.137.

Ostrom, E. 1972. Metropolitan Reform: Propositions Derived from Two Traditions. *Social Science Quarterly*, 53, 474–493.

Ostrom, E., Gardner, R., Walker, J. 1994. Rules, Games, and Common-pool Resources. University of Michigan Press.

Otto, I.M., Reckien, D., Reyer, C.P.O., Marcus, R., Le Masson, V., Jones, L., Norton, A., Serdeczny, O. 2017. Social vulnerability to climate change: a review of concepts and evidence. *Regional Environmental Change*, 17, 1651–1662. https://doi.org/10.1007/s10113-017-1105-9.

Owusu, M., Nursey-Bray, M., Rudd, D. 2019. Gendered perception and vulnerability to climate change in urban slum communities in Accra, Ghana. *Regional Environmental Change*, 19. https://doi.org/10.1007/s10113-018-1357-z.

Ozdemir, S., Carlos Fernandez de Arroyabe, J., Sena, V., Gupta, S. 2023. Stakeholder diversity and collaborative innovation: Integrating the resource-based view with

stakeholder theory. *Journal of Business Research*, 164, 113955. https://doi.org/10.1016/j.jbusres.2023.113955.

Paavola, J., Adger, W.N. 2006. Fair adaptation to climate change. *Ecological Economics*, 56, 594–609. https://doi.org/10.1016/j.ecolecon.2005.03.015.

Pachauri, R.K., et al. 2014. AR5 Synthesis Report: Climate Change 2014. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

Pahl-Wostl, C. 2009. A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global Environmental Change*, 19, 354–365. https://doi.org/10.1016/j.gloenvcha.2009.06.001.

Pahl-Wostl, C. 2007. Transitions towards adaptive management of water facing climate and global change. *Water Resources Management*, 21, 49–62. https://doi.org/10.1007/s11269-006-9040-4.

Pahl-Wostl, C., Knieper, C. 2014. The capacity of water governance to deal with the climate change adaptation challenge: Using fuzzy set Qualitative Comparative Analysis to distinguish between polycentric, fragmented and centralized regimes. *Global Environmental Change*, 29, 139–154. https://doi.org/10.1016/j.gloenvcha.2014.09.003.

Palinkas, L.A., Horwitz, S.M., Green, C.A., Wisdom, J.P., Duan, N., Hoagwood, K. 2015. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health*, 42, 533–544. https://doi.org/10.1007/s10488-013-0528-y.

Parry, M.L., Carter, T.R., Konijn, N.T. 2013. The Impact of Climate Variations on Agriculture: Volume 1: Assessment in Cool Temperature and Cold Regions. Springer Science & Business Media.

Pasquini, L., Cowling, R.M., Ziervogel, G. 2013. Facing the heat: Barriers to mainstreaming climate change adaptation in local government in the Western Cape Province, South Africa. *Habitat International*, 40, 225–232. https://doi.org/10.1016/j.habitatint.2013.05.003.

Pasquini, L., Ziervogel, G., Cowling, R.M., Shearing, C. 2015. What enables local governments to mainstream climate change adaptation? Lessons learned from two municipal case studies in the Western Cape, South Africa. *Climate and Development,* 7, 60–70. https://doi.org/10.1080/17565529.2014.886994.

Patel, M., Patel, N. 2019. Exploring Research Methodology: Review Article. *International Journal of Research and Review*, 6(3), 48-55.

Patton, M. 1980. Qualitative Evaluation Methods. Newbury Park, CA: Sage.

Patrick, H.O. 2021. Climate Change, Water Security, and Conflict Potentials in South Africa: Assessing Conflict and Coping Strategies in Rural South Africa. In: *Handbook of Climate Change Management: Research, Leadership, Transformation.* Luetz, J.M., Ayal, D. (Eds.), Springer International Publishing, Cham, 1775–1792. https://doi.org/10.1007/978-3-030-57281-5_84.

Patton, M.Q. 2002. Qualitative research and evaluation methods, 3rd ed. ed. Thousand Oaks, CA: Sage Publications.

Pelling, M., O'Brien, K., Matyas, D. 2014. Adaptation and transformation. *Climate Change,* 133. https://doi.org/10.1007/s10584-014-1303-0.

Perez, C., Jones, E.M., Kristjanson, P., Cramer, L., Thornton, P.K., Förch, W., Barahona, C. 2015. How resilient are farming households and communities to a changing climate in Africa? A gender-based perspective. *Global Environmental Change,* 34, 95–107. https://doi.org/10.1016/j.gloenvcha.2015.06.003.

Pereznieto, P., Rivett, J., Le Masson, V. 2020. Ending violence against children while addressing the global climate crisis [Working Paper 591].

Persson, Å. 2019. Global adaptation governance: An emerging but contested domain. *WIREs Climate Change*, 10, e618. https://doi.org/10.1002/wcc.618.

Phillippi, J., Lauderdale, J. 2018. A Guide to Field Notes for Qualitative Research: Context and Conversation. *Qualitative Health Research,* 28, 381–388. https://doi.org/10.1177/1049732317697102.

Pickson, R.B., Boateng, E. 2022. Climate change: a friend or foe to food security in Africa? *Environment, Development and Sustainability*, 24, 4387–4412. https://doi.org/10.1007/s10668-021-01621-8.

Pielke, R., Prins, G., Rayner, S., Sarewitz, D. 2007. Lifting the taboo on adaptation. *Nature*, 445, 597–598. https://doi.org/10.1038/445597a.

Pierre, J., Peters, G. 2000. Governance, Politics and the State. Basingstoke: Macmillan.

Pinto, I., Zachariah, M., Wolski, P., Landman, S., Phakula, V., Maluleke, W., et al. 2022. Climate change exacerbated rainfall causing devastating flooding in Eastern South Africa. World Weather Attribution. https://www.worldweatherattribution.org/climate-change-exacerbated-rainfall-causing-devastating-flooding-in-eastern-south-africa/ [Accessed 17 November 2022].

Polit, D. F., Hungler, B. P. 1999. Nursing research: principles and methods. 6th Edition. Lippincott Williams & Wilkins, Philadelphia, PA.

Pollitt, C., Bouckaert, G. 2011. Public Management Reform: A Comparative Analysis – New Public Management, Governance, and the Neo–Weberian State. 3rd Edition. Oxford University Press.

Pollitt, C., Bouckaert, G. 2009. Continuity and Change in Public Policy and Management. Cheltenham, UK: Edward Elgar Publishing. https://doi.org/10.4337/9781849802291.

Ponterotto, J.G. 2005. Qualitative research in counseling psychology: A primer on research paradigms and philosophy of science. *Journal of Counseling Psychology*, 52, 126–136. https://doi.org/10.1037/0022-0167.52.2.126.

Post, C., Sarala, R., Gatrell, C., Prescott, J.E. 2020. Advancing Theory with Review Articles. *Journal of Management Studies*, 57, 351–376. https://doi.org/10.1111/joms.12549.

Pradhan, N.S., Khadgi, V.R., Schipper, L., Kaur, L., Geoghegan, T. 2012. Role of policy and institutions in local adaptation to climate change: case studies on responses to too much and too little water in the Hindu Kush Himalayas. https://www.preventionweb.net/publication/role-policy-and-institutions-local-adaptation-climate-change-case-studies-responses-too. [Accessed 20 October 2022].

Prasad, B.D. 2008. Content Analysis. *Research methods for social work*, 5, 1-20. http://www.css.ac.in/download/deviprasad/content%20analysis.%20a%20method%20of%20social%20science%20research.pdf. [Accessed 5 December 2020].

Pressend, M. 2011. Financial barriers to adaptation implementation: A South African case study on financing water adaptation. In: *Overcoming Barriers to Climate Change Adaptation Implementation in Southern Africa*. Pretoria, SA: Africa Institute of South Africa. 163–179.

Preston, B., Yuen, E., Westaway, R. 2011. Putting vulnerability to climate change on the map: A review of approaches, benefits, and risks. *Sustainability Science*, 6, 177–202. https://doi.org/10.1007/s11625-011-0129-1.

Preston, B.L., Dow, K., Berkhout, F. 2013. The Climate Adaptation Frontier. *Sustainability*, 5, 1011–1035. https://doi.org/10.3390/su5031011.

Preston, B.L., Suppiah, R., Macadam, I., Bathols, J. 2006. Climate change in the Asia/Pacific region: A consultancy report prepared for the climate change and development roundtable. Climate Change Impacts and Risk / CSIRO Marine and Atmospheric Research.

Puleston, J. 2011. Online Research: Now & Next 2011 (Warc), Kings Fund, London. *International Journal of Market Research*, 53, 557–562. https://doi.org/10.2501/IJMR-53-4-557-562.

Qudrat-I Elahi, K. 2009. UNDP on good governance. *International Journal of Social Economics*, 36(12), 1167-1180. https://doi.org/10.1108/03068290910996981.

Rankoana, S.A. 2020. Climate change impacts on water resources in a rural community in Limpopo province, South Africa: a community-based adaptation to water insecurity.*International Journal of Climate Change Strategies and Management*, 12, 587–598. https://doi.org/10.1108/IJCCSM-04-2020-0033.

Rathwell, K.J., Armitage, D., Berkes, F. 2015. Bridging knowledge systems to enhance governance of environmental commons: A typology of settings. *The Commons Journal*, 9(2), 851-880. https://doi.org/10.18352/ijc.584.

Raven, P.H., Wagner, D.L. 2021. Agricultural intensification and climate change are rapidly decreasing insect biodiversity. *Proceedings of the National Academy of Sciences*, 118, e2002548117. https://doi.org/10.1073/pnas.2002548117.

Rayner, T., Jordan, A. 2013. The European Union: the polycentric climate policy leader? *WIREs Climate Change*, 4, 75–90. https://doi.org/10.1002/wcc.205.

Reddy, K.R., Brand, D., Wijewardana, C., Gao, W. 2017. Temperature Effects on Cotton Seedling Emergence, Growth, and Development. *Agronomy Journal*, 109, 1379–1387. https://doi.org/10.2134/agronj2016.07.0439.

Reddy, Y., Pather-Elias, S., Kesen, L., Adriázola, P., Wolpe, P., Sithole, M., Nkohla, F., Tshangela, M., Thobela, C. 2021. The Local Government Climate Change Support Programme in South Africa. Real Practice in Collaborative Climate Action. Berlin/ Cape Town: adelphi/ Sustainable Energy Africa. https://www.cityenergy.org.za/wp-content/uploads/2021/05/V-LED-South-Africa_singles_online.pdf. [Accessed 19 June 2022].

Refsgaard, J.C., Arnbjerg-Nielsen, K., Drews, M., Halsnæs, K., Jeppesen, E., Madsen, H., Markandya, A., Olesen, J.E., Porter, J.R., Christensen, J.H. 2013. The role of uncertainty in climate change adaptation strategies—A Danish water management example. *Mitigation and Adaptation Strategies for Global Change*, 18, 337–359. https://doi.org/10.1007/s11027-012-9366-6.

Reid, C.E., Mann, J.K., Alfasso, R., English, P.B., King, G.C., Lincoln, R.A., Margolis, H.G., Rubado, D.J., Sabato, J.E., West, N.L., Woods, B., Navarro, K.M., Balmes, J.R. 2012. Evaluation of a heat vulnerability index on abnormally hot days: an environmental public health tracking study. *Environmental Health Perspectives*, 120, 715–720. https://doi.org/10.1289/ehp.1103766.

Reid, P., Vogel, C. 2006. Living and responding to multiple stressors in South Africa—Glimpses from KwaZulu-Natal. *Global Environmental Change*, 16, 195–206. https://doi.org/10.1016/j.gloenvcha.2006.01.003.

Republic of South Africa [RSA]. 2022. Climate Change Bill. https://www.gov.za/sites/default/files/gcis_document/202203/b9-2022.pdf. [Accessed 15 February 2023].

Resurrección, B. 2013. Persistent women and environment linkages in climate change and sustainable development agendas. *Women's Studies International Forum*, 40, 33–43. https://doi.org/10.1016/j.wsif.2013.03.011.

Rhodes, R.A.W. 1997. Understanding Governance: Policy Networks, Governance, Reflexivity and Accountability. Buckingham: Open University Press. 20, 394–396.

Ribot, J. 2011. Vulnerability Before Adaptation: Toward Transformative Climate Action. *Global Environmental Change*, 21, 1160–1162. https://doi.org/10.1016/j.gloenvcha.2011.07.008.

Rickards, L., Howden, S. 2012. Transformational adaptation: Agriculture and climate change. *Crop and Pasture Science*, 63, 240. https://doi.org/10.1071/CP11172.

Rigon, A. 2014. Building Local Governance: Participation and Elite Capture in Slum-upgrading in Kenya. *Development and Change*, 45, 257–283. https://doi.org/10.1111/dech.12078.

Rittel, H.W.J., Webber, M.M. 1973. Dilemmas in a General Theory of Planning. *Policy Sciences*, 4, 155–169.

Roberts, D. 2010. Prioritizing climate change adaptation and local level resilience in Durban, South Africa. *Environment and Urbanization*, 22, 397–413. https://doi.org/10.1177/0956247810379948.

Roberts, D. 2008. Thinking globally, acting locally — institutionalizing climate change at the local government level in Durban, South Africa. *Environment and Urbanization*, 20, 521–537. https://doi.org/10.1177/0956247808096126.

Roberts, D., O'Donoghue, S. 2013. Urban environmental challenges and climate change action in Durban, South Africa. *Environment and Urbanization*, 25, 299–319. https://doi.org/10.1177/0956247813500904.

Roberts, N. 2000. "Wicked Problems and Network Approaches to Resolution." *The International Public Management Review*, 1(1).

Robinson, L., Berkes, F. 2011. Multilevel participation for building adaptive capacity: Formal agency-community interactions in northern Kenya. *Global Environmental*

Change: Human and Policy Dimensions, 21, 1185–1194. https://doi.org/10.1016/j.gloenvcha.2011.07.012.

Robledo, C., Forner, C. 2005. Adaptation of forest ecosystems and the forest sector to climate change. Forests and Climate Change Working Paper 2.

Rogers, N.J.L., Adams, V.M., Byrne, J.A. 2023. Factors affecting the mainstreaming of climate change adaptation in municipal policy and practice: a systematic review. *Climate Policy*, 0, 1–18. https://doi.org/10.1080/14693062.2023.2208098.

Romero-Lankao, P., Dodman, D. 2011. Cities in transition: transforming urban centers from hotbeds of GHG emissions and vulnerability to seedbeds of sustainability and resilience: Introduction and Editorial overview. *Current Opinion in Environmental Sustainability*, 3, 113–120. https://doi.org/10.1016/j.cosust.2011.02.002.

Romero-Lankao, P., Qin, H., Dickinson, K. 2012. Urban vulnerability to temperature-related hazards: A meta-analysis and meta-knowledge approach. *Global Environmental Change*, 22, 670–683. https://doi.org/10.1016/j.gloenvcha.2012.04.002.

Rosendo, S., Celliers, L., Mechisso, M. 2018. Doing more with the same: A reality-check on the ability of local government to implement Integrated Coastal Management for climate change adaptation. *Marine Policy*, 87, 29–39. https://doi.org/10.1016/j.marpol.2017.10.001.

Roncoli, C., Okoba, B., Gathaara, V., Ngugi, J., Nganga, T. 2010. Adaptation to Climate Change for Smallholder Agriculture in Kenya: Community-Based Perspectives from Five Districts. University of Georgia report to the World Bank for the project 'Adaptation to Climate Change of Smallholder Agriculture in Kenya,' June 2010.

Rosenzweig, C., Solecki, W. 2010. Introduction to Climate Change Adaptation in New York City: Building a Risk Management Response. *Annals of the New York Academy of Sciences*, 1196, 13–18. https://doi.org/10.1111/j.1749-6632.2009.05306.x.

Ross, H., Shaw, S., Rissik, D., Cliffe, N., Chapman, S., Hounsell, V., Udy, J., Trinh, N.T., Schoeman, J. 2015. A participatory systems approach to understanding climate adaptation needs. *Climate Change*, 129, 27–42. https://doi.org/10.1007/s10584-014-1318-6.

Roy, J., Tschakert, P., Waisman, H., et al. 2018. Sustainable Development, Poverty Eradication and Reducing Inequalities. In: *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*. Cambridge University Press.

Rubin, H.J., Rubin, I.S. 2005. Qualitative Interviewing (2nd ed.): The Art of Hearing Data. SAGE Publications, Inc. https://doi.org/10.4135/9781452226651.

Rudd, M.A. 2004. An institutional framework for designing and monitoring ecosystem-based fisheries management policy experiments. *Ecological Economics,* 48, 109–124. https://doi.org/10.1016/j.ecolecon.2003.10.002.

Runhaar, H., Wilk, B., Persson, Å., Uittenbroek, C., Wamsler, C. 2018. Mainstreaming climate adaptation: taking stock about "what works" from empirical research worldwide. *Regional Environmental Change*, 18, 1201–1210. https://doi.org/10.1007/s10113-017-1259-5.

Russell, C.K., Gregory, D.M. 2003. Evaluation of qualitative research studies. *Evidence Based Nursing,* 6, 36–40. https://doi.org/10.1136/ebn.6.2.36.

Sanchez-Rodriguez, R. 2009. Learning to adapt to climate change in urban areas. A review of recent contributions. *Current Opinion in Environmental Sustainability,* 1, 201–206. https://doi.org/10.1016/j.cosust.2009.10.005.

Sapiains, R., Ibarra, C., Jiménez, G., O'Ryan, R., Blanco, G., Moraga, P., Rojas, M. 2021. Exploring the contours of climate governance: An interdisciplinary systematic literature review from a southern perspective. *Environmental Policy and Governance*, 31, 46–59. https://doi.org/10.1002/eet.1912.

Sarantakos, S. (2005). Social research. 3rd Edition. Palgrave Macmillan, New York.

Sartorius, K., Sartorius, B. 2016. Service delivery inequality in South African municipal areas: A new way to account for inter-jurisdictional differences. *Urban Studies*, 53. https://doi.org/10.1177/0042098015613001.

Saunders, A., Lewis, M., Thornhill, P. 2012. Research Methods for Business Students, 6th ed.

Savelli, E., Rusca, M., Cloke, H., Di Baldassarre, G. 2021. Don't blame the rain: Social power and the 2015–2017 drought in Cape Town. *Journal of Hydrology*, 594, 125953. https://doi.org/10.1016/j.jhydrol.2020.125953.

Savin-Baden, M., Major, C. 2023. Qualitative Research: The Essential Guide to Theory and Practice. Routledge, London. https://doi.org/10.4324/9781003377986.

Schenk, T., Vogel, R.A.L., Maas, N., Tavasszy, L.A. 2016. Joint Fact-Finding in Practice: Review of a Collaborative Approach to Climate-Ready Infrastructure in Rotterdam. *European Journal of Transport and Infrastructure Research*, 16. https://doi.org/10.18757/ejtir.2016.16.1.3132.

Schewe, J., Heinke, J., Gerten, D., Haddeland, I., Arnell, N., Clark, D., Dankers, R., Eisner, S., Fekete, B., Colón-González, F.J., Gosling, S., Kim, H., Liu, X., Masaki, Y., Portmann, F., Satoh, Y., Stacke, T., Tang, Q., Wada, Y., Kabat, P. 2014. Multimodel assessment of water scarcity under climate change. *Proceedings of the National Academy of Sciences of the United States of America*, 111, 3245–3250. https://doi.org/10.1073/pnas.1222460110.

Schilling, J., Hertig, E., Tramblay, Y., Scheffran, J. 2020. Climate change vulnerability, water resources and social implications in North Africa. *Regional Environmental Change*, 20, 15. https://doi.org/10.1007/s10113-020-01597-7.

Schipper, E.L.F., Burton, I. 2009. Understanding adaptation: origins, concepts, practice and policy. The earthscan reader on adaptation to climate change. London, UK and Sterling, VA, USA, 1-9.

Schipper, E.L.F. 2006. Conceptual History of Adaptation in the UNFCCC Process. *Review of European, Comparative & International Environmental Law*, 15, 82–92. https://doi.org/10.1111/j.1467-9388.2006.00501.x.

Schoonenboom, J., Johnson, R.B. 2017. How to Construct a Mixed Methods Research Design. *Kölner Zeitschrift für Soziologie und Sozialpsychologie / Cologne Journal of Sociology and Social Psychology*, 69, 107–131. https://doi.org/10.1007/s11577-017-0454-1.

Schostak, J. 2006. Interviewing and Representation in Qualitative Research. https://www.scribd.com/document/247156940/Schostak-J-2006-Interviewing-and-Representation-in-Qualitative-Research-pdf. [Accessed 6 September 2022].

Schreiner, B.G., Mungatana, E.D., Baleta, H. 2018. Impacts of drought induced water shortages in South Africa: Economic analysis. Water Research Commission Report. https://www.wrc.org.za/wp-content/uploads/mdocs/2604%20Vol%202.pdf. [Accessed 28 September 2022].

Schwalb, L., Walk, H. 2007. Blackbox governance—Lokales engagement im Aufwind [Blackbox governance--Local engagement on the rise]. In: *Local governance - mehr Transparenz und Bürgernähe?* Schwalb, L., Walk, H. (Eds.). 7–22. Wiesbaden, Germany: VS Verlag für Sozialwissenschaften.

Schwandt, T.A. 2000. Three epistemological stances for qualitative inquiry: Interpretivism, hermeneutics, and social constructionism. In: *Handbook of Qualitative Research*. SAGE Publishing, 189–213.

Scoville-Simonds, M., Jamali, H., Hufty, M. 2020. The Hazards of Mainstreaming: Climate change adaptation politics in three dimensions. *World Development*, 125, 104683. https://doi.org/10.1016/j.worlddev.2019.104683.

Segal, N., Cloete, B. 2012. Combating climate change: How might "Green" growth facilitate of hinder SA's developmental objectives? Pretoria: DNA Economics.

Serdeczny, O., Adams, S., Baarsch, F., Coumou, D., Robinson, A., Hare, W., Schaeffer, M., Perrette, M., Reinhardt, J. 2017. Climate change impacts in Sub-Saharan Africa: from physical changes to their social repercussions. *Regional Environmental Change*, 17, 1585–1600. https://doi.org/10.1007/s10113-015-0910-2.

Shamoo, A., Resnik, D. 2007. Responsible Conduct of Research. *Journal of Biomedical Optics*, 12, 39901. https://doi.org/10.1117/1.2749726.

Shannon, D.M., Bradshaw, C.C. 2002. A Comparison of Response Rate, Response Time, and Costs of Mail and Electronic Surveys. *The Journal of Experimental Education*, 70, 179–192. https://doi.org/10.1080/00220970209599505.

Sharif, F., Armitage, P. 2004. The effect of psychological and educational counselling in reducing anxiety in nursing students. *Journal of Psychiatric and Mental Health Nursing*, 11, 386–392. https://doi.org/10.1111/j.1365-2850.2003.00720.x.

Shaxson, L., Datta, A., Tshangela, M., Matomela, B. 2016. Understanding the organisational context for evidence-informed policy-making. Pretoria: Department of Environmental Affairs; and London: Overseas Development Institute.

Sikes, P. 2004. Methodology, Procedures and Ethical Concerns. In: *Doing Educational Research: A Guide for First Time Researchers*. Sage. 15–33.

Silwal, P., Roberts, L., Rennie, H.G., Lexer, M.J. 2019. Adapting to climate change: an assessment of local adaptation planning processes in forest-based communities in Nepal. *Climate and Development*, 11, 886–898. https://doi.org/10.1080/17565529.2019.1586634.

Simatele, D., Binns, T., Simatele, M. 2012. Sustaining livelihoods under a changing climate: the case of urban agriculture in Lusaka, Zambia. *Journal of Environmental Planning and Management*, 5, 1175–1191.

Simelton, E., Quinn, C.H., Batisani, N., Dougill, A.J., Dyer, J.C., Fraser, E.D.G., Mkwambisi, D., Sallu, S., Stringer, L.C. 2013. Is rainfall really changing? Farmers' perceptions, meteorological data, and policy implications. *Climate and Development*, 5, 123–138. https://doi.org/10.1080/17565529.2012.751893.

Simonis, U.E. 2004. Defining good governance: The conceptual competition is on. WZB Discussion Paper, No. P 2004-005. Wissenschaftszentrum Berlin für Sozialforschung (WZB), Berlin.

Singh, A., Zwickle, A., Bruskotter, J., Wilson, R. 2017. The perceived psychological distance of climate change impacts and its influence on support for adaptation policy. *Environmental Science & Policy*, 73, 93–99. https://doi.org/10.1016/j.envsci.2017.04.011.

Skogen, K., Helland, H., Kaltenborn, B. 2018. Concern about climate change, biodiversity loss, habitat degradation and landscape change: Embedded in different packages of

environmental concern? *Journal for Nature Conservation,* 44. https://doi.org/10.1016/j.jnc.2018.06.001.

Smit, B., Burton, I., Klein, R., Wandel, J. 2000. An Anatomy of Adaptation to Climate Change and Variability. *Climate Change,* 45, 223–251. https://doi.org/10.1023/A:1005661622966.

Smit, B., Pilifosova, O. 2003. From Adaptation to Adaptive Capacity and Vulnerability Reduction. In: *Climate Change, Adaptive Capacity and Development.* Smith, J.B., Klein, R.J.T., Huq, S. (Eds.). 1-28. London: Imperial College Press. https://doi.org/10.1142/9781860945816_0002.

Smit, B., Wandel, J. 2006. Adaptation, adaptive capacity and vulnerability. *Global Environmental Change,* 16, 282–292. https://doi.org/10.1016/j.gloenvcha.2006.03.008.

Smith, S. 2013. Climate change and South Africa: a critical analysis of the National Climate Change Response White Paper and the push for tangible practices and media-driven initiatives. *Global Media Journal: African Edition*, 7, 47–66. https://doi.org/10.10520/EJC139533.

Smyth, J.D. 2016. The SAGE Handbook of Survey Methodology. SAGE Publications Ltd. https://doi.org/10.4135/9781473957893.

Soss, J. 2014. Talking Our Way to Meaningful Explanations: A Practice-Centered View of Interviewing for Interpretive Research. In: *Interpretation and Method*. Routledge.

South African Weather Service Report [SAWS], 2016. Annual Report 2016/2017. Towards a weather smart nation. https://www.weathersa.co.za/Documents/AnnualReports/SAWS%20Annual%20Report%20Web%20red.pdf. [Accessed 28 March 2020].

South Africa's National Treasury, 2016. Annual Report. https://www.treasury.gov.za/publications/annual%20reports/national%20treasury/nt%20annual%20report%202016-17.pdf. [Accessed 30 April 2022].

Sovacool, B. 2011. An international comparison of four polycentric approaches to climate and energy governance. *Energy Policy,* 39, 3832–3844. https://doi.org/10.1016/j.enpol.2011.04.014.

Sowman, M., Rebelo, X. 2022. Sustainability, Disaster Risk Reduction and Climate Change Adaptation: Building from the Bottom Up – A South African Perspective from the Small-scale Fisheries Sector. In: *Creating Resilient Futures: Integrating Disaster Risk Reduction, Sustainable Development Goals and Climate Change Adaptation Agendas*. Flood, S., Jerez Columbié, Y., Le Tissier, M., O'Dwyer, B. (Eds.). Springer International Publishing, Cham, 151–181. https://doi.org/10.1007/978-3-030-80791-7_8.

Spires, M., Shackleton, S., Cundill, G. 2014. Barriers to implementing planned community-based adaptation in developing countries: a systematic literature review. *Climate and Development*, 6, 277–287. https://doi.org/10.1080/17565529.2014.886995.

Spires, M., Shackleton, S.E. 2018. A synthesis of barriers to and enablers of pro-poor climate change adaptation in four South African municipalities. *Climate and Development*, 10, 432–447. https://doi.org/10.1080/17565529.2017.1410088.

Spradley, J. P. 2016. The ethnographic interview. USA: Waveland Press Inc.

Sraku-Lartey, M. 2014. Harnessing indigenous knowledge for sustainable forest management in Ghana. *International Journal on Food System Dynamics*, 5, 1–8.

Statistics South Africa. 2011. Census: uMkhanyakude District Municipality. https://www.statssa.gov.za/census/census_2011/census_products/KZN_Municipal_Report.pdf. [Accessed 15 June 2020].

Stephan, M., Marshall, G., McGinnis, M. 2019. An Introduction to Polycentricity and Governance, in: Thiel, A., Blomquist, W.A., Garrick, D.E. (Eds.), Governing Complexity. Cambridge University Press, 21–44. https://doi.org/10.1017/9781108325721.002.

Stern, N. 2022. A Time for Action on Climate Change and a Time for Change in Economics. *The Economic Journal*, 132, 1259–1289. https://doi.org/10.1093/ej/ueac005.

Stern, N. 2008. The Economics of Climate Change. *American Economic Review*, 98(2), 1–37.

Stewart, D.W., Kamins, M.A. 1993. Secondary research: Information sources and methods., 2nd ed. ed.

Stirling, A. 2006. Analysis, Participation and Power: Justification and Closure in Participatory Multi-Criteria Analysis. *Land Use Policy*, 23, 95–107.

Storbjörk, S. 2007. Governing Climate Adaptation in the Local Arena: Challenges of Risk Management and Planning in Sweden. *Local Environment*, 12, 457–469. https://doi.org/10.1080/13549830701656960.

Stringer, L.C., Dyer, J.C., Reed, M.S., Dougill, A.J., Twyman, C., Mkwambisi, D. 2009. Adaptations to climate change, drought and desertification: local insights to enhance policy in southern Africa. *Environmental Science & Policy*, 12, 748–765. https://doi.org/10.1016/j.envsci.2009.04.002.

Sundström, A., McCright, A.M. 2014. Gender differences in environmental concern among Swedish citizens and politicians. *Environmental Politics*, 23, 1082–1095. https://doi.org/10.1080/09644016.2014.921462.

Tall, A., Hansen, J., Jay, A., Campbell, B.M., Kinyangi, J., Aggarwal, P.K., Zougmore, R. 2014. Scaling up climate services for farmers: Mission Possible. Learning from good practice in Africa and South Asia. https://assets.publishing.service.gov.uk/media/57a089f340f0b6497400033e/CCAFS_Report_13_web.pdf. [Accessed 10 August 2020].

Tan, X.-C., Wang, Y., Gu, B.-H., Kong, L.-S., Zeng, A. 2022. Research on the national climate governance system toward carbon neutrality—A critical literature review. *Fundamen/tal Research*, 2, 384–391. https://doi.org/10.1016/j.fmre.2022.03.010.

Tanner, T., Mitchell, T. 2008. Entrenchment or Enhancement: Could Climate Change Adaptation Help Reduce Poverty? *IDS Bulletin*, 39(4), 6-15. https://doi.org/10.2139/ssrn.1629175

Taylor, C. 1987. Interpretation and the sciences of man., in: Interpretive Social Science: A Second Look. Berkeley: University of California Press. 33–81.

Tearfund. 2008. Linking climate change adaptation and disaster risk reduction. [Technical Paper]. https://www.preventionweb.net/files/3007_CCAandDRRweb.pdf. [Accessed 6 May 2022].

Teddlie, C., Tashakkori, A. 2009. Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences. Sage, London.

Termeer, C.J.A.M., Dewulf, A., Biesbroek, G.R. 2017. Transformational change: governance interventions for climate change adaptation from a continuous change perspective. *Journal of Environmental Planning and Management*, 60, 558–576. https://doi.org/10.1080/09640568.2016.1168288c.

Termeer, C.J.A.M., Dewulf, A., Biesbroek, R. 2019. A critical assessment of the wicked problem concept: relevance and usefulness for policy science and practice. *Policy and Society*, 38, 167–179. https://doi.org/10.1080/14494035.2019.1617971.

Termeer, C.J.A.M., Dewulf, A., Rijswick, H.F.M.W., van Buuren, A., Huitema, D., Meijerink, S., Rayner, T., Wiering, M. 2011. The regional governance of climate adaptation: a framework for developing legitimate, effective, and resilient governance arrangements. https://www.wur.nl/en/publication-details.htm?publicationId=publication-way-343038363136 [Accessed 9 September 2022].

Thomas, D.S.G., Twyman, C., Osbahr, H., Hewitson, B. 2007. Adaptation to climate change and variability: farmer responses to intra-seasonal precipitation trends in South Africa. *Climate Change*, 83, 301–322. https://doi.org/10.1007/s10584-006-9205-4.

Thomas, K., Hardy, R.D., Lazrus, H., Mendez, M., Orlove, B., Rivera-Collazo, I., Roberts, J.T., Rockman, M., Warner, B.P., Winthrop, R. 2019. Explaining differential vulnerability to climate change: A social science review. *WIREs Climate Change*, 10, e565. https://doi.org/10.1002/wcc.565.

Thompson, H.E., Berrang-Ford, L., Ford, J.D. 2010. Climate Change and Food Security in Sub-Saharan Africa: A Systematic Literature Review. *Sustainability*, 2, 2719–2733. https://doi.org/10.3390/su2082719.

Thornhill, M., Green-Govendor, J., Khoza, B. 2009. A status quo analysis on the impacts of climate change in KwaZulu-Natal. Report to the Department of Agriculture and Environmental Affairs. Provincial Government, Published by DAEARD, Cedara, Pietermaritzburg, South Africa.

Thurston, A.M., Stöckl, H., Ranganathan, M. 2021. Natural hazards, disasters and violence against women and girls: a global mixed-methods systematic review. *BMJ Global Health*, 6, e004377. https://doi.org/10.1136/bmjgh-2020-004377.

Tilleard, S., Ford, J. 2016. Adaptation readiness and adaptive capacity of transboundary river basins. *Climate Change*, 137, 575–591.

Tol, R. 2018. The Economic Impacts of Climate Change. *Review of Environmental Economics and Policy*, 12, 4–25.

Tompkins, E.L., Boyd, E., Nicholson-Cole, S., Adger, W.N., Weatherhead, K., Arnell, N.W. 2010. Observed adaptation to climate change: UK evidence of transition to a well-adapting society? *Global Environmental Change*, 20, 627–635.

Tompkins, E., Adger, W.N. 2004. Does Adaptive Management of Natural Resources Enhance Resilience to Climate Change? *Ecology & Society*, 9. https://doi.org/10.5751/ES-00667-090210.

Tosun, J., Leininger, J. 2017. Governing the Interlinkages between the Sustainable Development Goals: Approaches to Attain Policy Integration. *Global Challenges*, 1, 1700036. https://doi.org/10.1002/gch2.201700036.

Treece, E.W., Treece, J.W. 1982. Elements of Research in Nursing. 3rd edn C V Mosby, London.

Tripathi, N., Bhattarya, S. 2004. Integrating Indigenous Knowledge and GIS for Participatory Natural Resource Management: State-of-the-Practice. *Electronic Journal of Information Systems in Developing Countries*, 17, 1–13. https://doi.org/10.1002/j.1681-4835.2004.tb00112.x.

Tschakert, P. 2007. Views from the vulnerable: Understanding climatic and other stressors in the Sahel. *Global Environmental Change*, 17, 381–396. https://doi.org/10.1016/j.gloenvcha.2006.11.008.

Tschakert, P., Dietrich, K.A. 2010. Anticipatory Learning for Climate Change Adaptation and Resilience. *Ecology & Society*, 15.

Tsige, M., Synnevåg, G., Aune, J.B. 2020. Gendered constraints for adopting climate-smart agriculture amongst smallholder Ethiopian women farmers. *Scientific African*, 7, e00250. https://doi.org/10.1016/j.sciaf.2019.e00250.

Tubiello, F.N., Fischer, G. 2007. Reducing climate change impacts on agriculture: Global and regional effects of mitigation, 2000–2080. *Technological Forecasting and Social Change*, 74, 1030–1056. https://doi.org/10.1016/j.techfore.2006.05.027.

Turpie, J., Visser, M. 2012. The impact of climate change on South Africa's rural areas. Chapter 4 of Financial and Fiscal Commission: Submission for the 2013/14 Division of Revenue.

Turyahikayo, E. 2021. Philosophical Paradigms as the Bases for Knowledge Management Research and Practice. *Knowledge Management & E-Learning*, 13, 209–224.

Twinomuhangi, R., Sseviiri, H., Mulinde, C., Mukwaya, P., Nimusiima, A., Kato, A. 2021. Perceptions and vulnerability to climate change among the urban poor in Kampala City, Uganda. *Regional Environmental Change,* 21. https://doi.org/10.1007/s10113-021-01771-5.

Ülker, D., Erguven, O., Gazioglu, C. 2018. Socio-economic impacts in a Changing Climate: Case Study Syria Duygu Ülker, Orhan Ergüven and Cem Gazioğlu Socio-economic impacts in a Changing Climate: Case Study Syria. *International Journal of Environment and Geoinformatics*, 5. https://doi.org/10.30897/ijegeo.406273.

uMhlabuyalingana Local Municipality. 2021. uMhlabuyalingana Local Municipality. https://umhlabuyalingana.gov.za/ [Accessed 22 March 2021].

uMkhanyakude District Municipality [UKDM]. 2022. uMkhanyakude District Municipality. http://www.ukdm.gov.za/ [Accessed 5 February 2021].

uMkhanyakude District Municipality [UKDM]. 2019. Spatial Development Framework. http://www.ukdm.gov.za/ [Accessed 10 February 2021].

uMkhanyakude District Municipality [UKDM]. 2018. Integrated Development Plan. https://ukdm.gov.za/index.php/integrated-development-plan-idp/idp-2018-2019. [Accessed 8 February 2021].

United Nations Development Programme [UNDP]. 2002. Human Development Report 2002. https://hdr.undp.org/system/files/documents/human-development-report-2002-english.human-development-report-2002-english. [Accessed 4 June 2021].

United Nations Development Programme [UNDP]. 2004. Human Development Report. Cultural Liberty in Todays' Diverse World. https://www.undp.org/sites/g/files/zskgke326/files/migration/np/UNDP_NP_Human-Development-Report-2004.pdf. [Accessed 6 June 2021].

United Nations Framework Convention on Climate Change [UNFCCC]. 2019. Annual Report. https://unfccc.int/sites/default/files/resource/unfccc_annual_report_2019.pdf. [Accessed 8 February 2021].

United Nations Framework Convention on Climate Change [UNFCCC]. 2013. Report of the Conference of the Parties on its eighteenth session, held in Doha from 26 November to 8 December 2012. Part one: Proceedings. https://unfccc.int/documents/7642 [Accessed 10 November 2022).

United Nations Framework Convention on Climate Change [UNFCCC]. 2007. Climate Change: Impacts, Vulnerabilities and Adaptation in Developing Countries. Climate Change Secretariat (UNFCCC), Bonn, 68 p.

United Nations Framework Convention on Climate Change [UNFCCC]. 2002. Report of the Conference of the Parties on its seventh session, held at Marrakesh from 29 October to 10 November 2001 (FCCC/CP/2001/13/Add.1, UNFCCC, Marrakesh, Morocco, 2001). https://unfccc.int/documents/2516. [Accessed 22 August 2021].

United Nations Framework Convention on Climate Change [UNFCCC]. 1992. United Nations Framework Convention on Climate Change. FCCC-84.

Urothody, A.A., Larsen, H.O. 2010. Measuring climate change vulnerability: a comparison of two indexes. *Banko Janakari,* 20, 9–16. https://doi.org/10.3126/banko.v20i1.3503.

Urwin, K., Jordan, A. 2008. Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance. *Global Environmental Change,* 18, 180–191. https://doi.org/10.1016/j.gloenvcha.2007.08.002.

Valdivia, C., Seth, A., Gilles, J.L., García, M., Jiménez, E., Cusicanqui, J., Navia, F., Yucra, E. 2010. Adapting to Climate Change in Andean Ecosystems: Landscapes, Capitals, and Perceptions Shaping Rural Livelihood Strategies and Linking Knowledge Systems.

Annals of the American Association of Geographers, 100, 818–834. https://doi.org/10.1080/00045608.2010.500198.

van Assche, K., Beunen, R., Duineveld, M. 2014. Evolutionary Governance Theory - An Introduction. SpringerBriefs in Economics (BRIEFSECONOMICS).

van Bueren, E.M., Klijn, E.H., Koppenjan, J.F. 2003. Dealing with Wicked Problems in Networks: Analysing an Environmental Debate from a Network Perspective. *Journal of Public Administration Research and Theory*, 13, 193–212. http://dx.doi.org/10.1093/jopart/mug017.

van der Bank, M., Karsten, J. 2020. Climate Change and South Africa: A Critical Analysis of the Earthlife Africa Johannesburg and Another v Minister of Energy and Others 65662/16 (2017) Case and the Drive for Concrete Climate Practices. *Air, Soil and Water Research*, 13. https://doi.org/10.1177/1178622119885372.

Vaughan, C., Dessai, S. 2014. Climate services for society: origins, institutional arrangements, and design elements for an evaluation framework. *WIREs Climate Change*, 5, 587–603. https://doi.org/10.1002/wcc.290.

Verkerk, J., Teisman, G., Buuren, A.V. 2015. Synchronising climate adaptation processes in a multilevel governance setting: exploring synchronisation of governance levels in the Dutch Delta. *Policy & Politics*, 43, 579–596. https://doi.org/10.1332/030557312X655909.

Vernon, T. 2008. The Economic Case for Pro-Poor Adaptation: What do we Know? *IDS Bulletin*, 39, 32–41. https://doi.org/10.1111/j.1759-5436.2008.tb00474.x.

Vink, M., Schouten, G. 2018. Foreign-Funded Adaptation to Climate Change in Africa: Mirroring Administrative Traditions or Traditions of Administrative Blueprinting? *Review of Policy Research*, 35, 792–834. https://doi.org/10.1111/ropr.12291.

Visbeck, M. 2007. From climate assessment to climate services. *Nature Geoscience*, 1, 2–3. https://doi.org/10.1038/ngeo.2007.55.

vom Brocke, J., Simons, A., Niehaves, Bjoern, Niehaves, Bjorn, Reimer, K., Plattfaut, R., Cleven, A. 2009. Reconstructing the Giant: On the importance of rigour in documenting

the literature search process. *ECIS 2009 Proceedings*, 161. https://aisel.aisnet.org/ecis2009/161.

Wamsler, C. 2017. Stakeholder involvement in strategic adaptation planning: Transdisciplinarity and co-production at stake? *Environmental Science & Policy,* 75, 148–157. https://doi.org/10.1016/j.envsci.2017.03.016.

Wamsler, C., Alkan-Olsson, J., Björn, H., Falck, H., Hanson, H., Oskarsson, T., Simonsson, E., Zelmerlow, F. 2020. Beyond participation: when citizen engagement leads to undesirable outcomes for nature-based solutions and climate change adaptation. *Climate Change*, 158, 235–254. https://doi.org/10.1007/s10584-019-02557-9.

Wamsler, C., Pauleit, S. 2016. Making headway in climate policy mainstreaming and ecosystem-based adaptation: two pioneering countries, different pathways, one goal. *Climate Change*, 137, 71–87. https://doi.org/10.1007/s10584-016-1660-y.

Watson, C. 2020. Community Engagement and Community Energy. In: *Ireland and the Climate Crisis*. Robbins, D., Torney, D., Brereton, P. (eds). Palgrave Studies in Media and Environmental Communication. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-47587-1_12.

Webb, E.J., Campbell, D.T., Schwarz, R.D., Sechrest, L. 1984. The Use of Archival Sources in Social Research. In: *Sociological Research Methods - An Introduction.* Bulmer M. (Ed.). London: MacMillan.

Welch, G., von Recklinghausen, F., Taenzer, A., Savitz, L., Weiss, L. 2017. Data Cleaning in the Evaluation of a Multi-Site Intervention Project. EGEMS Wash. DC 5, 4. https://doi.org/10.5334/egems.196.

Wellington, J., Szczerbinski, M. 2007. Research Methods for the Social Sciences, 1st ed. Continuum.

Westley, F.R., Tjornbo, O., Schultz, L., Olsson, P., Folke, C., Crona, B., Bodin, O. 2013. A Theory of Transformative Agency in Linked Social-Ecological Systems. *Ecology & Society*, 18.

Williams, D.S., Celliers, L., Unverzagt, K., Videira, N., Máñez Costa, M., Giordano, R. 2020. A Method for Enhancing Capacity of Local Governance for Climate Change Adaptation. *Earths Future*, 8. https://doi.org/10.1029/2020EF001506.

Wingqvist, G.O., Drakenberg, O., Slunge, D., Sjöstedt, M., Ekbom, A. 2012. The role of governance for improved environmental outcomes. Perspectives for developing countries and countries in transition. Swedish Environmental Protection Agency. https://gmv.gu.se/digitalAssets/1466/1466002_the_role_of_gov_improved_en_outcomes_finalreport.pdf. [Accessed 12 May 2023].

Winkler, E.A. 2022. Are universal ethics necessary? And possible? A systematic theory of universal ethics and a code for global moral education. *SN Social Sciences*, 2, 66. https://doi.org/10.1007/s43545-022-00350-7.

Winthrop, M., Kajumba, T. 2018. Policy Brief: Women as agents of change: towards a climate and gender justice approach. https://www.climatelearningplatform.org/policy-brief-women-agents-change-towards-climate-and-gender-justice-approach. [Accessed 2 April 2021].

Wise, R.M., Fazey, I., Stafford Smith, M., Park, S.E., Eakin, H.C., Archer Van Garderen, E.R.M., Campbell, B. 2014. Reconceptualising adaptation to climate change as part of pathways of change and response. *Global Environmental Change*, 28, 325–336. https://doi.org/10.1016/j.gloenvcha.2013.12.002.

Witte, K., Allen, M. 2000. A meta-analysis of fear appeals: implications for effective public health campaigns. *Health Education & Behavior*, 27, 591–615. https://doi.org/10.1177/109019810002700506.

Wong, P.P., Losada, I.J., Gattuso, J.P., Hinkel, A., Khattabi, A., McInnes, K.L., Saito, Y., Sallenger, A. 2014. Coastal Systems and Low-Lying Areas. In: *Climate Change 2014: Impacts,Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and

L.L.White (Eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 361-409.

World Bank. 2020. Moving Towards Sustainability: The Livestock Sector and the World Bank. https://www.worldbank.org/en/topic/agriculture/brief/moving-towards-sustainability-the-livestock-sector-and-the-world-bank. [Accessed 9 July 2021].

World Bank, *et al.* 2015. The World Bank Annual Report 2015. https://www.worldbank.org/en/about/annual-report-2015. [Accessed 2 March 2022].

World Bank, 1992. Governance and Development. The World Bank, Washington, D.C. https://documents1.worldbank.org/curated/en/604951468739447676/pdf/multi-page.pdf. [Accessed 19 July 2022].

World Food Programme [WFP]. 2014. World Food Programme in 2014. WFP 2014. http://publications.wfp.org/en/annual-report/2014/. [Accessed 19 July 2022].

Yamin, F., Rahman, A., Huq, S. 2005. Vulnerability, Adaptation and Climate Disasters: A Conceptual Overview. *IDS Bulletin*, 36, 1–14. https://doi.org/10.1111/j.1759-5436.2005.tb00231.x.

Yazar, M., Haarstad, H., Drengenes, L.L., York, A. 2022. Governance learning from collective actions for just climate adaptation in cities. *Frontiers in Sustainable Cities*, 4.

Yeasmin, S., Rahman, K.F. 2012. "Triangulation" Research Method as the Tool of Social Science Research. *BUP JOURNAL*, 1(1), 154-163.

Yilmaz, K., Yazicigil, H. 2011. Potential Impacts of Climate Change on Turkish Water Resources: A Review. In: *NATO Science for Peace and Security Series C: Environmental Security*. 105–114. https://doi.org/10.1007/978-94-007-1143-3_12.

Yin, R.K. 1994. Case study research: Design and methods (2nd ed.).

Ylipaa, J., Gabrielsson, S., Jerneck, A. 2019. Climate Change Adaptation and Gender Inequality: Insights from Rural Vietnam. *Sustainability*, 11, 2805. https://doi.org/10.3390/su11102805.

Young, O.R. 2010. Institutional dynamics: Resilience, vulnerability and adaptation in environmental and resource regimes. *Global Environmental Change*, 20, 378–385. https://doi.org/10.1016/j.gloenvcha.2009.10.001.

Zacarias, D.A. 2018. Understanding community vulnerability to climate change and variability at a coastal municipality in southern Mozambique. *International Journal of Climate Change Strategies and Management*, 11, 154–176. https://doi.org/10.1108/IJCCSM-07-2017-0145.

Zelli, F., van Asselt, H. 2013. Introduction: The Institutional Fragmentation of Global Environmental Governance: Causes, Consequences, and Responses. *Global Environmental Politics*, 13, 1–13. https://doi.org/10.1162/GLEP_a_00180.

Ziervogel, G. 2018. Climate Adaptation and Water Scarcity in Southern Africa. *Current History*, 117, 181–186. https://doi.org/10.1525/curh.2018.117.799.181.

Ziervogel, G., New, M., Archer van Garderen, E., Midgley, G., Taylor, A., Hamann, R., Stuart-Hill, S., Myers, J., Warburton, M. 2014. Climate change impacts and adaptation in South Africa. *WIREs Climate Change*, 5, 605–620. https://doi.org/10.1002/wcc.295.

Ziervogel, G., Parnell, S. 2012. South African Coastal Cities: Governance Responses to Climate Change Adaptation. In: *Climate Change at the City Scale*. Routledge.

Ziervogel, G., Shale, M., DU, M. 2010. Climate change adaptation in a developing country context: The case of urban water supply in Cape Town. *Climate and Development*, 2, 94–110. https://doi.org/10.3763/cdev.2010.0036.

APPENDICES

Appendix A: Ethical Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Sibiya

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H20/10/27**
PROJECT TITLE	The Role of Climate Change Governance in Community Adaptation in KwaZulu-Natal: A Study of uMkhanyakude District Municipality
INVESTIGATOR(S)	Miss N Sibiya
SCHOOL/DEPARTMENT	Geography, Archaeology and Environmental Studies/
DATE CONSIDERED	16 October 2020
DECISION OF THE COMMITTEE	Approved Permission letters are required before data collection can commence Risk Level: Minimal
EXPIRY DATE	15 November 2023

DATE 16 November 2020 **CHAIRPERSON** (Professor J Knight)

cc: Supervisor : Professor M Simatele

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University. Unreported changes to the application may invalidate the clearance given by the HREC (Non-Medical)

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

Signature Date 16 / 11 / 2020

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

Appendix B: Research Participant Consent Form

CONSENT FORM

(TELEPHONIC AND/OR ONLINE INTERVIEWS RESEARCH PARTICIPANTS)

Invitation to participate in a research study entitled "The Role of Climate Change Governance in Community Adaptation in KwaZulu-Natal: A Study of uMkhanyakude District Municipality"

I…… agree to participate in this research project. Miss Nomfundo Sibiya has informed me that she will conduct a telephonic or an online interview where I will be expected to answer a number of structured questions. Therefore, I understand what my participation will involve. I have also received, read, and understood the participant information sheet for this study. I have been notified about my rights to withdraw at any time and my right to anonymity and confidentiality.

	Please tick one
I agree that my participation will remain anonymous	YES ☐ NO ☐
I agree that the researcher may use anonymous quotes in her research report	YES ☐ NO ☐
I agree that the information I provide may be used anonymously by other researchers following this study	YES ☐ NO ☐
I agree that the researcher may audio record the interview	YES ☐ NO ☐

…… ……..

Participant's Signature **Date**

I, Nomfundo Sibiya, confirm that the above participant has been fully informed about the nature and conduct of the abovementioned study.

Study Investigator
Nomfundo Sibiya

…… ……..

Investigator's Signature **Date**

Appendix C: Research Participant Information Sheet (Online Surveys)

PARTICIPANT INFORMATION SHEET

(ONLINE SURVEY RESEARCH PARTICIPANTS)

RE: Invitation to participate in a research study entitled "The Role of Climate Change Governance in Community Adaptation in KwaZulu-Natal: A Study of uMkhanyakude District Municipality"

Dear Sir/Madam,

My name is Nomfundo Sibiya, I am a PhD student in the School of Geography, Archaeology and Environmental Studies at the University of the Witwatersrand in Johannesburg. I am investigating the role of government and non-governmental institutions in enabling or preventing community adaptation and the development and execution of climate change adaptation policies and strategies.

Therefore, I am writing to invite you to take part in an online survey. This activity will take approximately 30 minutes. Every effort will be made to ensure that responses are confidential, however because this is an online-based survey the researcher cannot guarantee the confidentiality and anonymity of material transferred over the internet. The information you give to me will be held securely and not disclosed to anyone else. I will be using a false name to represent your participation, in my final thesis. If you are happy for the information you will provide to be used anonymously by other researchers in the future, it will be made available to them with all identifiers removed. If you feel uncomfortable with the information being shared in the future for future research purposes, please feel free to let me know. If at any point you are uncomfortable with any question, you do not need to answer it and if you want to stop the online survey you can stop at any time. You will not receive any direct benefits for participating in this study, and there are no disadvantages or penalties for not participating.

If you have any questions afterwards about this research, please feel free to contact me or my supervisor on the details listed below. This study will be written up as a thesis which will be available online through the university library website. The findings will also be presented at

conferences and published in academic journals. You must be at least 18 years old to participate. The survey can be accessed on the following link (English version): https://forms.gle/ynoWT4jx85RPyvqf7.

If you wish to receive a summary of this report, I will be happy to send it to you upon request. If you have any queries, concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (non-medical), telephone + 27(0)11 717 1408, e-mail Shaun.Schoeman@wits.ac.za.

Yours sincerely,

Study Investigator

Nomfundo Sibiya

573380@students.wits.ac.za

+27(0)73 731 2862

Supervisor

Professor Mulala Simatele

Mulala.simatele@wits.ac.za

+27(0)11 717 6602

Appendix D: Research Participant Information Sheet (Government Officials)

PARTICIPANT INFORMATION SHEET

(TELEPHONIC AND/OR ONLINE INTERVIEW RESEARCH PARTICIPANTS)

RE: Invitation to participate in a research study entitled "The Role of Climate Change Governance in Community Adaptation in KwaZulu-Natal: A Study of uMkhanyakude District Municipality"

Dear Sir/Madam,

My name is Nomfundo Sibiya, I am a PhD student in the School of Geography, Archaeology and Environmental Studies at the University of the Witwatersrand in Johannesburg. As part of my studies, I am required to do a research project which fits into the overall degree. In view of the above, I am investigating the role of government and non-governmental institutions in enabling or preventing community adaptation and the development and execution of climate change adaptation policies and strategies.

Therefore, I am writing to invite you to take part in a telephonic or an online interview. Telephonic interview costs will be covered by the study investigator therefore you will not incur any costs. Online interviews will be conducted during working hours as such I will assume you have access to the internet at work. I will use a platform which you are most comfortable with (for example Microsoft Teams, Zoom, Skype). This activity will take approximately 30 minutes. You will not receive any direct benefits for participating in this study, and there are no disadvantages or penalties for not participating. The telephonic and online interview will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a false name to represent your participation, in my final thesis. If you are happy for the information you will provide to be used anonymously by other researchers in the future, it will be made available to them with all identifiers removed. If you feel uncomfortable with the information being shared in the future for future research purposes, please feel

free to let me know. If at any point you are uncomfortable with any question, you do not need to answer it and if you want to stop the telephonic or online interview we can stop at any time.

If you have any questions afterwards about this research, please feel free to contact me or my supervisor on the details listed below. This study will be written up as a research report which will be available online through the university library website. If you wish to receive a summary of this report, I will be happy to send it to you upon request. If you have any queries, concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (non-medical), telephone + 27(0)11 717 1408, e-mail Shaun.Schoeman@wits.ac.za.

Yours sincerely,

Study Investigator

Nomfundo Sibiya

573380@students.wits.ac.za

+27(0)73 731 2862

Supervisor

Professor Mulala Simatele

Mulala.simatele@wits.ac.za

+27(0)11 717 6602

Appendix E: Questionnaire Guide for Online Survey research participants

Questionnaire on the Role of Climate Change Governance in Community Adaptation in KwaZulu-Natal: A Study of uMkhanyakude District Municipality

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Instructions:

By completing and submitting the survey, you are indicating that you have read and understood the Participant Information Sheet and you give consent to participate in this study.

Please fill out the form below to the best of your knowledge. You are also welcomed to elaborate on each answer should you wish to do so. All answers are relevant to this research even when the answer is "I don't know."

SECTION A: GENERAL

A1. What is your affiliation?

a) Ward Councillor ☐ b) Inkosi ☐

c) Induna ☐ d) Non-Government Organisation ☐

e) Community-based Organisation ☐ f) Key Individual in the community ☐

A2. Which Local Municipality within uMkhanyakude District are you from?

a) uMhlabuyalingana Local Municipality ☐ b) Jozini Local Municipality ☐

c) Big 5 Hlabisa Local Municipality ☐) Mtubatuba Local Municipality ☐

A3. What gender are you?

a) Male ☐ b) Female ☐

c) Other (please specify).....

A4. What is your ethnic background?

a) Black ☐ b) White ☐

c) Colored ☐ d) Indian ☐

e) Other (please specify) ……

A5. What is your highest level of education?

a) Less than High school ☐ b) High School ☐

c) Diploma ☐ d) Degree ☐

e) Honours degree ☐ f) Postgraduate degree ☐

SECTION B:

B1. Do you believe climate change exists?

a) Yes ☐ b) No ☐

B2. In your view, what risks are associated with climate change in South Africa? (You can select as many risks you think are associated with climate change)

a) Declining water supplies ☐ b) Reduced agricultural yields ☐

c) Health impacts ☐ d) Socioeconomic impacts ☐

e) Increased livestock losses ☐ f) Reduced work & business opportunities ☐

g) All of the above ☐ h) All of the above ☐

i) Other (Please specify).....

B3. Has climate change affected you and/or your community in any way?

a) Yes ☐ b) No ☐

c) Maybe ☐ d) I don't know ☐

B4. If yes, how has it affected you and/or your community?

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B5. Who assisted you/ your community during or after a climate change incidence had occurred?

a) Local Municipality (this includes Disaster Management within the Local Municipality) ☐
b) District Municipality (this includes Disaster Management within the District Municipality) ☐
c) Department of Environmental Affairs ☐
d) Non-Governmental Organisation ☐
e) Community-Based Organisation ☐
d) All of the above ☐
e) None of the above ☐

B6. If you received assistance from any of the above groups, was the assistance you received sufficient? (were you able to adapt to the effects of climate change after the incidence(s)

a) Yes ☐ b) No ☐
c) Maybe ☐ d) I don't know ☐

B7. What feelings do you have towards climate change and its impact on communities?

a) Positive feelings ☐ b) Negative feelings ☐
c) I don't know ☐
d) Other (Please specify).....

B8. In your view who should be responsible for developing and implementing climate change adaptation policies and strategies in South Africa?

a) Non-Governmental Organisations ☐ Civil Society ☐

c) Government Institutions ☐ d) Academics/researchers ☐

(Department of Environmental Affairs) ☐

e) All of the above f) None of the above ☐

g) Other (Please specify).....

B9. Are you aware of any climate change policies, bills and/or strategies?

a) Yes ☐ b) No ☐

c) Maybe ☐ d) I don't know ☐

B10. If yes, which policies, bills and/or strategies are you aware of?

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B11. In your view does the existing policies, bills and/or strategies enable or prevent your and/or your communities ability to adapt to climate change?

a) Enable - helps you and your community in some way ☐

b) Prevent - don't help you in any way ☐

c) I don't know ☐

B12. Have you previously or are currently involved in developing or implementing climate change policies and strategies in uMkhanyakude District Municipality?

a) Yes ☐ b) No ☐

c) Maybe ☐

B13. If yes, what was your involvement?

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B14. Do you think local communities knowledge and experiences on climate change adaptation is taken into consideration when climate change policies and strategies are developed in uMkhanyakude District Municipality?

a) Yes ☐ b) No ☐

c) Maybe ☐ d) I don't know ☐

B15. In your view, do you think the current policies and strategies around climate change adaptation in uMkhanyakude District Municipality are effective?

a) Yes ☐ b) No ☐

c) Maybe ☐ d) I don't know ☐

B16. If yes, please explain in detail how you think they are effective?

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B17. If no, please explain in detail why you think they are not effective?

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B18. In your view, what do you think would be the best way to tackle climate change adaptation in uMkhanyakude District Municipality?

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Thank you for your time, participation, and valuable contribution.

Appendix F: Questionnaire Guide for District and Local Government Authorities

TELEPHONIC OR ONLINE INTERVIEW SCHEDULE

DISTRICT AND LOCAL GOVERNMENT AUTHORITIES: UMKHANYAKUDE DISTRICT MUNICIPALITY

1. Are you able to share what your job function is?

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2. How long have you been in this position?

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3. What climate change adaptation policies, strategies and programmes exist at the UKDM EDTEA?

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4. How are the strategies and programmes developed and implemented to suit the climate change context at the district and local level?

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5. Who are the stakeholders that are involved in developing the UKDM EDTEA climate change adaptation strategies and programmes?

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6. How do the strategies and programmes at the district and local level align with the provincial and national climate change priorities (in terms of policies, strategies, and programmes priorities)?

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7. In your view, do you think any of these strategies and programmes have implications on communities ability to adapt to climate change?

Yes	No	I don’t know

7.1 If yes, what are the implications of each of the policies, strategies, and programmes?

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8. During the time you have been in this position, have you been involved in the development of any climate change adaptation policies, programmes, and strategies?

Yes	No	I don’t know

8.1 If yes, please name the policies, strategies, and programmes you have been involved in developing and explain what role you played in the development process.

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8.2 Based on your answer in 8.1, which of these policies, strategies and programmes do you think have been and/or are being implemented.

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8.3 In your view, how are these being implemented?

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9. What has been the outcomes of each of the UKDM EDTEA's climate change adaptation strategies and programmes?

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10. Do you find the current institutional arrangement of the UKDM EDTEA climate change adaptation policy implementation effective?

Yes	No	I don't know

10.1 If yes, in your view how is it effective?

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10.2 If no, in your view why do you think it is not effective?

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11. What financial support exists at the UKDM EDTEA for implementing climate change adaptation strategies and programmes?

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12. What are the key challenges that exist in implementing climate change adaptation policies, strategies, and programmes at the UKDM EDTEA?

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13. In your view, what are the key opportunities that exist that could aid in strengthening climate change adaptation governance in South Africa?

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14. Based on what we have discussed, is there anything you would like to add and/ or do you have any questions you would like to ask me?

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Thank you for your time, participation, and valuable contribution.

Appendix G: Questionnaire Guide for Provincial Government Authorities

TELEPHONIC OR ONLINE INTERVIEW SCHEDULE

PROVINCIAL GOVERNMENT AUTHORITIES: KZN DEPARTMENT OF ECONOMIC DEVELOPMENT, TOURISM AND ENVIRONMENTAL AFFAIRS (KZN EDTEA)

1. Are you able to share what your job function is?

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2. How long have you been in this position?

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3. What climate change adaptation policies, strategies and programmes exist at the KZN EDTEA?

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4. How are the provincial strategies and programmes developed and implemented to suit the province's climate change context?

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5. Who are the stakeholders that are involved in developing the KZN climate change adaptation strategies and programmes?

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6. How are the strategies and programmes at provincial level aligned with the national policies, strategies, and programmes?

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7. In your view, do you think any of these strategies and programmes have implications on communities ability to adapt to climate change?

Yes	No	I don’t know

7.1 If yes, what are the implications of each of the policies, strategies, and programmes?

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8. During the time you have been in this position, have you been involved in the development of any climate change adaptation policies, programmes, and strategies?

Yes	No	I don’t know

8.1 If yes, please name the policies, strategies, and programmes you have been involved in developing and explain what role you played in the development process.

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8.2 Based on your answer in 8.1, which of these policies, strategies and programmes do you think have been and/or are being implemented.

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8.3 In your view, how are these being implemented?

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9. What has been the outcomes of each of the KZN EDTEA's climate change adaptation strategies and programmes?

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10. Do you find the current institutional arrangement of the KZN EDTEA's climate change adaptation policy development and implementation effective?

Yes	No	I don't know

10.1 If yes, in your view how is it effective?

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10.2 If no, in your view why do you think it is not effective?

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11. What financial support exists at the KZN EDTEA for developing and implementing climate change adaptation strategies and programmes?

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12. What are the key challenges that exist in developing and implementing climate change adaptation policies, strategies, and programmes at the KZN EDTEA?

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13. What are the key opportunities that exist that could aid in strengthening climate change adaptation governance in South Africa?

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14. Based on what we have discussed, is there anything you would like to add and/ or do you have any questions you would like to ask me?

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Thank you for your time, participation, and valuable contribution.

Appendix H: Questionnaire Guide for National Government Authorities

TELEPHONIC OR ONLINE INTERVIEW SCHEDULE

NATIONAL GOVERNMENT AUTHORITIES: DEPARTMENT OF ENVIRONMENT, FORESTRY AND FISHERIES (DEFF)

1. Are you able to share what your job function is?

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2. How long have you been in this position?

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3. What climate change adaptation policies, strategies and programmes exist at the DEFF?

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4. How are policies, strategies and programmes constituted at the DEFF?

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5. Who are the stakeholders that are involved in developing these policies, strategies, and programmes?

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6. In your view, do you think any of these policies, strategies and programmes have implications on communities ability to adapt to climate change?

Yes	No	I don't know

6.1 If yes, what are the implications of each of the policies, strategies, and programmes?

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7. During the time you have been in this position, have you been involved in the development of any climate change adaptation policies, programmes, and strategies?

Yes	No	I don't know

7.1 If yes, please name the policies, strategies, and programmes you have been involved in developing and explain what role you played in the development process.

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7.2 Based on your answer in 7.1, which of these policies, strategies and programmes do you think have been and/or are being implemented.

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7.3 In your view, how are these being implemented?

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8. What has been the outcomes of each of these policies, strategies, and programmes?

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9. Do you find the current institutional arrangement of the DEFF's climate change adaptation policy development effective?

Yes	No	I don't know

9.1 If yes, in your view how is it effective?

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9.2 If no, in your view why do you think it is not effective?

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10. What financial support exists at the DEFF for developing and implementing climate change adaptation policies, strategies, and programmes?

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11. What are the key challenges that exist in developing and implementing climate change adaptation policies, strategies, and programmes at the DEFF?

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12. What are the key opportunities that exist that could aid in strengthening climate change adaptation governance in South Africa?

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13. Based on what we have discussed, is there anything you would like to add and/ or do you have any questions you would like to ask me?

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Thank you for your time, participation, and valuable contribution.

Appendix I: Guide for Secondary Data Analysis

SECONDARY DATA ANALYSIS

(Web-based searches, Public Records, Scholarly Journal Articles, Information collected by government departments such as Reports, Policy documents and Handbooks)

The types of data or information that will be gathered include the following (but is not limited to the below mentioned):

1. The mission statement and the mandate of the DFFE, EDTEA, UKDM and other subsectors of the economy affected by climate change
2. Functions and roles of stakeholders at the DFFE, EDTEA and UKDM
3. Annual Reports of DFFE, DEDTEA and UKDM
4. The current climate change adaptation implementation landscape
5. Policies and strategies around climate change adaptation – assess their objectives, the roles of stakeholders, the role of the public, time frames
6. Programmes around climate change adaptation
7. Target audience for specific documents
8. To check whether the documents were solicited, edited, and/or anonymous
9. Review existing mapping and climate data
10. Budgets for climate change adaptation
11. Cultural Theory Risk - General myths about Climate Change adaptation and its relationship with human interference or lack thereof.

Appendix J: Research Article 1

sustainability

MDPI

Article

Empowering the Voiceless: Securing the Participation of Marginalised Groups in Climate Change Governance in South Africa

Nomfundo Sibiya [1,*], Mikateko Sithole [2], Lindelani Mudau [2] and Mulala Danny Simatele [1,3]

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* Correspondence: 573380@students.wits.ac.za or npsibiya@gmail.com

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Abstract: For many of the world's poor people, adaptation to climate change is not a choice but a reality. Existing evidence suggests that the poor, particularly those in the developing world, are the most vulnerable to any changes in climate variability and change. Using research methods inspired by the tradition of participatory research, we explore and discuss community perceptions on climate change adaptation governance in South Africa. We examine the myriad ways in which climate change adaptation policies and strategies are developed, and we systematically discuss the factors which either facilitate or hamper the involvement of all stakeholders in the development of these intervention measures. Our findings indicate that women seem to be the group of people who are mostly unaware of community initiatives, policies, and strategies for the adaptation to climate change. Thus, it is argued that, although South Africa has developed good climate change initiatives, policies, and strategies, the implementation of these policies seems to present difficulties, as those for whom they have been developed do not seem to have any knowledge of their effectiveness in helping them build resilience against extreme weather events. This study recommends that, in order to achieve successful public participation in climate change adaptation policy development, there must be an all-inclusive system which incorporates all stakeholders, including vulnerable groups.

Keywords: climate change governance; climate change adaptation; community participation; South Africa

1. Introduction

The impacts of climate change on socio-economic and environmental aspects have now become a global concern [1]. Climate change impacts have significant implications on exacerbating existing inequalities, and they are driving those with poor adaptive capacity into deeper conditions of vulnerability to shocks and stresses [2,3]. It has indeed become a social justice issue, and the late recognition of this state of affairs is indicative of both global and national failures to formulate and implement adequate adaptation policies and strategies which build the resilience of those most affected by it [4].

It is no exaggeration to argue that the most vulnerable groups to climate change lack a voice to influence and participate in any policy-making processes [5]. Their lived experiences and the challenges associated with extreme weather events are often unconsidered and unrepresented in many climate change intervention measures implemented by gov-

ernments [6–8]. This exacerbates their position of vulnerability, in as much as they are the groups in society who have done the least to trigger changes in climatic conditions [9–14]. Thus, paying attention to how adaptation policies and strategies are developed, by way of considering who influences the nature of these intervention measures and who participates in their formation, is a moral grounding issue to climate change governance [15]. This paper evaluates how climate change policies and strategies are developed in South Africa.At the core is the need to understand how climate change impacts and intersects with people's vulnerabilities and whether existing adaptation policies and strategies reflect the needs of those most impacted by it [16].

While there is a rich presence of literature focusing on rights-based analysis and emphasising a human rights approach to adaptation policy development, the pathways to comprehensive and/or transformative participation largely remain under-researched and misunderstood [17]. There is, therefore, an urgent need to move away from the instrumentalist approaches of participation and towards a system which aids in identifying conduits for realising participatory rights for different groups of the voiceless, highlighting opportunities and exposing barriers to participation at multiple scales. Such a process would bring adaptation decision-making closer to those most negatively impacted by climate change [18–21]. The current, centralized structures of governance and decision-making, which to be honest, were created and designed to deal with other social and economic challenges, and which must now address climate changes issues, need to be reformed, aligned, and tailored to deal with contemporary, climate-induced problems in specific contexts [5]. The one-size-fits-all governance approach cannot be applied to understanding the impacts of climate change on different groups of people and in diverse geographical locations [22].

Additionally, this paper investigates the question of whose voices matter in the development of climate change policies and strategies in South Africa. Thus, in this paper, we argue that vulnerable groups of people, who oftentimes lack the voice and power to influence policy direction, expend tremendous energy and vitality to change their vulnerability to climate change. The missing link, however, is the absence of governance systems and structures which are capable of harnessing the ingenuity and energy of the poor to foster meaningful and transformative public–public and private–public partnerships aimed at the inclusive participation in designing, developing, and co-implementing transgressive adaptation strategies [23]. If this gap can be bridged, it would enable the formulation of governance systems and approaches which would contribute to developing a pro-poor climate change agenda and framework for building the adaptive capacity and resilience of groups of people who are most vulnerable to climate-induced, extreme weather events and variability.

2. Climate Change Governance: A Synthesis of Literature from the Global to theLocal Context

Climate change is a cross-cutting issue that affects all sub-sectors of an economy and presents different challenges to social, economic, and environmental systems [24]. It has been conclusively argued that, although climate change is a global concern, its impacts are disproportionally felt by the poor people living in the poor countries of the world [25,26]. Sub-Saharan Africa has been identified and is projected to be a region thatwill and is most susceptible and vulnerable to climate change impacts due, in part, to a large presence of poor people on the continent, weak institutional and policy frameworks,a lack of infrastructure, stagnation, deterioration in the economic systems, and a generallack of political will [27,28]. Furthermore, Africa suffers from low levels of technological advancement, education, rapid population growth, high rates of poverty, and a lack of social safety nets [18–21]. These biophysical, political, and socioeconomic stresses interact to heighten the region's susceptibility to climate change, despite emitting the lowest levels of greenhouse gases in the world [25,29–32].

Adger *et al.* [6] argue that climate change does not only disturb the livelihoods of poor people, but it also compromises the economic growth and national development of countries, particularly those in the developing south. A study by van der Bank and

Karsten [24], observes that in countries with poor and weak economic systems and policy frameworks, the impacts of climate change always have far-and-wide-ranging effects, and these tend to affect and subject the poor to unprecedented levels of risk to environmental hazards. Pielke *et al.* [33] further observe that recognising the inevitable impacts of climate change on poor people and the economies of poor countries is a vital first step in identifying and developing appropriate and strategic policy frameworks for supporting climate change mitigation and adaptation initiatives. Edifying these observations, Kurukulasuriya and Mandelsohn [34], as well as Smit and Skinner [35], advocate for pro-poor climate change adaptation policies and strategies that are based on the realities that confront poor people, and which have strong scientific bases. Furthermore, Challinor [36], supported by Niang *et al.* [37], is of the view that any pro-poor adaptation initiatives must support the livelihoods of those who are most vulnerable to climate change by finding effective strategies to cope with environmental changes by addressing the local and institutional barriers to the use of these strategies. In the same vein, Averchenkova [5] posits that the capacity of civil society to engage in climate change and to influence decisions seems to be generally weak in developing countries, particularly for the rural poor communities, as they have both limited resources and a limited capacity to engage. Thus, an issue-based perspective to adaptation must be the focal point in searching for an alternative perspective to the often-common bottom-up and top-down approaches, which are always the two dominant paradigms in adaptation discourses.

While it is important to consider these approaches, it is also imperative to cogitate the need for community mobilisation and participation in adaptation policy discussions, as pro-poor adaptation initiatives require that the myriad spatial contexts in which the poor live are taken into consideration [38,39]. This assertion, therefore, speaks to the importance of those mandated to formulate adaptation policies and strategies to recognize the ability of the poor to adapt to the impacts of climate change without pre-conceived assumptions. Reid and Simatele [40], for example, argue that national and local government institutions and authorities must recognize the important role that community engagement and mobilisation play in developing a comprehensive model for climate change adaptation. Cheru [41], on the other hand, argues that institutional and policy bureaucracy oftentimes tend to hamper the formulation of progressive policies to change the misery in which the poor live. Ribot *et al.* [42] elucidate this observation by arguing that institutional and policy frameworks can fundamentally constrain the capacity of the poor to adapt to external and internal stressors because institutions control the distribution of resources, which are the basis of any adaptation initiatives and efforts. They argue that extreme weather events are: " . . . not risks which are unknown . . . and it is not that the methods for coping do not exist . . . rather it is the inability of those most affected to cope to the impacts due to the lack of—or systematic alienation from accessing resources needed to guard against these events" [42] (p. 34).

Climate change is a complex phenomenon and generates multifaceted, distinct, and dynamic impacts in societies. These impacts cannot be addressed by using a silo approach, but rather, they require the application of myriad systems, approaches, and technologies. Jordan *et al.* [43], for example, are of the view that any single entity or actor is inadequately equipped to address and resolve challenges arising from changes in climatic conditions. This assertion, therefore, suggests that any attempts or efforts to formulate a response to the challenges of climate change require the adoption and implementation of holistic approaches, which are driven by a needs-based system, and which involve the participation of all stakeholders [44]. The unprecedented pace at which the world's climate is changing and impacting society requires that government institutions and instruments take a key posture of facilitating community initiatives and embracing all stakeholders in decision-making processes [5]. It is now obvious that self-ruling or self-regulated societal adaptation operating in silos is not sufficient, and governments must now play an active role in promoting collaborative systems in the search for solutions that bring about transformative adaptation to climate change [45,46]. This will further require significant changes in governance systems and processes; from the current bureaucratic ones to ones that ensure that government effectively interacts and builds effective, cooperative alliances with communities and the

private sector [47] (pp. 83–104). The success or failure of societies, communities, and households in adapting to the impacts of climate change is highly dependent on the nature and effectiveness of governance [38,48]. Filho *et al.* [29] argue that a key factor in enhancing climate adaptation is the strengthening of institutions and implementation of well-designed national and city-level planning policies and governance systems.

An effective and efficient governance system is a noble dashboard indicator for measuring the preparedness of any government entity to climate change challenges c. [49]. Chhotray and Stoker [50] and Richards and Smith [51] are of the view that a comprehensive and effective governance system which fosters the principles and values of stakeholder engagement and participation provides more opportunities for cultivating an inclusive platform for generating rich discussions and policy options. Gillard *et al.* [52] and Termeer *et al.* [53] further observe that, while centralised systems of governance can facilitate the coordination and prevent overlapping and duplication of programmes and the allocation of resources, they can also potentially prohibit experimental learning, trust-building, and collaborative management, and disregard local priorities and context sensitivities [54,55]. Thus, Armitage *et al.* [56] advocate for the breakdown of systems and processes which act as barriers for promoting the inclusive engagement and participation of various stakeholders, including grass-roots communities, in the identification of solutions to problems that affect them.

Binns *et al.* [20] and Cheru [41] argue that governments must move away from the naivety of believing that they are better placed to make key decisions on behalf of the poor people and to steer community development. On the contrary, they must pay attentionto the critical responsibilities and energy that the poor in local communities expend in resolving the myriad socio-economic and environmental problems they encounter daily. Alemaw and Simatele [16] argue that a characteristic challenge to the adaptation agenda of poor people is not the scale of their socio-economic status, but the weakness of national and local government institutions and governance systems in the face of unprecedented impacts arising from climate and environmental changes. At all levels of government, a lack of resources and knowledge has tended to prevent people and institutions from solving problems and mapping change triggered by climate change [16]. This situation has further resulted in the absence of any comprehensive climate change adaptation intervention measures and has destabilised the productivity of the poor [57]. Mubaya and Mafongoya [58] observe that a lack of transparency and inclusivity in policy discussions almost always results in the marginalisation and the disenfranchisement of the poor and those with little or no political or financial power to influence the direction of any policy formulation.

Despite the frequent exclusion of the poor from participating in policy discussions, existing literature suggests that, if given the right impetus and empowered to define their development, they can resolve many of the challenges they face [57]. Hsieh and Lee [59] argue that cultivating the participation of local people in decision-making always has the benefit of stimulating the achievement of several important objectives, among which are fostering a greater sense of commitment, involvement, and ownership of the resolu-tions reached; and second, delivering adaptation services which are much needed by the community. Edifying this observation, Hove *et al.* [60] are of the view that there is an urgent need to shift the paradigm of policy engagement from a top-down narrative to one which promotes and is based on a strong and genuine grass-roots-grown and -driven process. Simatele *et al.* [38], on the other hand, argue that a people-centred approach, through community involvement, can create sensitivity to, and enhance the nature of, the adaptation strategies which the poor can use to build their adaptive capacity and resilience to climate-induced, environmental changes. Zeidler *et al.* [61] further observe that any national strategy for building the resilience of the poor to climate change must be con-ducive and aligned to local conditions and the coping mechanisms or adaptation practices employed by the local people, which are usually rooted in indigenous knowledge systems (IKS) and community-based innovation. Kettle *et al.* [62] and Coffey and O'Toole [63] therefore advocate the urgency of obtaining governmental and non-governmental actors to

embrace traditional practices, which are ingrained in IKS, in their advisory services so as to formulate robust adaptation options for the targeted audiences.

A major challenge to the formulation of transformative climate change adaptation lies in what Leck and Simon [64] have deemed the "siloed and hierarchical approach" to climate change governance. They argue that, historically, this approach tends to negatively counter the connectedness and collaboration required for the development of more transformative systems and processes for community adaptation. The multidimensional challenges associated with climate change necessitate the need for collaboration and partnerships across multiple sectors, scales, and actors, so as to address climate change problems [16]. Thus, a more integrated approach to adaptation offers better opportunities to formulate comprehensive systems of climate change coordination and response vis-à-vis adaptation action [65–67]. Improved collaboration between knowledge generators, intermediary governmental and non-governmental agencies, and end-users is a key requirement in capturing the unique contexts in which we can come to understand the impacts of climate change [68–70]. Improving collaboration between governmental agencies and other stakeholders, including local communities, can aid in the effectiveness and efficiency of adapting knowledge delivery to end-users [65]. Evidence suggests that facilitating localised collaborations between municipalities and higher levels of government contributes to extending interventions beyond one geographical scale, as well as to integration across policy scales [16,64]. The potential for multi-stakeholder partnerships to adopt a flexible, decentralised, and inclusive structure [71,72] appeals—theoretically at least—to the idea that adaptation should be implemented locally, where vulnerability is experienced [73]. A combination of leadership, local government support, and stakeholder buy-in has been proven to be necessary to implement adaptation measures which meet the aspirations of the communities most affected by climate change [74,75].

Kalafatis *et al.* [76] and Ochieng [77] further argue that improving communicationcan significantly enhance knowledge uptake. A considerable body of literature from developing and developed countries emphasises the need for reliable and comprehensive climate change communication to influence the sharing and shaping of knowledge in adaptation and decision-making [78–86]. Kvamsås [87] observes that, even though the growing body of scientific knowledge does not lead to growing consistency in societal attention, political commitment, or state interventions [88], knowledge connects climate adaptation and local political agendas, influencing priorities and anchoring decisions. Undoubtedly, there is still much to be done to improve the supply of robust knowledge to policymakers and practitioners to enhance communities' capacities to adapt to climate change. Institutional capacity is the strongest predictor of national adaptation policies and action [89]. Evidence suggests that an effective governance system which cuts across sectoral and multilevel endeavours is vital for the efficient coordination of different climate change actors, and that development is a comprehensive and forward-looking adaptation agenda [90,91]. Mapfumo *et al.* [92] highlight the importance of political will and political feasibility to undertake coordinated measures of a transformational nature in response to the threats of severe climate impacts. In conclusion, therefore, it can be argued that leaders at all levels of society play a role as brokers, often as the glue that brings together different societal actors, thus enabling not only committed and effective community participation,but also assigning to that participation a meaningful place in governance [93,94]. Thus,the development of any climate change adaptation intervention measures and strategies requires the setting into motion of several considerations, among which the inclusive engagement and participation of different stakeholders and communities are paramount.

3. Materials and Methods

The primary data on which this paper is based was collected between February and October 2021 in the KwaZulu-Natal Province of South Africa. (See Figure 1). The study employed a combination of participatory research tools, including online surveys and semi-structured interviews, to explore the perception of communities on issues re-

lating to climate change adaptation governance in South Africa. A purposive sampling method was used to identify the key stakeholders in the four local municipalities of the uMkhanyakude District Municipality in northern KwaZulu-Natal: Big 5 Hlabisa Local Municipality (n = 27), uMhlabuyalingana Local Municipality (n = 28), Mtubatuba Local Municipality (n = 42), and Jozini Local Municipality (n = 29). These key stakeholders were drawn from different sectors of the community and included councillors, religious/church leaders, iziNduna (tribal councillor(s) or headmen among the Zulu people of South Africa), Amakhosi (chiefs or leaders of communities or tribes among the Zulu people), representatives from different non-governmental organisations, community leaders representing different community-based organisations, traditional leaders, business leaders, and school principals. Due to the challenges of COVID-19, the questionnaires were distributed online using the Google Forms platform. The online survey consisted of multiple-choice questions, dropdown questions, and open-ended questions. This method of data collection was highly suitable for a multifaceted topic such as climate change as it enabled the researchers to explore rich context-oriented discussions grounded in the lived experience of the key stakeholders, e.g., [95].

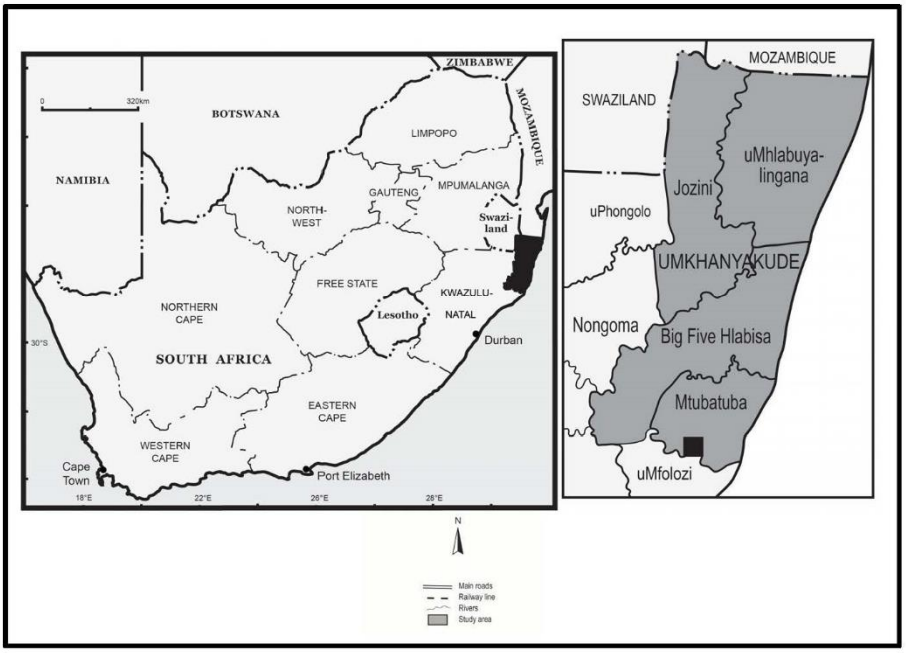

Figure 1. Location of the study sites in KwaZulu-Natal Province, South Africa. **Source:** Cartography Unit, University of the Witwatersrand (2021).

Additionally, the study used semi-structured interviews with officials from the Department of Forestry, Fisheries and the Environment (DFFE) (n = 6), KZN Department of Economic Development, Tourism, and Environmental Affairs (EDTEA) (n = 3), and local municipalities (n = 4). The semi-structured interviews were conducted telephonically and online through Microsoft Teams. The officials from government departments provided expert viewpoints related to climate change governance in South Africa. While the use of a limited selection of interviewees has the potential to draw criticism, many scholars have emphasised the wealth of understanding that can come from a narrow pool of perspectives, as discussed in [96].

The data obtained through online surveys were exported from Google Forms to a Microsoft Excel spreadsheet, where they were subsequently cleaned, coded, and analysed. Furthermore, the qualitative data were quantified using descriptive statistics (i.e., frequencies). In contrast, the data obtained through semi-structured interviews were digitally recorded and professionally transcribed. Major themes emerging from the qualitative data were compared and then organised to create more concise narratives that would

unify the data within each category. Both the quantitative and qualitative data enabled the researchers to analyse the myriad ways in which climate change adaptation policies and strategies are developed, as well as the factors which facilitate involvement in the discourse.

4. Results—Climate Change Governance and Community Adaptation inKwaZulu-Natal Province

Although climate change is a global concern, its effects are contextually specific and vary across countries, regions, and communities. Understanding these different impacts, therefore, requires that they are spatially contextualised. In view of this assertion, one of the key points of investigation for the study on which this paper is based involved the assessment of the research participants' understandings of climate change and its impacts on the community. To achieve this, a question requiring research participants to indicate their knowledge of climate change was asked, and their responses are presented in Table 1.

Table 1. Participants' Knowledge of climate change and impacts in uMkhanyakude District Municipality.

Type of Response	Knowledge of Existence of Climate Change	(%)	Knowledge of Climate Change Impacts on Community	(%)
Yes	120	95.2	114	90.4
Maybe	5	4	3	2.4
I don't know	1	0.8	6	4.8
No	0	0	3	2.4
Total number	126	100	126	100

Source: Field-based surveys (2021).

Scrutinizing Table 1 suggests that an estimated 95% of the research participants expressed knowledge of climate change, with 90% claiming that they have knowledge of the impacts of climate change on their communities. Only an estimated 0.8% of all of the respondents indicated not having any knowledge of climate change, with 2% indicating a lack of awareness of the climate change impacts on their community.

It was also imperative to have an understanding of what community members consider to be the manifestation of climate change in their respective communities. They were thus asked to identify any weather event(s) they ascribed to being a manifestation of changes in climatic conditions (c. Table 2).

Table 2. Observed impact of climate extreme events in uMkhanyakude District Municipality.

Impact of Extreme Climate Event	Cumulative No. Responses	(%)
Declining water supply	118	19.6
Reduced agricultural yields	109	18.1
Increased livestock losses	105	17.4
Health implications	100	16.6
Reduced work and business opportunities	86	14.3
Deterioration in socio-economic status	84	13.9
Total number	602	100

Source: Field-based surveys (2021).

The information in Table 2 suggests that an estimated 20% of all of the responses alluded to the declining water supply in the region as a factor of climate change, while 13% of the respondents pointed to deterioration in socio-economic status as a direct result

of climate change. What is important to note is the combined impacts on livelihood-supporting systems, which is estimated to be 55% of the total responses.

Although it can be argued that the above assertions are perceptions and lack scientific basis, they are indications that changes in climatic conditions are presenting a number of challenges for local and rural communities in South Africa. It was of paramount importance to establish community perceptions on organisations they consider important in facilitating their adaptive capacity against the impacts of climate change. Figure 2 is an illustration of these perceptions.

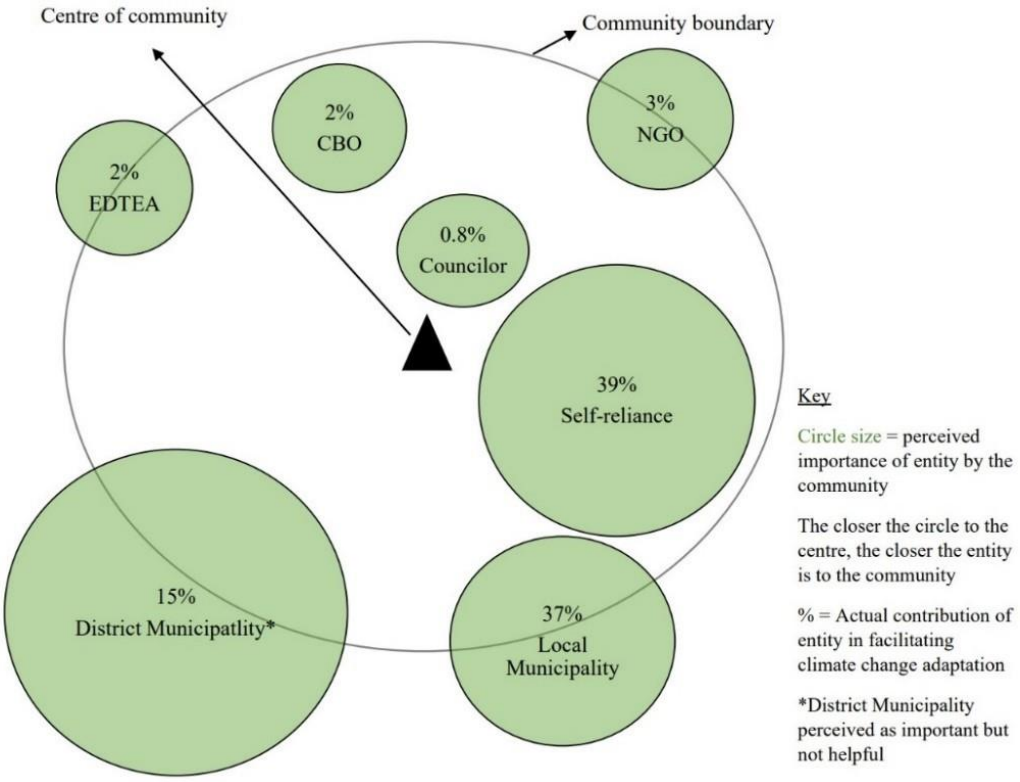

Figure 2. Community perception of important organisations in facilitating climate change adaptation in the study sites. **Source**: Field-based survey notes (2021).

An examination of Figure 2 suggests that, although the district municipality is considered by community members as the most important official entity (i.e., as judged by the size of the circle), which ideally should facilitate the adaptive capacity to climate change, it is far removed from the centre of the community, and it only provides about 15% of the assistance provided in responding to climate change challenges. Many community members (i.e., 39%) seemed to suggest that dealing with climate change challenges rests entirely on the community itself. However, closer scrutiny of Figure 2 suggests that, although the entities identified by the community are represented as being far removed from the centre of the community, they provide a combined 59.8% of the assistance for community responses to climate change.

Another important component for this study was the need to evaluate the effectiveness of any of the climate change outreach programmes and activities used by climate change practitioners in facilitating community adaptation to climate change challenges. Research participants were thus asked to rate the level of effectiveness of the activities. These views are illustrated in Table 3.

Table 3. Level of effectiveness of climate change initiatives, policies, and strategies in uMkhanyakude District Municipality.

Level of Effectiveness of Climate Change Activities	No. Responses	(%)
Not Effective	93	73.9
Less Effective	24	19.0
Very Effective	9	7.1
Total number	126	100

Source: Field-Based survey (2021).

Table 3 reveals that 73% of the responses suggest that the existing climate change initiatives and strategies are not effective, while only 7% see them as effective. In view of this, it was imperative to ascertain the level of community awareness of any existing climate change initiatives and strategies used to promote their resilience and adaptation to climate change. Research participants were asked to rate the level of effectiveness, by way of indicating whether they were aware of any existing climate change initiatives, policies, and/or strategies for community adaptation. Figure 3 illustrates these responses. Figure 3 suggests that an estimated 60% of the responses indicated a lack of knowledge of any climate change initiatives, policies, and strategies for community adaption to climate change. A further 19% indicated knowledge of climate change initiatives for community adaptation, while 21% expressed a view of being moderately aware. What is of particular interest in Figure 3 is that an estimated 36% of the 60% of the responses expressing a lack of knowledge of any climate change initiatives and/or policies were women, while only 7% of the total 19% claiming to have knowledge of climate change policies, strategies, and activities for community adaptation were women. The overall impression represented in Figure 3 is indicative of the fact that women seem to be the group of people who are generally unaware of any community initiatives, policies, and strategies for adaptation to climate change. On the one hand, Figure 4 suggests that an estimated 88% of all of the responses from the research participants indicated neither participation nor involvement in climate change activities, strategies, or policies for community adaptation, with only 7% indicating participation in community climate change adaptation discourses.

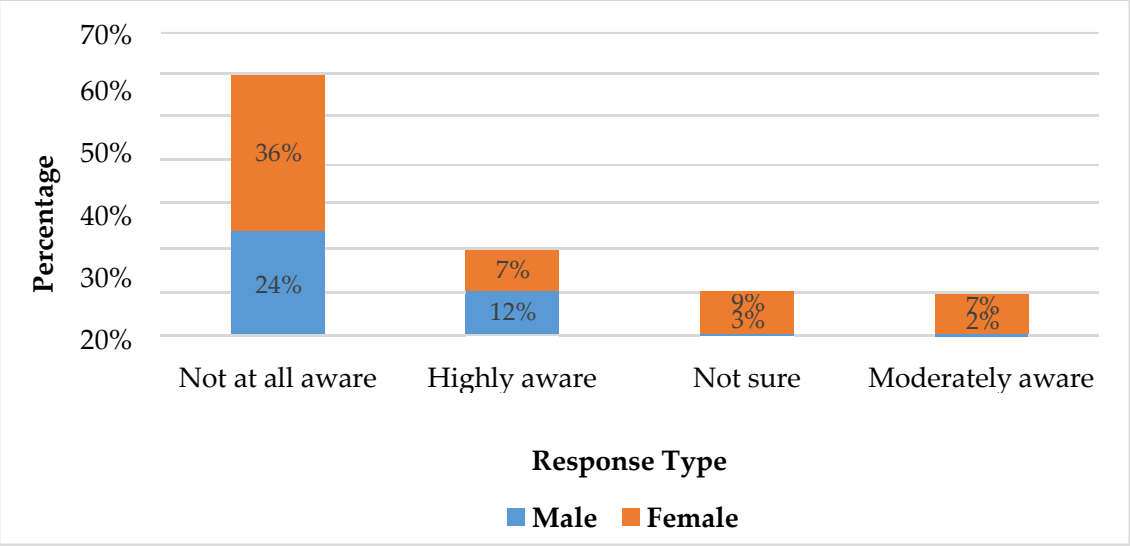

Figure 3. Level of community awareness of climate change initiatives, policies, and strategies in uMkhanyakude District Municipality. **Source:** Field-based surveys (2021).

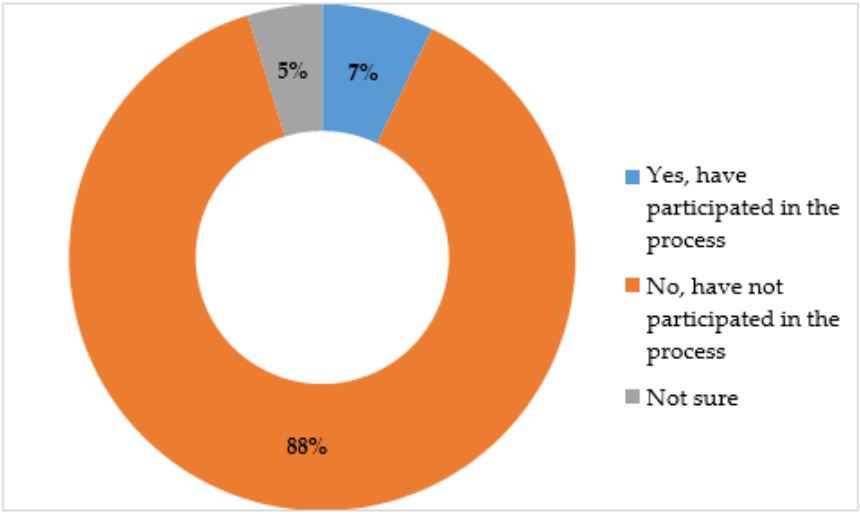

Figure 4. Level of participation by community members in climate change initiatives, policies, and strategies in uMkhanyakude District Municipality. **Source:** Field-based surveys (2021).

In view of the above assertions, it was imperative to have an understanding of the climate change adaptation policy landscape in South Africa in terms of its formulation. This was in a bid to comprehensively contextualise the opportunities and barriers that may exist in facilitating or hindering community participation in climate change discussions at the grass-roots level. Thus, discussions with policy practitioners drawn from different sectors of the government, quasi-organisations, and NGOs in uMkhanyakude District Municipality were conducted. These technocrats were engaged in articulating the policy-formulation processes, with particular interest paid to understanding the level of stakeholder participation and how this element is espoused and embedded in the entire policy-formulation framework. Figure 5 is a depiction of the policy-making process for climate change adaptation in South Africa.

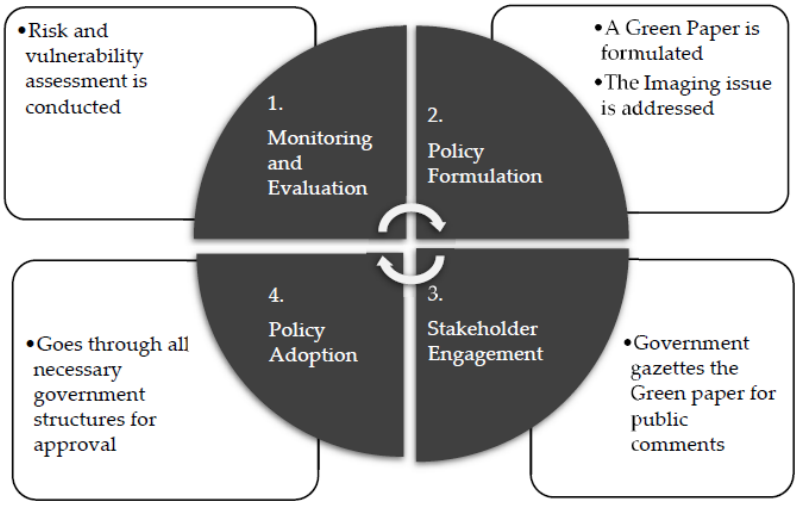

Figure 5. The South African climate change adaptation policy-making cycle. **Source:** Field-based interview notes (2021).

Policy formulation for climate change adaptation in South Africa goes through a four-stage process, as illustrated in Figure 5. It is issue-based and driven by identified risks arising from climate change.

As a result of the comprehensive policy-formulation processes as illustrated in the above policy-making cycle, South Africa has developed a number of policy instruments and strategies for promoting community adaptation. It was thus important to identify the existing instruments which are used to promote climate change adaptation among rural communities in South Africa. Figure 6 depicts some of the instruments which guide the climate change adaptation agenda in the uMkhanyakude District Municipality.

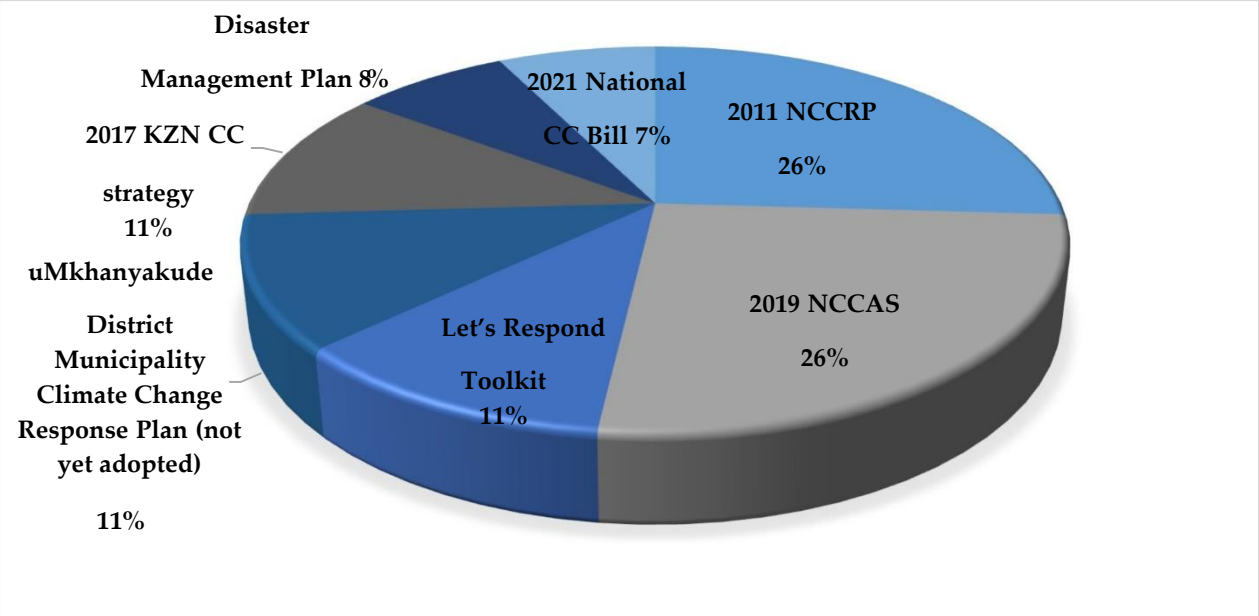

Figure 6. Climate change instruments for climate change adaptation in the study sites. **Source:** Field-based interview notes (2021).

An important element emerging from Figure 6 is that the National Climate Change Response Policy (NCCRP) and the National Climate Change Adaptation Strategy (NC- CAS) are two policy documents which predominantly guide the formulation of climate change adaptation strategies at the national and local/or community levels. In view of thestrides made in developing a climate change adaptation framework in South Africa, it was necessary to establish the extent to which these national policy frameworks influence the formulation of comprehensive strategies and initiatives for community adaptation to climate change. Officials were thus asked to indicate whether, as technocrats, they perceived these policy instruments and initiatives to be effective in facilitating the adaptive capacity and resilience of grass-roots communities to climate change. Table 4 reveals that all (i.e., 100%) officials indicated that climate change initiatives, policies, and strategies have great potential in influencing community adaptation in a positive way.

Table 4. Perceptions of officials on the effectiveness of adaptation instruments to climate change in the study sites.

Type of Response	No. Cumulative Response	%
Yes, instruments are effective for adaptation	13	100
No, I don't think so	0	0
I am not sure, maybe they do	0	0
Total number	13	100

Source: Field-based interview notes (2021).

From one point of view, it can be argued that, although South Africa has developed good climate change initiatives, policies, and strategies, the implementation of these policies seems to present difficulties as those for whom they have been developed do not seem to have any knowledge of their effectiveness in helping them build resilience against extreme weather events. In view of this assertion, it was important to have some level of understanding of factors which may contribute to making these intervention measures less effective. Table 5 depicts the views of research participants on what they consider to be major barriers to the development of an effective climate change adaptation agenda in the study sites.

Table 5. Barriers to comprehensive climate change adaptation in the study sites.

Perceived Barriers	Qualitative Examples from Research Participants	Solutions: Research Participants' Views
Lack of informative interactions with the communities (e.g., awareness campaigns) **Lack of local expertise** (e.g., no dedicated climate change practitioners within the district and local municipalities) **Competing political priorities** **Cognitive and organisational silos** **Lack of public engagement**	"I feel that the municipality has told us that the weather or climate change is not a priority for them." "District or UMkhanyakude never conducts formal workshops for councillors; they also do not call public meetings to facilitate climate change workshops." "Nothing is done by the Municipality. They also do not educate nor inform us of the existing climate change adaptation plans. The Municipality never asks for the communities views. In short, I don't think the Municipality knows how to best handle climate change governance." "I don't see local authorities doing much about climate change." "I think it is not effective because the communities we are living in are poor, but the Municipality wants payments forany service rendered to the communities, where are these people supposed to get the money as I have already said most of them are unemployed." "If it was effective then the district would not be in such dire state. Plans need not only talk to climate adaptation but also touch on mitigation to ensure a proactive approach and not a reactive one. Currently, climate change is viewed as a disaster impact at uMkhanyakude, which means the municipality reacts to the impacts not necessarily plan by putting measures in place i.e., air quality monitoring or early warning systems, etc. I am not sure of the level of mobilisation or infiltration into other business units or sectors, or whether the strategy remains a strategy for only Disaster management and environmental management officials. Not sure whether other sectors, i.e., water, human settlements, planners understand their role in managing climate change. Furthermore, the plans need to be budgeted for and much effort needs to also go towards involving other non-governmental/community-based organisation to ensure holistic regional implementation." "In most cases when these policies are developed community people are not contacted, therefore the most important information is left out." "After being affected by drought no one was able to address our loss, not even by conducting awareness campaigns on extreme weather events and strategies to cope." "No public engagement or participation was conducted when developing the strategies, I feel like the communities are left out when such strategies are developed, and it becomes difficult for the Municipalities to implement the climate change adaptation strategies."	"Conduct climate change awareness campaigns—Educate the communities andencourage them to advocate for climate change issues." "Active participation and involvement—be inclusive." "Bottom-up Approach include communities views and engage with them. The municipality must have meetings with community members and take suggestions from them." "Building collaborative partnerships between government, NGOs, CBOs, municipalities, traditional structures and communities." "Enhance youth participation." "Include all sectors within uMkhanyakude District Municipality and develop skills related to tackling climate change." "Building capacity—train people within the communities who can teach and engage with the communities on climate change issues." "Transparency in policy development and implementation is important."

Source: Field-based survey notes (2021).

A key theme emerging from Table 5 revolves around the lack of community engagement, collaboration, and transparency among the different actors mandated to manage issues relating to climate change and socio-economic development. It is evident from the views articulated by the participants that there are no comprehensive interactions and engagements between the uMkhanyakude District Municipality, the community, and other government departments who, in earnest, should work together towards developing integrated adaptation policies and strategies. The silo approach to dealing with climate change has created a situation where many of the rural people in the study sites have learnt to be self-reliant when responding to climate-change-induced challenges.

5. Discussion

The empirical evidence presented in this paper suggests that climate change is having devastating impacts on the livelihood-supporting systems of many poor and rural households in South Africa. These changes are not only affecting the biophysical elements of the natural resource base, but they are also greatly compromising the ability of many small-scale farmers, especially women, who, in most cases, lack any form of productive assets to deploy so as to minimise the impacts of climate change. These findings are not unique to South Africa, but rather they seem to align with the findings of other studies in the sub-region. Simatele *et al.* [38], for example, argue that the changes in climatic conditionsare increasingly limiting the ability of the poor to actively engage in meaningful agricultural activities, owing to the eroding effects of climate change on their asset portfolios. This view is supported by Diffenbaugh and Burke [97] (p. 9880), who observe that "there is growing evidence that poorer countries or individuals are more negatively affected by a changing climate, either because they lack the resources for climate protection or because they tend to reside in warmer regions where additional warming would be detrimental to both productivity and health. The increase in vulnerability of the poor to climate change requires an urgent and concerted policy response to their plight.

There is, therefore, an urgent need for government systems and policies to go beyond the syndrome of simply acknowledging the impacts of climate, but rather moving in a space which ensures and enables human and natural systems to adjust to the actual and projected climate stimuli and impacts. Thus, the formulation of pro-poor policies and strategies which promote gender equality in issues of climate change must be prioritised as they have the potential to facilitate the identification of appropriate intervention measures which can contribute to building the adaptive capacity and resilience of the most vulnerable in society. Demetriades and Esplen [98] (p. 27), for example, argue that " . . . achieving a gender balance in participation in climate change negotiations and representation at decision-making (vis-à-vis policy) tables is a good starting point . . . to successful (climate change) interventions." This view is supported by Villagrasa [99] (p. 41), as cited by Dennison [100], who argues that "promoting women's and girls' meaningful participation in decision-making also contributes to addressing gender inequalities by raising the profile and status of women and girls in the community and challenging traditional assumptions about their capabilities." Achieving this requires a radical shift towards designing gender-sensitive climate change responses and policies which incorporate the voices of the poor and powerless, as well as taking into consideration their local practices, including their indigenous knowledge.

A key element to an inclusive climate change adaptation policy which is transformative in nature and builds the resilience of the poor to current and future climate risks lies in the quality of its leaders and the sharpness of the country's governance systems in dealing with complex issues, as discussed in [41]. If South Africa is to comprehensively respond to the challenges of climate change, it will require the theoretical sharpness and practical abilities of both state and local authorities to adapt formal institutions to new and changing,

climate-induced realities. As observed by Roelich and Giesekam [101], priority must be given to: (a) raising climate change awareness and agricultural skill development among rural and vulnerable groups of people in order to improve productivity and reduce poverty, unemployment, and helplessness; (b) strengthen the level of community participation in policy discussions and formulations. Such an approach would result in the development of optimal intervention strategies which are based on the lived realities of those most impacted by climate change; (c) promoting equity through the opening up of the political process to poor and powerless people to influence economic efficiency and, more specifically, the control of climate-change-related financial resources.

It is not an exaggeration to argue that the rural poor of South Africa are expending tremendous dynamism and vivacity to change their fortunes in the face of changes in climatic conditions. All they require is a supportive framework through which they can pursue their ambitions and aspirations to build their adaptive capacity and resilience to climate change. Moser and Satterthwaite [39], for example, argue that the poor are not passive actors, but rather they are actively involved in protecting and modifying their asset portfolios against the impacts of climate change. This view is supported by Nicoson and von Uexkull [102], who argue that, while climate change does not cause weak governance, weak governance limits individuals' and communities' coping capacities in the face of climate change. We can thus argue that, while state and local authorities have failed to adequately articulate new visions or provide necessary services for climate change adaptation, there is an urgent need to mobilise community resources and citizens' groups to charter an adaptation agenda that is suited and responsive to the needs of those most vulnerable to climate change.

As argued above, it is not the incapability of the poor to adjust to changes in climatic conditions that worsens their vulnerability, but rather it is the poor governance systems and weak policies and strategies which harm the everyday lives of the poor. In as much as South Africa has some of the best social policies on the African continent, the country has for too long lacked good governance, an essential ingredient in the development of transformative climate change adaptation policies and strategies. The prevailing approach to governance, based on a central government, places very little emphasis on the importance of private agents and actors or citizens' groups in devising locally tailored, innovative approaches for climate change adaptation. It allows the vested interests of politically and economically powerful elites to influence unduly the nature of policies and strategies which are then implemented by local authorities and which are devoid of the lived experiences of thepoor. Flato *et al.* [103] and Cheru [41], for example, argue that African governments must create a climate of equity, cooperation, and accountability, in which the talents of all their citizens can be applied to solving the climate change problems they face. This will require significant reforms in governance systems in terms of the representativeness of society in decision-making processes. The engagement of civil society in fair and transparent policymaking, promoting ethos in partnerships with local authorities, community-based organisations (CBOs), traditional leaders, and the private sector, can make the difference between formulating a good, pro-poor climate change adaptation agenda, or one which has misplaced priorities.

In conclusion, therefore, the importance of co-designing climate change policies and strategies with communities cannot be overemphasised, particularly because the communities represent the voices of the most vulnerable and marginalised groups in South Africa. Thus, in order to achieve successful public participation in climate change adaptation policy development, there must be an all-inclusive system which incorporates all stakeholders, including vulnerable groups. Bahauddin *et al.* [104] advocate strong relationships and collaboration between the government and different stakeholders if comprehensive climate change adaptation policies are to be developed. Thus, there is an urgent need for South Africa as a country to establish working institutions that are invested in fulfilling their mandates and supporting communities in building strong partnerships between civil society, public–public, and public–private sectors. Such partnerships may trigger the achievement of effective and transformative systems of climate change governance and building the resilience of the poor. The United Nations [105] has observed that "business as usual" approaches will not in any way achieve climate-resilient development for the

world's most vulnerable people. Adger *et al.* [48] and Adger *et al.* [106] further argue that the success or failure of climate change adaptation is highly dependent on the effectiveness of governance, whilst Filho *et al.* [29] (p. 35) are of the view that the key factors to enhance climate adaptation are based on "strengthening institutions, designing well formulated national and city-level planning policies for systematic governance of social, economic and political processes which are essential for navigating the climate crisis." If South Africa is to adapt effectively to climate change, the case for institutional reformation and strengthening in ways that embrace the voices of the marginalised groups, is therefore, an important ingredient. In the absence of these elements, transformative adaptation to climate change will remain a myth.

6. Conclusions, Limitations and Recommendations

In this paper, it has been established that climate change in South Africa, like any other African country, is having devastating impacts on social and economic aspects. The poor and rural households that are mainly dependent on agriculture productivity for their livelihoods and income generation are the most affected. Furthermore, it has been demonstrated that any attempts to grasp the complexity and dimensions of climate change require flexibility and a keen interest on the part of state and local authorities to intensify support for those most impacted by it. Given the interrelated nature of climate change on social and economic processes, state and local authorities, including their cooperating partners, must move away from narrowly focused, sectoral perspectives and towards more inclusive, multidisciplinary and participatory approaches. The extent to which transformative adaptation to climate change will be achieved will depend on the extent and appropriateness of innovative approaches to climate governance. There is a need for South Africa to base its adaptation agenda on the lived experiences of the poor, and the strategies to be developed must reflect the local needs for climate change response. Thus, the empirical evidence presented in this study should be used as an entry point through which the government can enhance preparedness plans for climate change adaptation, particularly for vulnerable groups who oftentimes lack the voice and power to influence policy direction. This will also contribute to UN Sustainable Goal 13, which speaks to strengthening resilience and adaptive capacity against climate-related hazards and natural disasters.

This research, however, is subject to several limitations. First, this study focused on the perceptions of key individuals in the community. Although engaging with key individuals in the community is important in acquiring a better understanding of the local community needs and resources, household members are the ones who navigate climate change issues on a daily basis. Thus, future studies could investigate the individual household members' views and perceptions on climate change governance in South Africa.

Secondly, the study used online data collection instruments. This method posed a limitation because digitally illiterate participants could not participate in the survey. Thus, this led to a digital divide, which increased the social exclusion of already-vulnerable groups. Future studies must ensure that the data collection instrument used allows for equal and fair opportunities for all groups and individuals to participate in the study.

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References

1. Ülker, D.; Ergüven, O.; Gazioğlu, C. Socio-economic impacts in a Changing Climate: Case Study Syria. *Int. J. Environ. Geoinform.* **2018**, *5*, 84–93. [CrossRef]
2. Cook, J.; Oreskes, N.; Doran, P.T.; Anderegg, W.R.L.; Verheggen, B.; Maibach, W.; Carlton, J.S.; Lewandowsky, S.; Skuce, A.G.; Green, S.A.; *et al.* Consensus on consensus: A synthesis of consensus estimates on human-caused global warming. *Environ. Res. Lett.* **2016**, *11*, 048002. [CrossRef]
3. Finn, C. AGU Updates climate change position statement. *Eos Trans. Am. Geophys. Union* **2013**, *94*, 301. [CrossRef]
4. Riedy, C.; McGregor, I. Climate Governance is failing us: We all need to respond. *J. Multidiscip. Int. Stud.* **2011**, *8*, 1–9. [CrossRef]
5. Averchenkova, A.; Gannon, K.E.; Patrick, C. *Governance of Climate Change Policy: A Case Study of South Africa*; Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London School of Economics and Political Science: London, UK, 2019.
6. Adger, W.N.; Huq, S.; Brown, K.; Conway, D.; Hulme, M. Adaptation to climate change in the developing world. *Prog. Dev. Stud.* **2003**, *3*, 179–195. [CrossRef]
7. Kahn, M.E. Two measures of progress in adapting to climate change. *Glob. Environ. Chang.* **2003**, *13*, 307–312. [CrossRef]
8. Klein, R.J.T.; Smith, J.B. Enhancing the capacity of developing countries to adapt to climate change: A policy-relevant research agenda. In *Climate Change, Adaptive Capacity and Development*; Smith, J.B., Klein, R.J.T., Huq, S., Eds.; Imperial College Press: London, UK, 2003; pp. 317–334.
9. Bele, M.Y.; Tiani, A.M.; Somorin, O.A.; Sonwa, D.J. Exploring vulnerability and adaptation to climate change of communities in the forest zone of Cameroon. *Clim. Chang.* **2013**, *119*, 875–889. [CrossRef]
10. Bryan, E.; Ringler, C.; Okoba, B.; Roncoli, C.; Silvestri, S.; Herrero, M. Adapting agriculture to climate change in Kenya: Household strategies and determinants. *J. Environ. Manag.* **2013**, *114*, 26–35. [CrossRef]
11. IPCC. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change*; Field, C.B., Barros, V., Stocker, T.F., Qin, D., Dokken, D.J., Ebi, K.L., Mastrandrea, M.D., Mach, K.J., Plattner, G.-K., Allen, S.K., *et al.*, Eds.; Cambridge University Press: Cambridge, UK; New York, NY, USA, 2012; Volume 582.
12. Midgley, G.F.; Thuiller, W. Potential responses of terrestrial biodiversity in Southern Africa to anthropogenic climate change. *Reg. Environ. Chang.* **2011**, *11*, 127–135. [CrossRef]
13. Ostfeld, R.S. Climate change and the distribution and intensity of infectious diseases. *Ecology* **2009**, *90*, 903–905. [CrossRef]
14. Douglas, I.; Alam, K.; Maghenda, M.; Mcdonnell, Y.; Mclean, L.; Campbell, J. Unjust waters: Climate change, flooding and the urban poor in Africa. *Environ. Urban.* **2008**, *20*, 187–205. [CrossRef]
15. Di Gregorio, M.; Fatorelli, L.; Paavola, J.; Locatelli, B.; Pramova, E.; Nurrochmat, D.R.; May, P.H.; Brockhaus, M.; Sari, I.M.; Kusumadewi, S.D. Multi-level governance and power in climate change policy networks. *Glob. Environ. Chang.* **2019**, *54*, 64–77. [CrossRef]
16. Alemaw, B.F.; Simatele, D. Integrating Climate Change Adaptation and Mitigation into Sustainable Development Planning: The Policy Dimension. In *Climate Variability and Change in Africa*; Matondo, J.I., Alemaw, B.F., Sandwidi, W.J.P., Eds.; Sustainable Development Goals Series; Springer: Cham, Switzerland, 2020. [CrossRef]
17. Musavengane, R.; Simatele, D.M. Community-based natural resource management: The role of social capital in collaborative environmental management of tribal resources in KwaZulu-Natal, South Africa. *Dev. S. Afr.* **2016**, *33*, 806–821. [CrossRef]
18. Perez, C.; Jones, E.; Kristjanson, P.; Cramer, L.; Thornton, P.; Förch, W.; Barahona, C. How resilient are farming households and communities to a changing climate in Africa? A gender-based perspective. *Glob. Environ. Chang.* **2015**, *34*, 95–107. [CrossRef]
19. IPCC. *Summary for Policymakers in: Climate Change 2014: Impacts, Adaptation and Vulnerability. Part A: Global and Sectoral Aspects, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*; Cambridge University Press: Cambridge, UK; New York, NY, USA, 2014; pp. 1–32.
20. Binns, T.; Dixon, A.; Nel, E. *Africa: Diversity and Development*; Routledge: London, UK; New York, NY, USA, 2012.
21. Roudier, P.; Sultan, B.; Quirion, P.; Berg, A. The impact of future climate change on West African crop yields: What does the recent literature say? *Glob. Environ. Chang.* **2011**, *21*, 1073–1083. [CrossRef]
22. Alemaw, B.F.; Matondo, J.I. Overview of Climate Variability and Change in Africa: Perspectives and Experiences. In *Climate Variability and Change in Africa*; Matondo, J.I., Alemaw, B.F., Sandwidi, W.J.P., Eds.; Sustainable Development Goals Series; Springer: Cham, Switzerland, 2020. [CrossRef]

23. Pattberg, P. Public–private partnerships in global climate governance. *WIREs Clim. Chang.* **2010**, *1*, 279–287. [CrossRef]
24. Van der Bank, M.; Karsten, J. Climate Change and South Africa: A critical analysis of the Earthlife Africa Johannesburg and Another v Minister of Energy and Others 65662/16 (2017) Case and the Drive for Concrete Climate Practices. *Air Soil Water Res.* **2020**, *13*, 1178622119885372. [CrossRef]
25. Filho, W.L.; Balogun, A.-L.; Olayide, O.E.; Azeiteiro, U.M.; Ayal, D.Y.; Muñoz, P.D.C.; Nagy, G.J.; Bynoe, P.; Oguge, O.; Toamukum, N.Y.; *et al.* Assessing the impacts of climate change in cities and their adaptive capacity: Towards transformative approaches to climate change adaptation and poverty reduction in urban areas in a set of developing countries. *Sci. Total Environ.* **2019**, *692*, 1175–1190. [CrossRef]
26. Hummel, D. *Climate Change, Land Degradation and Migration in Mali and Senegal-Some Policy Implications, Migration and Development*; Institute of Social-Ecological Research: Frankfurt am Main, Germany, 2015.
27. Amoah, L.N.A.; Simatele, M.D. Food Security and Coping Strategies of Rural Household Livelihoods to Climate Change in the Eastern Cape of South Africa. *Front. Sustain. Food Syst.* **2021**, *5*, 692185. [CrossRef]
28. Etale, L.; Simatele, D.M. Climate change adaptation for food security and gender-land rights in Western Kenya. *J. Asian Afr. Stud.* **2021**, 0021909620988302. [CrossRef]
29. Leal Filho, W.; Raath, S.; Lazzarini, B.; Vargas, V.R.; de Souza, L.; Anholon, R.; Quelhas, O.L.G.; Haddad, R.; Klavins, M.; Orlovic, V.L. The role of transformation in learning and education for sustainability. *J. Clean. Prod.* **2018**, *199*, 286–295. [CrossRef]
30. Bewket, W. Climate change perceptions and adaptive responses of smallholder farmers in central highlands of Ethiopia. *Int. J. Environ. Stud.* **2012**, *69*, 507–523. [CrossRef]
31. IPCC. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Working Group II Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*; Cambridge University Press: Cambridge, UK, 2007.
32. Reid, P.; Vogel, C. Living and responding to multiple stressors in South Africa—Glimpses from KwaZulu-Natal. *Glob. Environ. Chang.* **2006**, *16*, 195–206. [CrossRef]
33. Pielke, R.; Prins, G.; Rayner, S.; Sarewitz, D. Climate change 2007: Lifting the taboo on adaptation. *Nature* **2007**, *445*, 597–598. [CrossRef] [PubMed]
34. Kurukulasuriya, P.; Mendelsohn, R. *A Ricardian Analysis of the Impact of Climate Change on African Cropland*; CEEPA Discussion Paper No. 8; Centre for Environmental Economics and Policy in Africa, University of Pretoria: Pretoria, South Africa, 2006.
35. Smit, B.; Skinner, M.W. Adaptation options in agriculture to climate change: A typology. *Mitig. Adapt. Strateg. Glob. Chang.* **2002**, *7*, 85–114. [CrossRef]
36. Challinor, A. Towards a Science of Adaptation that Prioritises the Poor. *IDS Bull.* **2008**, *39*, 81–86. [CrossRef]
37. Niang, I.; Ruppel, O.C.; Abdrabo, M.A.; Essel, A.; Lennard, C.; Padgham, J.; Urquhart, P. Africa. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*; Barros, V.R., Field, C.B., Dokken, D.J., Mastrandrea, M.D., Mach, K.J., Bilir, T.E., Eds.; Cambridge University Press: Cambridge, UK, 2014; pp. 1199–1265.
38. Simatele, D.; Binns, T.; Simatele, M.C. Sustaining livelihoods under a changing climate: The case of urban agriculture in Lusaka, Zambia. *J. Environ. Plan. Manag.* **2012**, *55*, 1175–1191. [CrossRef]
39. Moser, C.; Satterthwaite, D. *Towards Pro-Poor Adaptation to Climate Change in the Urban Centres of Low- and Middle-Income Countries*; GURC and IIED Discussion Paper Series, Climate Change and Cities 3; IIeD: London, UK, 2008.
40. Reid, M.; Simatele, M.D. Perspectives on Energy Insecurity and Its Impacts on Urban Livelihoods: Adaptation and Resilience of Women in the Informal Sector. *Front. Sustain. Cities* **2021**, *3*, 706476. [CrossRef]
41. Cheru, F. *African Renaissance: Roadmaps to the Challenge of Globalization*; Zed: London, UK, 2002.
42. Ribot, J.C.; Najam, A.; Watson, G. Climate variation, vulnerability and sustainable development in the semi-arid tropics. In *Climate Variability, Climate Change and Social Vulnerability in the Semi-Arid Tropics*; Ribot, J.C., Magalhães, A.R., Panagides, S.S., Eds.; Cambridge University Press: Cambridge, UK; New York, NY, USA, 1996; pp. 13–54.
43. Jordan, C.H.; Spencer, S.J.; Zanna, M.P.; Hoshino-Browne, E.; Correll, J. Secure and defensive high self-esteem. *J. Personal. Soc. Psychol.* **2003**, *85*, 969–978. [CrossRef]
44. Wamslera, C. Stakeholder involvement in strategic adaptation planning: Transdisciplinarity and co-production at stake? *Environ. Sci. Policy* **2017**, *75*, 148–157. [CrossRef]
45. Tantoh, H.B.; Simatele, D.M.; Ebhuoma, E.; Donkor, K.; McKay, T.J. Towards a pro-community-based water resource management system in Northwest Cameroon: Practical evidence and lessons of best practices. *GeoJournal* **2021**, *86*, 943–961. [CrossRef]
46. Berkhout, T. Corporate Social Responsibility Can Be the Strategic Engine for Long-Term Corporate Profits and Responsible Social Development. *Altern. J.* **2005**, *31*, 124–138.
47. Matson, P.A.; Clark, W.C.; Andersson, K. *Pursuing Sustainability: A Guide to the Science and Practice*; Princeton University Press: Princeton, NJ, USA, 2016; pp. 83–104.
48. Adger, W.N.; Brown, K.; Nelson, D.R.; Berkes, F.; Eakin, H.; Folke, C.; Galvin, K.; Gunderson, L.; Goulden, M.; O'Brien, K.; *et al.* Resilience implications of policy responses to climate change. *WIREs Clim. Chang.* **2011**, *2*, 757–766. [CrossRef]
49. Noble, I.R.; Huq, S.; Anokhin, Y.A.; Carmin, J.; Goudou, D.; Lansigan, F.P.; Osman-Elasha, B.; Villamizar, A. Adaptation needs and options. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*; Field, C.B., Barros, V.R., Dokken, D.J., Mach, K.J., Mastrandrea, M.D., Bilir, T.E., Chatterjee, M., Ebi, K.L., Estrada, Y.O., Genova, R.C., *et al.*, Eds.; Cambridge University Press: Cambridge, UK; New York, NY, USA, 2014; pp. 833–868.

50. Chhotray, V.; Stoker, G. *Governance Theory and Practice: A Cross-Disciplinary Approach*; Palgrave Macmillan: Houndmills, UK, 2009.
51. Richards, D.; Smith, M.J. *Governance and Public Policy in the UK*; Oxford University Press: Oxford, UK, 2002.
52. Gillard, S.; Foster, R.; Gibson, S.; Goldsmith, L.; Marks, J.; White, S. Describing a principles-based approach to developing and evaluating peer worker roles as peer support moves into mainstream mental health services. *Ment. Health Soc. Incl.* **2017**, *21*, 133–143. [CrossRef]
53. Termeer, C.J.; Dewulf, A.; van Lieshout, M. Disentangling Scale Approaches in Governance Research: Comparing Monocentric, Multilevel, and Adaptive Governance. *Ecol. Soc.* **2010**, *15*, 29. [CrossRef]
54. Jordan, A.J.; Huitema, D.; Hilden, M.; van Asselt, H.; Rayner, T.J.M.; Schoenefeld, J.J.; Tosun, J.; Forster, J.; Boasson, E.L. Emergence of polycentric climate governance and its future prospects. *Nat. Clim. Chang.* **2015**, *5*, 977–982. [CrossRef]
55. Ostrom, E. Beyond Markets and States: Polycentric Governance of Complex Economic Systems. *Am. Econ. Rev.* **2010**, *100*, 641–672. [CrossRef]
56. Armitage, D.; de Loë, R.; Plummer, R. Environmental governance and its implications for conservation practice. *Conserv. Lett.* **2012**, *5*, 245–255. [CrossRef]
57. Twinomuhangi, R.; Natuhwera, C.; Ampaire, E.L. Role of Local Policies in Facilitating Adaptation of Smallholder Farming to Climate Change in Uganda. *J. Environ. Earth Sci.* **2019**, *9*, 88–100.
58. Mubaya, C.P.; Mafongoya, P. The role of institutions in managing local level climate change adaptation in semi-arid Zimbabwe. *Clim. Risk Manag.* **2017**, *16*, 93–105. [CrossRef]
59. Hsieh, T.-F.; Lee, Y.-M. Community-Based Adaptation to Climate Change: The Case of a Community University Workshop in Taiwan. *Sustainability* **2021**, *13*, 1729. [CrossRef]
60. Hove, M.; Ngwerume, E.T.; Muchemwa, C. The Urban Crisis in Sub-Saharan Africa: A Threat to Human Security and Sustainable Development. *Stability Int. J. Secur. Dev.* **2013**, *2*, 7. [CrossRef]
61. Zeidler, J.; Kandjinga, L.; David, A.; Turpie, J.; Malema, D. *Climate Governance and Development Case Study*; Heinrich Boll Stiftung: Cape Town, South Africa, 2012.
62. Kettle, N.P.; Dow, K.; Tuler, S.; Webler, T.; Whitehead, J. Integrating scientifc and local knowledge to inform risk-based management approaches for climate adaptation. *Clim. Risk Manag.* **2014**, *4–5*, 17–31. [CrossRef]
63. Coffey, B.; O'toole, K. Towards an Improved Understanding of Knowledge Dynamics in Integrated Coastal Zone Management: A Knowledge Systems Framework. *Conserv. Soc.* **2012**, *10*, 318–329. [CrossRef]
64. Leck, H.; Simon, D. Local Authority Responses to Climate Change in South Africa: The Challenges of Transboundary Governance. *Sustainability* **2018**, *10*, 2542. [CrossRef]
65. Crick, J.M. The Antecedents and Consequences of a Customer Value-Oriented Dominant Logic: A Dynamic Managerial Capabilities Perspective. Ph.D. Thesis, Loughborough University, Loughborough, UK, 2018.
66. Surminski, S.; Leck, H. *You Never Adapt Alone—The Role of Multi-Sectoral Partnerships in Addressing Urban Climate Risks*; Centre for Climate Change Economics and Policy Working Paper No. 262; Grantham Research Institute on Climate Change and the Environment Working Paper No. 232; Centre for Climate Change Economics and Policy: London, UK, 2016.
67. Dyer, J.M.; Savage, N.S.; Jin, M.; Zyla, T.R.; Elston, T.C.; Lew, D.J. Tracking shallow chemical gradients by actin-driven wandering of the polarization site. *Curr. Biol.* **2013**, *23*, 32–41. [CrossRef]
68. Hammill, A.; Harvey, B.; Echeverria, D. *Understanding Needs, Meeting Demands: User-Oriented Analysis of Online Knowledge Broker Platforms for Climate Change and Development*; Institute of Development Studies: Brighton, UK, 2013.
69. Best, A.; Holmes, B. Systems thinking, knowledge and action: Towards better models and methods. *Evid. Policy* **2010**, *6*, 45–59. [CrossRef]
70. Harvey, B.; Diagne, B.; Nnam, J.; Tadege, A.; Knowledge Sharing for Climate Change Adaptation in Africa: Opportunities and Challenges. From MEA Bulletin—Guest Article No. 73. 2009. Available online: http://enb.iisd.org/email/mea-l/guestarticle73.html (accessed on 23 August 2017).
71. Brouwer, J.; Jansen, E.; Flache, A.; Hofman, A. The impact of social capital on self-efficacy and study success among first-year university students. *Learn. Individ. Differ.* **2016**, *52*, 109–118. [CrossRef]
72. Hemmati, M. *Multi-Stakeholder Processes for Governance and Sustainability: Beyond Deadlock and Conflict*; Earthscan: London, UK, 2002.
73. Pauw, W.P.; Chan, M. Multistakeholder partnerships for adaptation: The role of micro, small and medium enterprises. In *Private-Sector Action in Adaptation: Perspectives on the Role of Micro, Small and Medium Size Enterprises*; Schaer, C., Kuruppu, N., Eds.; UNEP/DTU: Copenhagen, Denmark, 2018; pp. 98–109.
74. Anguelovski, I.; Chu, E.; Carmin, J. Variations in approaches to urban climate adaptation: Experiences and experimentation from the global South. *Glob. Environ. Chang.* **2014**, *27*, 156–167. [CrossRef]
75. Dilling, L.; Pizzi, E.; Berggren, J.; Ravikumar, A.; Andersson, K. Drivers of adaptation: Responses to weather- and climate-related hazards in 60 local governments in the Intermountain Western U.S. *Environ. Plan. A* **2017**, *49*, 2628–2648. [CrossRef]
76. Kalafatis, S.E.; Lemos, M.C.; Lo, Y.-J.; Frank, K.A. Increasing information usability for climate adaptation: The role of knowledge networks and communities of practice. *Glob. Environ. Chang.* **2015**, *32*, 30–39. [CrossRef]
77. Ochieng, B.O. *Effective Communication of Science and Climate Change Information to Policy Makers*; IDRC: Nairobi, Kenya, 2009; Volume 22.

78. Ebhuoma, E.E.; Simatele, D.M. 'We know our Terrain': Indigenous knowledge preferred to scientific systems of weather forecasting in the Delta State of Nigeria. *Clim. Dev.* **2019**, *11*, 112–123. [CrossRef]
79. Spear, M.; Norton, A.; Hill, C.; Price, C.; Ormondroyd, G. Wood based panels in modern methods of construction for housing: Greenhouse gas abatement analysis. In Proceedings of the International Panel Products Symposium 2019, Llandudno, UK, 8–9 October 2019; pp. 95–108.
80. Adhikari, B.; Taylor, K. Vulnerability and adaptation to climate change: A review of local actions and national policy response. *Clim. Dev.* **2012**, *4*, 54–65. [CrossRef]
81. Huntjens, R.J.C.; Verschuere, B.; McNally, R.J. Inter-Identity Autobiographical Amnesia in Patients with Dissociative Identity Disorder. *PLoS ONE* **2012**, *7*, e40580. [CrossRef] [PubMed]
82. McNeeley, S.M. Examining barriers and opportunities for sustainable adaptation to climate change in Interior Alaska. *Clim. Chang.* **2012**, *111*, 835–857. [CrossRef]
83. Tompkins, E.L.; Eakin, H. Managing private and public adaptation to climate change. *Glob. Environ. Chang.* **2012**, *22*, 3–11. [CrossRef]
84. Harries, T.; Penning-Rowsell, E. Victim pressure, institutional inertia and climate change adaptation: The case of flood risk. *Glob. Environ. Chang.* **2011**, *21*, 188–197. [CrossRef]
85. Robinson, L.W.; Berkes, F. Multi-level participation for building adaptive capacity: Formal agency-community interactions in northern Kenya. *Glob. Environ. Chang.* **2011**, *21*, 1185–1194. [CrossRef]
86. Gupta, J.; Termeer, C.; Klostermann, J.; Meijerink, S.; van der Brink, M.; Jong, P.; Nooteboom, S.; Bergsma, E. The Adaptive Capacity Wheel: A method to assess the inherent characteristics of institutions to enable the adaptive capacity of society. *Environ. Sci. Policy* **2010**, *13*, 459–471. [CrossRef]
87. Kvamsås, H. Addressing the adaptive challenges of alternative stormwater planning. *J. Environ. Policy Plan.* **2021**, *23*, 809–821. [CrossRef]
88. Vink, M.J.; Dewulf, A.; Termeer, C. The role of knowledge and power in climate change adaptation governance: A systematic literature review. *Ecol. Soc.* **2013**, *18*, 4. [CrossRef]
89. Berrang-Ford, L.; Pearce, T.; Ford, J.D. Systematic review approaches for climate change adaptation research. *Reg. Environ. Chang.* **2015**, *15*, 755–769. [CrossRef]
90. Cashmore, M.; Wejs, A. Constructing legitimacy for climate change planning: A study of local government in Denmark. *Glob. Environ. Chang. Hum. Policy Dimens.* **2014**, *24*, 203–212. [CrossRef]
91. Lodge, M.; Wegrich, K. *The Problem Solving Capacity of the Modern State: Governance Challenges and Administrative Capacities*; Oxford University Press: Oxford, UK, 2014.
92. Mapfumo, P.; Onyango, M.; Honkponou, S.K.; El Mzouri, E.H.; Githeko, A.; Rabeharisoa, L.; Obando, J.; Omolo, N.; Majule, A.; Denton, F.; *et al.* Pathways to transformational change in the face of climate impacts: An analytical framework. *Clim. Dev.* **2017**, *9*, 439–451. [CrossRef]
93. Kocho-Schellenberg, J.-E.; Berkes, F. Tracking the development of co-management: Using network analysis in a case from the Canadian Arctic. *Polar Rec.* **2015**, *51*, 422–431. [CrossRef]
94. Twigg, J. *Characteristics of a Disaster Resilient Community: A Guidance Note*; DFID DRRICG: London, UK, 2007.
95. Yin, R.K. *Case Study Research Design and Methods*, 5th ed.; Sage: Thousand Oaks, CA, USA, 2014; 282p.
96. Crouch, M.; McKenzie, H. The logic of small samples in interview-based qualitative research. *Soc. Sci. Inf.* **2006**, *45*, 483–499. [CrossRef]
97. Diffenbaugh, N.S.; Burke, M. Global warming has increased global economic inequality. *Proc. Natl. Acad. Sci. USA* **2019**, *116*, 9808–9813. [CrossRef]
98. Demetriades, J.; Esplen, E. The Gender Dimensions of Poverty and Climate Change Adaptation. *IDS Bull.* **2009**, *39*, 24–31. [CrossRef]
99. Villagrasa, D. Kyoto Protocol negotiations: Reflections on the role of women. *Gend. Dev.* **2002**, *10*, 40–44. [CrossRef]
100. Dennison, C. From Beijing to Kyoto: Gendering the International Climate Change Negotiation Process. In Proceedings of the 53rd Pugwash Conference on Science and World Affairs—Advancing Human Security: The Role of Technology and Politics, Halifax, NS, Canada, 17–21 July 2003.
101. Roelich, K.; Giesekam, J. Decision making under uncertainty in climate change mitigation: Introducing multiple actor motivations, agency and influence. *Clim. Policy* **2018**, *19*, 175–188. [CrossRef]
102. Nicoson, C.; von Uexkull, N. Humanitarian Consequences of Climate Change. In *Overlapping Vulnerabilities: The Impact of Climate Change on Humanitarian Needs*; Norwegian Red Cross: Oslo, Norway, 2019.
103. Flato, G.; Ananicheva, M.; Antonov, E.; Atkinson, D.; Brown, R.; Hamilton, L.; Harwood, L.; Jia, G.; Kattsov, V.; Kivva, K.; *et al.* Chapter 4—Regional drivers and projections of regional change. In *Adaptation Actions for a Changing Arctic: Perspectives from the Bering-Chukchi-Beaufort Region*; Arctic Monitoring and Assessment Programme (AMAP): Oslo, Norway, 2017; pp. 89–124.
104. Bahauddin, K.M.; Rahman, N.; Hasnine, T. Environmental Reviews and Case Studies: Public Perception, Knowledge, and Participation in Climate Change Adaptation Governance in the Coastal Region of Bangladesh Using the Social Ecological Inventory (SEI) Tool. *Environ. Pract.* **2016**, *18*, 32–43. [CrossRef]

105. United Nations. *A New Global Partnership: Eradicate Poverty and Transform Economies through Sustainable Development*; The Report ofthe High-Level Panel of Eminent Persons on the Post-2015 Development Agenda; UN: New York, NY, USA, 2013.
106. Adger, W.N.; Dessai, S.; Goulden, M.; Hulme, M.; Lorenzoni, I.; Nelson, D.R.; Naess, L.O.; Wolf, J.; Wreford, A. Are there sociallimits to adaptation to climate change? *Clim. Chang.* **2009**, *93*, 335–354. [CrossRef]

Appendix K: Research Article 2

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Article

Overcoming Bureaucratic Resistance: An Analysis of Barriers to Climate Change Adaptation in South Africa

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Abstract: Climate change is already a reality, and it is affecting the lives and livelihoods of many people globally. Many scientists argue that adaptation is, therefore, necessary to address the impact of climate change on life-supporting systems. Climate change adaptation, however, is a complex process that involves transformations implemented through governance at multiple levels. In this paper, the barriers to climate change adaptation in South Africa are presented and analysed. Semi-structured, in- depth interviews were conducted telephonically and online via Microsoft Teams with 13 government officials working at the Department of Forestry, Fisheries, and the Environment; the KwaZulu-Natal Department of Economic Development and Environmental Affairs; and the uMkhanyakude District Municipality. The findings suggest that the barriers to climate change adaptation in South Africa include inadequate financial resources, a lack of human capacity at the provincial and local levels, limited political will at the local level, limited understanding of climate change adaptation issues by communities, inadequate coordination across government levels and sectors, no legal mandate at the local level, no climate change unit at the district and local levels, a lack of knowledge by some staff members tasked with environmental duties at the local level, not enough climate change plans in place at the local level, and outdated information on climate change used in the IDPs. This paper, therefore, recommends that climate change be a standing item in the Integrated Development Plan for local governments, which will ensure that climate change is budgeted for appropriately. In addition, this paper suggests that a mandate for climate change adaptation be developed for all three government levels. There is also a need for the government to invest in capacity development and improve horizontal and vertical coordination to strengthen the weak climate governance capacity that exists.

Keywords: climate change adaptation; governance; systems integration; institutional arrangement; barriers; South Africa

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1. Introduction

Climate change adaptation is defined by the IPCC [1] as the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." It is estimated that without adaptation, climate change will drive approximately 132 million people into extreme poverty in the next decade alone [2]. Therefore, it is no exaggeration to argue that climate change is a

"wicked" problem [3] or a "super wicked problem" [4]. Climate change is expected to have the largest impact on rainfall, temperature, and water availability in South Africa [5]. The western regions of South Africa are projected to have 30% reduced water availability by 2050 [5]. Van der Bank and Karsten [6] argue that over the last five decades, annual temperatures have increased by approximately 1.5 times in South Africa and 0.65 °C globally. According to the World Economic and Social Survey conducted by Savelli *et al.* [7] in South Africa, poor and marginalised individuals are likely to experience the worst impacts of future water shortages. This survey supports an earlier study by Nhamo and Agyepong [8], which reported that the overall dam levels in Cape Town, South Africa, dropped from 92.5% to 23% during the 2014–2017 drought, whereas in 2000, severe floods affected northern South Africa, resulting in multiple deaths and damaging infrastructure [9]. In 2016 and 2017, there were reported cases of localised flooding in several provinces across South Africa. Most recently, the 2022 Durban floods had devastating impacts on the lives of many vulnerable people. In light of the above, it is undeniable that the sub-Saharan African region is very susceptible and vulnerable to the impacts of climate change [10]. These impacts have been observed in all sectors of the economy, environment, and society [11]. Given the highly interactive and wicked nature of climate change, many scholars, such as Sibiya *et al.* [12] and Adom *et al.* [13], have analysed the impact of climate change on marginalised communities, water, and food security in South Africa. Biesbroek *et al.* [14] and Keskitalo [15], however, are of the view that the number of studies on climate change adaptation and the forms it takes is far from unlimited, and much remains to be understood about the governance of adaptation and how this may affect its success or failure.

Huitema *et al.* [16] defined adaptation governance as "the patterns that emerge from the governing activities of social, political, and administrative actors in the realm of climate change adaptation." "Governance is not a set of rules or an activity, but a process; the process of governance is not based on control but on coordination; it involves both the public and private sectors; and it is not a formal institution but a continuing interaction" [17].Research shows that most of the studies concerning the governance of climate change have focused on the development of the international climate change system, its constituent agreements, the UNFCCC and the Kyoto Protocol, and their implementation [18–21]. While research on barriers to climate change adaptation in South Africa has been conducted previously [22–24], previous research can only be considered a first step towards a more profound understanding of how to overcome these barriers. Furthermore, there is limited empirical evidence in the literature that demonstrates the views of those mandated to drive the climate change adaptation agenda in South Africa. In view of these gaps, an analysis of the barriers to climate change adaptation in South Africa is provided in this paper. The overall aim is to provide an entry point through which the government can develop and enhance a more enabling environment that promotes effective climate change adaptation in South Africa.

The literature review investigates the challenges of climate change adaptation from the global to the local context. In the Section 2 of the paper, the methodology used in this is described. In the Section 3, the empirical evidence of this study is articulated, followed by a comprehensive discussion, conclusions, limitations, and recommendations.

2. Literature Review

1.1. Theoretical Framework—Barriers to Climate Change Adaptation

The major challenge for successful adaptation is the ability to traverse the barriers that arise in the governance of adaptation [25–28]. Barriers are defined by Adger *et al.* [29] as the result of action in the realms of finance, culture, and politics that raises questions about the effectiveness and accountability of climate change adaptation. While Moser and Ekstrom [26] define barriers as hurdles that impede adaptation or may necessitate changes that result in missed opportunities or increased costs. They can be overcome, prevented, or minimised by individual or collective action with intensive effort, creative management, changed ways of thinking, political will, and reprioritization of resources, land uses, and

institutions [26]. It is imperative to note that barriers are not viewed the same way by all actors involved in the adaptation process. Thus, Klaus *et al.* [30] argue that while a barrier may be observed as such by one actor, it may not be the same for another actor' therefore, it depends on how something is valued.

Scholars have used several ways to categorise the barriers to climate change adaptation. The categories used by Adger *et al.* [29], for example, include institutional, social, informational, financial, and cognitive. On the other hand, Falaleeva *et al.* [31] use the earth system governance framework, which involves stability, credibility, adaptiveness, and inclusiveness categories. Biesbroek *et al.* [32] identified seven barrier categories: "conflicting timescales; substantive, strategic, and institutional uncertainty; institutional crowdedness and institutional voids; fragmentation; lack of awareness and communication; motives and willingness to act; and resources." Moser and Ekstrom [26] use a systematic diagnostic framework. The framework uses theories of coupled socioecological systems thinking and multi-level governance theories by focusing on scale, contextual processes, and structures, amongst other factors, and it enables a flexible approach to examining the barriers [33]. Anderies *et al.* [34] define socioecological systems thinking as "an ecological system intricately linked with and affected by one or more social systems." Berkes [35] views the social (human) and ecological (biophysical) subsystems of systems thinking as two fundamental parts that function as a coupled, symbiotic, and co-evolutionary system. Furthermore, Hooghe and Marks [36] are of the view that theories of multi-level governance can be categorised into two definite types: the first is governance with a distinct structure and a vertically tiered hierarchy, in which only a limited number of authorities have actual decision-making powers [37]. The second type is "polycentric" governance, which is defined by Ostrom [38] as "multiple governing authorities at different scales rather than a monocentric unit."

This systematic diagnostic framework comprises three components, which are identifying the nature of the barrier, its source, and the location of influence over the barrier. In identifying the nature of the barrier, four phases of adaptation, including understanding, planning, implementation, and monitoring, guide this process (as illustrated in Figure 1). According to Moser and Ekstrom [26], the understanding phase focuses on the availability of adequate and valuable information and knowledge and the capacity of actors to engage efficiently with it. The planning phase encompasses the development of adaptation options, the assessment of options, and the selection of options. The management phase focuses on the implementation of the selected options, monitoring the environment and outcome of the realised options, and evaluation.

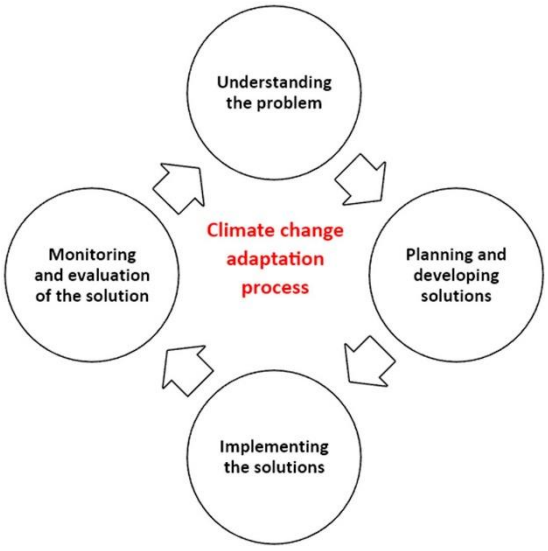

Figure 1. Depiction of the systematic diagnostic framework. Source: Reprinted/adapted with permission from Moser and Ekstrom (2010) [26].

The second component of the framework (Figure 2) involves identifying the source. The three essential sources of the barriers include the actors involved in the adaptation process, the larger context in which they act, and the object upon which they act [26,39]. According to Moser and Ekstrom [26], although the system to be managed may produce signs of change, the actors, governance system, and larger human and biophysical context affect whether they are detected and how they are interpreted.

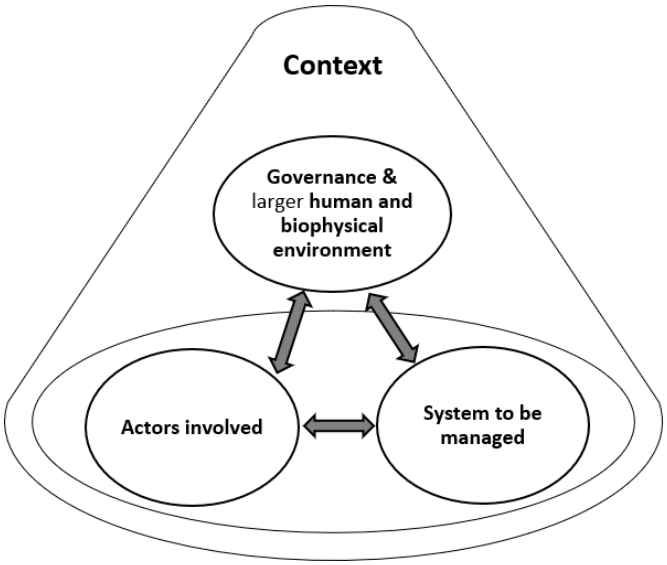

Figure 2. The structural elements of the diagnostic framework. Source: Reprinted/adapted with permission from Moser and Ekstrom (2010) [26].

The last component of the systematic diagnostic framework provides a "guide" to identify and understand the barriers, and to design strategies to evade, eradicate, or reduce them. A barrier that is both proximate and contemporary is one over which government officials have direct control here and now. (A in Figure 3), whereas a remote contemporary barrier is one that occurs now but is beyond the official's direct control (B in Figure 3). A proximate legacy barrier is one where a law prevents the official from taking a certain adaptation action (C in Figure 3). A remote legacy barrier is one that is a legacy of past science-policy decisions by remote officials (D in Figure 3).

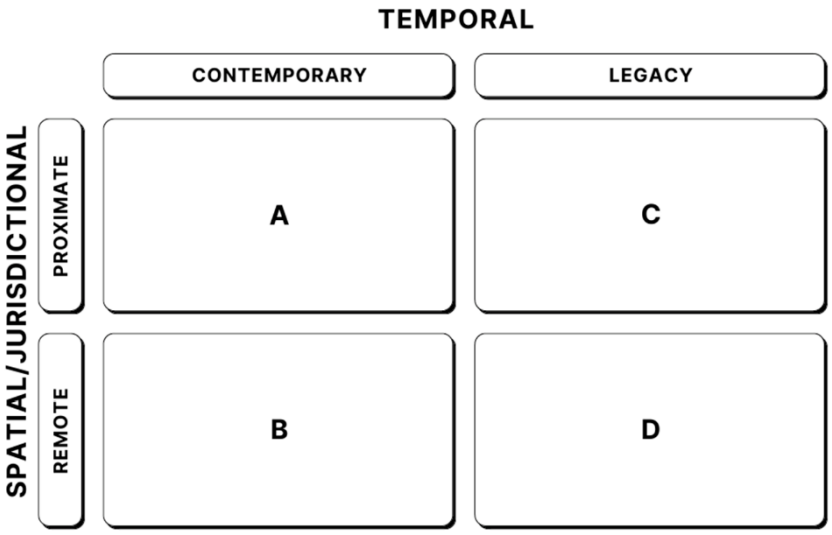

Figure 3. Opportunities to overcome barriers. Source: Reprinted/adapted with permission from Moser and Ekstrom (2010) [26].

1.2. Barriers to Climate Change Adaptation—A Synthesis of the Literature

Evidence is now emerging that barriers to adaptation often arise from institutional and cognitive constraints [26]. Governance failures occur when there is ineffective institutional decision-making and/or policy implementation [40,41]. These failures limit adaptation by creating barriers and slowing planning and delivery. Ekstrom and Moser [39] identified inadequate financial resources and political support as the common barriers encountered by local people in the San Francisco Bay Area in the United States of America in their adaptation efforts to climate change. This is supported by several studies that argue that at the national, provincial, and municipal government levels, a lack of financial resources and knowledge prevents and "locks out" people and institutions from solving problems and managing change [26,42,43]. Roberts [44], working extensively at the local and international scale on adaptation governance, is of the view that there are limited financial resources available locally to fund climate change adaptation initiatives at the national, provincial, or municipal levels in South Africa.

Furthermore, the problem of capacity has been conclusively cited in the policy integration literature [45]. Cullman *et al.* [46] argue that the sub-Saharan African region faces persistent technical and financial capacity constraints. Ryan and Bustos [47] argue that government departments and agencies working on climate adaptation policy do not have adequate human and technical abilities to analyse and evaluate the available information. On the other hand, studies conducted in Kenya, Ethiopia, Nigeria, Ghana, and Uganda by Mohmand and Loureiro [48] and Ampaire *et al.* [49] found that the local governments, though declared self-governing by the central government, do not have sufficient hu- man and financial resources to implement policies or climate-resilient actions, even when adaptation objectives and actions have been integrated into local development plans. A considerable body of literature argues that meeting funding requirements from bilateral and multilateral donors remains difficult for African countries [50,51]. The investment required for adaptation in developing countries can range from USD 50 billion to USD 500 billion annually in 2050 [52]. Numerous studies, therefore, argue that although adapta- tion finance through the United Nations Framework Convention on Climate Change will help offset some of the climate costs, it is not of the magnitude required for climate-proofing in developing countries [53–55].

The literature also demonstrates that the lack of explicit national agendas and inducements may burden local governments in a different way based on their different capacities [56,57]. Climate adaptation is also viewed as the segregated task of a particular sector that may hamper mainstreaming and horizontal coordination between sectors and departments and coerce the degree to which systems can learn or adapt to climate change [58–63]. It has also been argued that a lack of leadership and accountability at local levels hinders information dissemination, policy implementation, and financial accountabil- ity [14,64]. Additionally, it is highlighted in the literature that knowledge gaps are one of the main barriers that affect the planning and implementation of climate change adaptation measures [65]. Ryan and Bustos [47] observed that the knowledge available for climate adaptation policymaking (climate data, impact studies, social-environmental vulnerability assessments, etc.) is dispersed and fragmented. Numerous scholars have also identified limited climate change knowledge, institutional capacity, funding, awareness mechanisms, and coordination amongst and within government institutions as challenges [66,67].

In addition, Füssel [68] and Smit and Pilifosova [69] argue that government institutions lead the process of designing, implementing, and monitoring climate policy, and thus their "political will" is a major factor in the policy success. However, it is widely acknowledged in the literature that it is often a challenge to attain political will. Mossler *et al.* [70], for example, posit that one of the reasons for the low level of political support for climate change response globally is the way it has been framed by governments. He further argues that framing can shape the perception of a problem and impact the way the audience is likely to address it [70]. In the same vein, Füssel *et al.* [71] argue that making political decisions based on uncertainty in a dynamic system is a challenge that political leaders are

not always willing or able to face. On the other hand, Smith *et al.* [72] argue that political will is an important mechanism to overcome bureaucratic resistance and risk aversion in addressing wicked problems like climate change. Clement and Amezaga [73] are of the view that a lack of political will in national policymaking gives only weak inducements to those who implement local policies, which results in a reduced uptake. Keen *et al.* [74] argue that the political nature of local government means that political interests affect all decisions, including climate adaptation.

The historic tendency of municipalities to view climate change as an environmental problem can also affect mainstreaming, given that environmental issues are assigned a lower priority than other issues [75–77]. Thus, environmental departments are often not assigned much influence or resources [77–79]. Previous studies seem to suggest that politicians have not acknowledged climate adaptation as politically urgent to advance the policy agenda. Subsequently, they identify a tendency to prioritise other political concerns, which are often more tangible issues [58,75,80]. Ziervogel and Parnell [78] argue that one of the challenges that local governments face in mainstreaming adaptation to climate change is the lack of authority held by environmental departments to address climate change. Previous research has blamed the ineffective policy on limited budget allocations and staffing and insufficient stakeholder participation and linkages [81–85]. Therefore, there is strong evidence in the literature of the barriers that hinder the development and implementation of climate change adaptation policies and strategies in developed and developing countries with many pointing to various governance dimensions.

3. Materials and Methods

The data collection process for this paper was conducted between February and October 2021. A total of 30 government officials working on climate change adaptation at the national, provincial, and district/local government levels were purposively sampled from the government officials lists received from the Department of Forestry, Fisheries, and the Environment; KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs; and uMkhanyakude District Municipality. Out of the 30 government officials that were sampled, 13 participated in the study, making the response rate 43%. Semi-structured interviews were undertaken online through Microsoft Teams and telephonically with government officials from the Department of Forestry, Fisheries, and the Environment; the KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs; and the uMkhanyakude District Municipality. Government officials provided expert perspectives related to the barriers they are confronted with in facilitating effective climate change adaptation at the three government levels in South Africa. The profiles of the participants are displayed in Table 1 below.

The data obtained from government officials were analysed using thematic analysis. This involved familiarising and engaging with the data, generating codes for the data, searching for themes, reviewing themes, and defining and naming themes. According to Nowell *et al.* [86], a rigorous thematic analysis can generate insightful and reliable findings. This is aligned with Braun and Clarke [87], who argue that thematic analysis is flexible for identifying, describing, and interpreting themes within a data set in detail. It is tailored to qualitative studies that seek to investigate complex research issues, such as the one this paper sets out to investigate.

This paper used a systematic diagnostic framework developed by Moser and Ekstrom [26] to analyse the barriers to climate change adaptation in South Africa. It was important for a study of this nature to adopt this framework because understanding the barriers to climate change adaptation requires a holistic approach. The systematic diagnostic framework is based on four phases of adaptation, including understanding, planning, implementation, and monitoring. The framework uses theories of coupled socioecological systems thinking and multi-level governance theories by focusing on "scale, contextual processes, and structures, amongst other factors, and it enables a flexible approach to examining barriers" [33]. The systematic diagnostic framework enabled the classification

of the barriers identified in this paper and a comparison of the barriers across various government levels.

Table 1. The profiles of the government officials.

Title	Government Level
Youth Environmental Coordinator	District/Local
District and Local Government support—Environmental Management	District/Local
Executive Director—Community Services	District/Local
Youth Environmental Coordinator	District/Local
District Manager—Environmental Management	Provincial
Control Environmental Officer	Provincial
Climate Change Intern	Provincial
Climate Change Specialist	National
Chief Director—Climate Change Adaptation	National
Control Environmental Officer	National
Director of Adaptive Capacity Programme	National
Director—Climate Change Adaptation	National
Director—Climate Change Adaptation	National

Source: Field-based survey notes (2021).

4. Results

1.3. An Analysis of the Barriers to Climate Change Adaptation in South Africa

The fundamental issue driving this paper is to examine the barriers to climate change adaptation in South Africa. In light of this, government officials working on climate change adaptation were asked, "What are the key challenges that exist in developing and implementing climate change adaptation policies, strategies, and programmes at the national, provincial, and local government levels?" Firstly, government officials who participated in this study identified the barriers to climate change adaptation. Therefore, the nature of the barrier and the frequency of the responses received are presented in Figure 4 (in percentages).

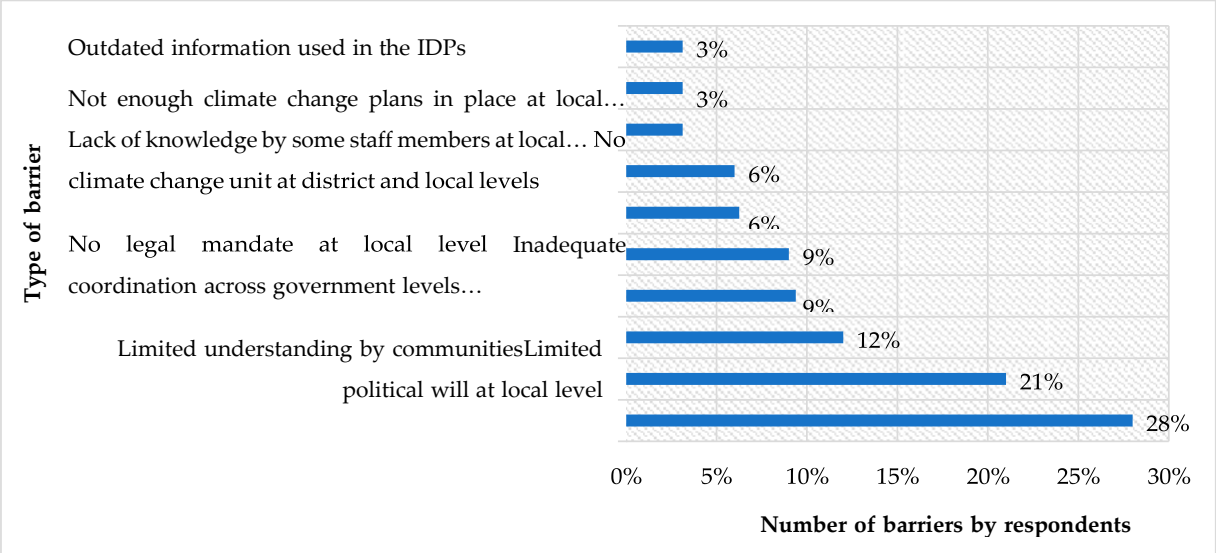

Figure 4. Frequency of different types of barriers encountered at the different government levels. Source: Field-based survey notes (2021).

The predominant barrier to climate change adaptation in South Africa is inadequate financial resources across all government levels, which represents 28% of the responses received from government officials working on climate change adaptation (Figure 4). A further 21% indicated that there is a lack of human capacity at the provincial and local government levels. An estimated 12% of the responses claimed that there is limited political will at the local government level, whereas 9% expressed that there is ineffective coordination across government officials, and a further 9% indicated there is a limited understanding of climate change issues by the communities. Of the total 12% of responses, 6% indicated that there is no climate change unit at the district and local government levels, and the remaining 6% expressed that there is no legal mandate at the local government level. Of the total 9% of responses, 3% claimed that outdated information on climate change is being used in the municipal Integrated Development Plans (IDPs); 3% expressed that there are not enough climate change plans in place at the local government level; and another 3% indicated a lack of knowledge by some staff members who are tasked with environmental duties at the district and local government levels.

In addition, the fundamental sources of the barriers were identified by government officials working on climate change adaptation issues. This data is presented using the systematic diagnostic framework; the data presented in Table 2 is structured around identifying the fundamental sources of the barriers under the four phases of adaptation (i.e., understanding, planning, implementation, and monitoring guide the process).

Table 2. A summary of the barriers presented by phase.

Understanding	Planning	Implementation and Monitoring
Limited understanding of climate change issues by communities	Not enough climate change plans in place at the local level	Inadequate financial resources
Limited political will		Lack of human resources
Lack of climate change knowledge by some staff members tasked with environmental duties	Inadequate coordination across government levels and sectors	
	No climate change unit at the local level	
	No legal mandate at the local level	
Outdated information on climate change issues used in the IDPs		

Source: Field-based survey notes (2021).

An examination of Table 2 suggests that four of the barriers have to do with understanding the importance of climate change adaptation. These include limited understanding of climate change issues by communities; lack of climate change knowledge by some staff members tasked with environmental duties; outdated information on climate change issues used in the municipal Integrated Development Plans; and limited political will. In view of this, one of the government officials indicated that:

> *"The change in political parties or administration after elections is always problematic because different political parties have different priorities and oftentimes climate change is not prioritised. Thus, it is important to note that politics is a reality we must learn to navigate"* (Remark 1).

Furthermore, Table 2 demonstrates that there are four barriers to climate change adaptation in the planning phase, one of which is that there are not enough climate change plans in place at the local level, and the other three overlap between the planning and implementation and monitoring phases (i.e., no legal mandate at the local level, no climate change unit at the local level, and inadequate coordination across government levels and sectors). To validate the above assertions, one government official alluded to the following:

> *"There isn't a united voice across government levels. It is not because people are in denial, but people are dealing with real-life issues, e.g., human settlements and service delivery.*

> *However, we need to work together. We need to find people within the different sectors to take up climate change work and work together using a bottom-up approach. We need to be proactive rather than reactive. We need to continue working at the operational level so that it cascades up"* (Remark 2).

Lastly, inadequate financial resources and a lack of human resources are the main barriers encountered in the implementation and monitoring phase. A government official from the Department of Forestry, Fisheries, and the Environment, who participated in an interview, disclosed that:

> *"There are not enough funds to implement all climate change plans and projects"* (Remark 3).

On the other hand, another government official indicated that:

> *"Although we receive external funding from donors, it is never enough"* (Remark 4).

In view of the lack of human resources, one government official stated that:

> *"The lack of employees who are purely climate change practitioners at the local government level hinders progress"* (Remark 5).

Social-ecological systems are nested within a larger system at global, regional, national, and local scales. Thus, it is important to note that the above-mentioned barriers vary across the government scales. In view of this, using the second component of the systematic diagnostic framework, the location of the influence over the barrier is identified in Table 3.

Table 3. A comparison of the barriers across the various government levels.

Barriers	**National Level**	**Provincial Level**	**District/Local Level**
	DFFE	**KZN EDTEA**	**UKDM**
Inadequate financial resources	X	X	X
Lack of human resources		X	X
Limited political will			X
Limited understanding of climate change issues by communities			X
Inadequate coordination	X	X	X
No legal mandate			X
No climate change unit			X
Lack of climate change knowledge by some staff members tasked with environmental duties			X
Not enough climate change plans			X
Outdated information on climate change issues used in the IDPs			X

Source: Field-based survey notes (2021).

The information in Table 3 suggests that there are inadequate financial resources and inadequate coordination across all three government levels in South Africa. Of particular interest is the fact that Table 3 seems to suggest that all the barriers (i.e., inadequate financial resources, lack of human resources, limited political will, limited understanding of climate change issues by communities, inadequate coordination, no legal mandate, no climate change unit, lack of climate change knowledge by some staff members tasked with environmental duties, not enough climate change plans, and outdated information on climate change issues used in the IDPs) are encountered or felt at the local government level in South Africa.

1.4. Suggested Strategies to Overcome Barriers

It was imperative to try and identify some of the origins of the barriers that were identified in this paper. Therefore, using the last component of the systematic diagnostic framework, Figure 5 demonstrates the origins of the barriers and how this has an influence on overcoming the barriers to climate change adaptation in South Africa.

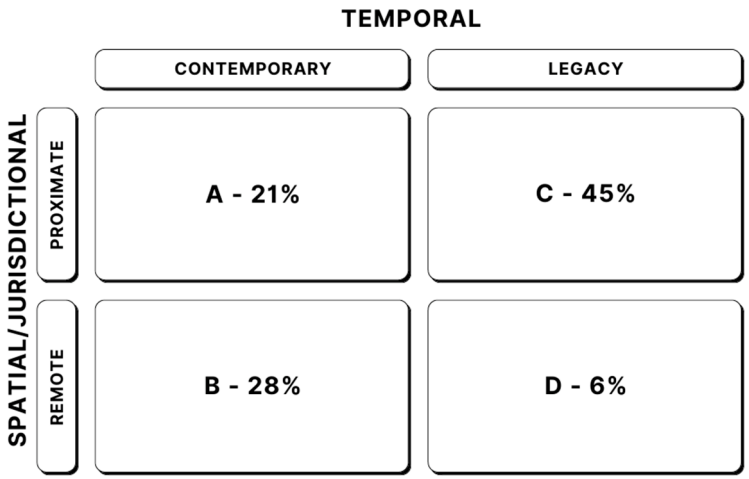

Figure 5. Summary of the origins of the barriers and the contribution represented as percentages. Source: Reprinted/adapted with permission from Moser and Ekstrom (2010) [26] using field-based survey notes (2021).

Scrutinising Figure 5 suggests that a combined total of 21% of the responses on the existing barriers form part of the proximate contemporary barriers. This comprises limited understanding of climate change issues by communities, representing 9% of the total responses, a lack of climate change knowledge by some staff members tasked with environmental duties (3%), and inadequate coordination across government levels and sectors (9%). These barriers can be overcome by government officials working on climate change adaptation, as they have control over them. The strategies that can be used to overcome these barriers include, but are not limited to, the following:

- Creating awareness and educating communities on climate change issues;
- Improving coordination across the government levels and sectors;
- Ensuring that staff members that are tasked with climate change issues are well-versed in this area of expertise.

A further 28% of the total responses form part of the remote contemporary barriers, which, although they occur now, the government officials working on climate change adaptation have no control over (i.e., the issue of inadequate financial resources). Therefore, the government can do the following:

- Prioritise climate change adaptation issues to ensure that they are budgeted for appropriately;
- Source external funding from donors for all government levels in order to ensure that there are funds to implement the strategies and plans that are meant to facilitate climate change adaptation on the ground.

A total of 45% of the total responses form part of the proximate legacy barriers against which the law prevents action. This comprises no legal mandate at the local levels (6%), no climate change unit at the district and local levels (6%), lack of human capacity at the provincial and local levels (21%), and limited political will at the local levels (12%). However, government officials have control over initiating changes in the regulations by:

- Advocating for the need for the government to create a legal mandate at the local government level;

1. Creating a climate change unit at the local government level;

- Increasing the human capacity to ensure that there are climate change adaptation practitioners on the ground implementing the strategies and plans that have been developed. In addition, these practitioners can play a major role in engaging with the communities, educating the communities, and driving change on the ground.

While the remaining 6% of the barriers form part of the "remote legacy barriers", which are a legacy of past decisions (i.e., not enough climate change plans in place at the local government level; representing 3% and the use of outdated information in the IDPs of municipalities; representing 3% of the total responses), some of these barriers could still be addressed by:

- Ensuring that the IDPs have relevant, up-to-date information on environmental issues, which can be achieved by having individuals who are well-versed in this area of expertise contribute to such important municipal documents and discussions.

However, closer scrutiny of Figure 5 suggests that the proximate barriers provide a combined 66% of the barriers over which government officials working on climate change adaptation have control by either providing the action to overcome the barriers or initiating changes in the regulations that exist. In view of this assertion, government officials shared the following suggestions:

- "*There is room for creating more climate change adaptation awareness programmes*" (Remark 6).
- "*Climate change adaptation strategies, plans and programmes must be aligned across the three levels of government and across sectors which are affected by climate change*" (Remark 7).
- "*There is an opportunity for improved integration between the three levels of government when it comes to climate change governance*" (Remark 8).

Therefore, the overall impression represented in Figure 5 indicates that although there are barriers that the law prevents, the government officials working on climate change adaptation should initiate and drive change.

5. Discussion

The findings presented in this paper demonstrate that the two predominant barriers to climate change adaptation in South Africa are inadequate financial resources, which are cross-cutting across all three government levels, and a lack of human capacity at the provincial and local levels. These barriers are mostly encountered in the implementation and monitoring phases of adaptation. The results presented in this study are consistent with previous findings from other studies. Ngwenya and Simatele [42] and Averchenkova *et al.* [88], for example, argued that at the national, provincial, and municipal government levels, a lack of financial resources and knowledge inhibits people and institutions from resolving problems and managing change. South Africa's National Treasury [89] estimates that nearly 80% of the district's municipal revenue is from the national government, and because of competing socio-economic demands, little of this revenue is allocated to the climate change response. Additionally, the empirical evidence presented in this paper supports previous studies that argue that financial barriers limit municipal adaptation mainstreaming, partly due to the many responsibilities they must perform and due to their lack of institutional autonomy [75,78]. These findings align with the findings from other regions. Measham *et al.* [75], for example, found that the key challenge to climate change adaptation across the Sydney region is the constrained resources (financial and human) faced by local governments. Hooli [90] found that in Namibia, the government has limited financial support for local or informal adaptation responses. As observed by Pressend [91], there is often an inadequate commitment to international funding for climate change adaptation actions, and when this funding is available, it is difficult to access it due to excessive red tape.

Goebel [92] concurred that a human resources crisis exists within South African municipalities, which must be addressed to overcome policy implementation hurdles.

Similarly, the South African National Development Plan 2030, "Our Future, Make It Work", considers that there is a lack of human resources and skills at the local government level. Alemaw and Simatele [23] further argue that the lack of resources at all government levels is inclined to inhibit people and institutions from solving problems and mapping changes caused by climate change. Having established this, we argue that the South African government must "put their money where their mouth is" and invest strategically in climate change to build a transformative climate change governance system. In addition, it is important to have a thought process on how South Africa will best utilise climate change adaptation finance for the benefit of all. Achieving this requires a radical shift towards enhancing investments in climate change funding in South Africa for adaptation.

Furthermore, the findings demonstrate that there is limited political will at the local government level, and this is because of poor understanding of climate change issues by politicians. This finding aligns with those of several previous studies. CoGTA [93], for example, acknowledged that a lack of policy coherence, skill scarcity, a lack of political leadership, and corruption are some of the major barriers encountered in promoting effective climate change adaptation in South Africa. This is supported by Khambule [94], who argues that weakening institutional ability and arrangements within municipalities takes place through political interference, a lack of efficient bureaucracy, and gross corruption. On the other hand, Scoville-Simonds *et al.* [95] are of the view that there are three major political adaptation difficulties, "related to differential responsibility, the global uneven production of vulnerability, and unequal relations of power in adaptation decision-making." Mapfumo *et al.* [96] suggest that political will and political probability are important factors in undertaking structured measures that are transformational in response to climate change. There is a need for South African political representatives to demonstrate political will for climate change adaptation when they make their national, provincial, and district/local budgets. Although there are conflicting priorities, such as service delivery through water provision, housing, energy supply, and infrastructure, climate change adaptation must be featured at the top of the list, particularly because climate change has and will continue to have dire impacts on all subsectors of the economy.

In addition, the findings presented in this paper revealed that three of the barriers to climate change adaptation alluded to by government officials had to do with understanding climate change issues. This involved a limited understanding of climate change adaptation issues by communities, a lack of knowledge by some staff members tasked with environmental duties at the local level, and outdated information used by politicians in the municipal IDPs. In view of this, we argue that climate change adaptation requires shared understanding. This finding largely corroborates Ross *et al.* [97], who argue that efficient and collective adaptation to climate change requires shared understandings of the possible impacts and risks gained through informed presentation and discussion with other participants. Numerous scholars, including Lemos *et al.* [98], argue that relations between knowledge producers and those who could use it can often overcome the cognitive and social divisions that weaken information usability by building trust, improving awareness, and improving understanding around issues of accuracy and reliability of climate information [99–102]. In view of this, therefore, this study argues that the government of South Africa must educate all citizens on climate change adaptation in order to improve understanding, increase awareness, and build trust.

It was also revealed that there is inadequate coordination across all government levels and that this affects the planning, implementation, and monitoring phases of adaptation. This paper suggests that there is a need for government officials working on climate change adaptation issues to advocate for coordination across government levels and sectors, as this will allow for resource mobilisation to address the wicked problem we are faced with. Loring *et al.* [103] argue that well-operated collaboration and coordination from each level of governance based on partnerships can facilitate adaptation to climate change and make societies more resilient to the uncertainty of impacts posed by climate change stakeholders. Some researchers also believe that learning through coordination improves local actors' capacity to adapt, enhances policy-making opportunities in broader governance networks,

and provides training for policymaking [104,105]. This is also supported by Mpandeli *et al.* [106], who argue that coordination ensures that there is resource mobilisation and policy convergence across sectors.

The findings of this study also demonstrate that two of the barriers to climate change adaptation alluded to by government officials have a negative impact on the planning, implementation, and monitoring phases of the adaptation process. These barriers include the lack of a legal mandate at the local government level and the fact that there is no climate change unit at the district and local levels. This finding seems to align with Du Plessis and Kotzé [107], who are of the view that the absence of a climate change mandate in South African municipalities has not helped matters as it has "downplayed the seriousness of the need for climate governance and action," making municipal authorities reluctant to act. Furthermore, this study argues that it is time for South Africa to tackle the long-standing barriers and move towards a governance system that will build the resilience and adaptive capacity of societies in times of changing climatic conditions.

It is suggestive that one barrier arises due to poor planning because there are not enough climate change plans at the local level. Without proper adaptation planning and the necessary investments in social safety nets, climate risks can adversely affect efforts to achieve the UN Sustainable Development Goals (SDGs) in sub-Saharan Africa [108–110].

The findings presented in this paper demonstrate that there is a differential distribution of resources across the different government levels. Therefore, it can be argued that the coordination among the multilevel polycentric governance structures and agency can become feasible and robust if coupled and symbiotic relationship is established as proposed by the social systems approach. Although multilevel governance systems may create more challenges and obstacles in the coordination among multilevel polycentric governance structures and decision making, social systems theory will enable us to overcome such challenges. This is in line with Biermann *et al.* [111] and Ostrom and Janssen [112], who argue that although multilevel governance theory enables learning and succeeding at multiple scales, there is no guarantee that it can successfully deal with complex human–ecological systems. Furthermore, it is congruent with numerous scholars who are of the view that to cope with the "wicked" problem of climate change, innovative and theoretically controversial adaptation actions whose goal is to support the associated social-ecological adaptation are necessary [113–115].

In view of the above discussion, it is important to note that the situation is not all doom and gloom. As illustrated in Figure 5, the majority of the barriers that exist are barriers over which government officials working on climate change adaptation have control by either providing actions to overcome the barriers or initiating changes in the regulations that exist. Thus, this paper argues that government officials working on climate change adaptation in South Africa should drive change, as they are better positioned to advocate for improvement in the conditions in which they are expected to drive the climate change adaptation agenda of the country.

6. Conclusions

This paper identifies some of the barriers to climate change adaptation in South Africa. These barriers include inadequate financial resources, a lack of human capacity at the provincial and local levels, limited political will at the local level, limited understanding of climate change adaptation issues by communities, inadequate coordination across government levels and sectors, no legal mandate at the local level, no climate change unit at the district and local levels, a lack of knowledge by some staff members tasked with environmental duties at the local level, not enough climate change plans in place at the local level, and outdated information on climate change used in the IDPs. There is, therefore, a need to improve capacity development, strengthen policy alignment, and improve integration between the three levels of government.

In addition, it is important for local municipalities to strengthen their role in issues related to climate change. Thus, we recommend that climate change be mainstreamed

in the Integrated Development Plan for local governments, which will ensure that when projects are budgeted for, they are climate responsive. Motivation from a climate change-responsive Integrated Development Plan will also ensure that there are funds to hire more climate change adaptation practitioners. Furthermore, there must be effective coordination of climate change adaptation issues across government levels and sectors if we are to effectively manage climate change.

Limitations and the Way Forward

Finally, this research is subject to a few limitations. Firstly, this study focused only on the barriers related to climate change adaptation. While our results reaffirm the importance of investigating and addressing the barriers to climate change adaptation, we are aware that barriers are highly context-specific, challenging to compare, and difficult to use for a more generalised understanding. Thus, there are opportunities to bolster our findings through future research. Most notably, our analysis focuses narrowly on barriers to climate change adaptation without taking into consideration the barriers encountered by government officials working in the subsectors of the economy that are affected by climate change (e.g., water, agriculture, and energy). We recommend that these limitations be addressed and explored in future studies.

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References

1. Intergovernmental Panel on Climate Change (IPCC). Adaptation to Climate Change in the Context of Sustainable Development and Equity. In *Climate Change 2001: Impacts, Adaptation and Vulnerability*; IPCC, Ed.; Cambridge University Press: Cambridge, UK, 2001.
2. Intergovernmental Panel on Climate Change (IPCC). Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. In *Climate Change 2022: Impacts, Adaptation and Vulnerability*; Pörtner, H.-O., Roberts, D.C., Tignor, M., Poloczanska, E.S., Mintenbeck, K., Alegría, A., Craig, M., Langsdorf, S., Löschke, S., Möller, V., *et al.*, Eds.; Cambridge University Press: Cambridge, UK; New York, NY, USA, 2022; p. 3056. [CrossRef]
3. Balint, P.J.; Stewart, R.E.; Desai, A.; Walters, L.C. *Wicked Environmental Problems: Managing Uncertainty and Conflict*; Island Press: Washington, DC, USA, 2011; p. 253.
4. Lazarus, R.J. Super wicked problems and climate change: Restraining the present to liberate the future. *Cornell Law Rev.* **2008**, *94*, 1153–1233.

5. Turpie, J.; Visser, M. The impact of climate change on South Africa's rural areas. In *Financial and Fiscal Commission Submission for the 2013/14 Division of Revenue*; Financial and Fiscal Commission: Cape Town, South Africa, 2013; pp. 100–162.
6. Van der Bank, M.; Karsten, J. Climate change and South Africa: A critical analysis of the Earthlife Africa Johannesburg and another v minister of energy and others 65662/16 (2017) case and the drive for concrete climate practices. *Air Soil Water Res.* **2020**,*13*, 1178622119885372. [CrossRef]
7. Savelli, E.; Rusca, M.; Cloke, H.; Di Baldassarre, G. Don't blame the rain: Social power and the 2015–2017 drought in Cape Town. *J. Hydrol.* **2021**, *594*, 125953. [CrossRef]
8. Nhamo, G.; Agyepong, A.O. Climate change adaptation and local government: Institutional complexities surrounding Cape Town's Day Zero. *Jàmbá J. Disaster Risk Stud.* **2019**, *11*, 717. [CrossRef] [PubMed]
9. David, S.G.T.; Twyman, C.; Osbahr, H.; Hewitson, B. Adaptation to climate change and variability: Farmer responses to intra-seasonal precipitation trends in South Africa. *Clim. Chang.* **2007**, *83*, 301–322.
10. Hummel, D. *Climate Change, Land Degradation and Migration in Mali and Senegal-Some Policy Implications, Migration and Development*; Institute of Social-Ecological Research: Frankfurt, Germany, 2015.
11. Skogen, K.; Helland, H.; Kaltenborn, B. Concern about climate change, biodiversity loss, habitat degradation and landscape change: Embedded in different packages of environmental concern? *J. Nat. Conserv.* **2018**, *44*, 12–20. [CrossRef]
12. Sibiya, N.; Sithole, M.; Mudau, L.; Simatele, M.D. Empowering the Voiceless: Securing the Participation of Marginalised Groups in Climate Change Governance in South Africa. *Sustainability* **2022**, *14*, 7111. [CrossRef]
13. Adom, R.K.; Simatele, M.D.; Reid, M. The Threats of Climate Change on Water and Food Security in South Africa. *Am. J. Environ. Clim.* **2022**, *1*, 73–91. [CrossRef]
14. Biesbroek, G.R.; Swart, R.J.; Carter, T.R.; Cowan, C.; Henrichs, T.; Mela, H.; Morecroft, M.D.; Rey, D. Europe adapts to climate change: Comparing national adaptation strategies. *Glob. Environ. Chang.* **2010**, *20*, 440–450. [CrossRef]
15. Keskitalo, E.C.H. (Ed.) *Developing Adaptation Policy and Practice in Europe: Multi-Level Governance of Climate Change*; Springer: Dordrecht, The Netherlands, 2010.
16. Huitema, D.; Adger, W.N.; Berkhout, F.; Massey, E.; Mazmanian, D.; Munaretto, S.; Plummer, R.; Termeer, C.C.J.A.M. The governance of adaptation: Choices, reasons, and effects. Introduction to the Special Feature. *Ecol. Soc.* **2016**, *21*, 37. [CrossRef]
17. Keping, Y. Governance and Good Governance: A New Framework for Political Analysis. *Fudan J. Humanit. Soc. Sci.* **2018**, *11*, 1–8. [CrossRef]
18. Sterk, W.; Wittneben, B. Enhancing the clean development mechanism through sectoral approaches: Definitions, applications and ways forward. *Int. Environ. Agreem. Politi. Law Econ.* **2006**, *6*, 271–287. [CrossRef]
19. Biermann, F. The rationale for a world environment organization. In *A World Environment Organization: Solution or Threat for Effective International Environmental Governance?* Biermann, F., Bauer, S., Eds.; Ashgate: Aldershot, UK, 2005; pp. 117–144.
20. Dessai, S.; Schipper, E.L. The Marrakech accords to the Kyoto Protocol: Analysis and future prospects. *Glob. Environ. Chang.* **2003**, *13*, 149–153. [CrossRef]
21. Grubb, M.; Yamin, F. Climatic collapse at The Hague: What happened, why, and where do we go from here? *Int. Aff.* **2001**, *77*, 261–276. [CrossRef]
22. Ortega-Cisneros, K.; Cochrane, K.L.; Rivers, N.; Sauer, W.H.H. Assessing South Africa's Potential to Address Climate Change Impacts and Adaptation in the Fisheries Sector. *Front. Mar. Sci.* **2021**, *8*, 652955. [CrossRef]
23. Alemaw, B.F.; Simatele, D. Integrating Climate Change Adaptation and Mitigation into Sustainable Development Planning: The Policy Dimension. In *Climate Variability and Change in Africa*; Sustainable Development Goals Series; Matondo, J.I., Alemaw, B.F., Sandwidi, W.J.P., Eds.; Springer: Cham, Switzerland, 2020.
24. Cockburn, I.; Henderson, R.; Stern, S. The impact of artificial intelligence on innovation. In *The Economics of Artificial Intelligence: An Agenda*; Agrawal, A., Gans, J., Goldfarb, A., Eds.; University of Chicago Press and NBER: Chicago, IL, USA, 2019.
25. Rijke, J.; Brown, R.; Zevenbergen, C.; Ashley, R.; Farrelly, M.; Morison, P.; van Herk, S. Fit-for-purpose governance: A framework to make adaptive governance operational. *Environ. Sci. Policy* **2012**, *22*, 73–84. [CrossRef]
26. Moser, S.C.; Ekstrom, J.A. A framework to diagnose barriers to climate change adaptation. *Proc. Natl. Acad. Sci. USA* **2010**, *107*, 22026–22031. [CrossRef]
27. Adger, W.N.; Barnett, J. Four Reasons for Concern about Adaptation to Climate Change. *Environ. Plan. A Econ. Space* **2009**, *41*, 2800–2805. [CrossRef]
28. Adger, W.N.; Eakin, H.; Winkels, A. Nested and teleconnected vulnerabilities to environmental change. *Front. Ecol. Environ.* **2009**, *7*, 150–157. [CrossRef]
29. Adger, W.N.; Agrawala, S.; Mirza, M.M.Q.; Conde, C.; O'Brien, K.; Pulhin, J.; Pulwarty, R.; Smit, B.; Takahashi, K. Assessment of Adaptation Practices, Options, Constraints and Capacity. In *Climate Change 2007: Impacts, Adaptation and Vulnerability*; Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change; Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J., Hanson, C.E., Eds.; Cambridge University Press: Cambridge, UK, 2007; pp. 717–743.
30. Klaus, E.; Susanne, C.M.; Esther, H.; Richard, K.; Christoph, O.; Anna, P.; Maja, R.; Catrien, T. Explaining and overcoming barriers to climate change adaptation. *Nat. Clim. Chang.* **2014**, *4*, 867–872.
31. Falaleeva, M.; O'Mahony, C.; Gray, S.; Desmond, M.; Gault, J.; Cummins, V. Towards climate adaptation and coastal governance in Ireland: Integrated architecture for effective management? *Mar. Policy* **2011**, *35*, 784–793. [CrossRef]

32. Biesbroek, R.; Klostermann, J.; Termeer, C.; Kabat, P. Barriers to climate change adaptation in the Netherlands. *Clim. Law* **2011**, *2*, 181–199. [CrossRef]
33. Mukheibir, P.; Kuruppu, N.; Gero, A.; Herriman, J. *Cross-Scale Barriers to Climate Change Adaptation in Local Government, Australia*; National Climate Change Adaptation Research Facility: Gold Coast, Australia, 2013; p. 95.
34. Anderies, J.M.; Janssen, M.A.; Ostrom, E. A framework to analyze the robustness of social-ecological systems from an institutional perspective. *Ecol. Soc.* **2004**, *9*, 18. [CrossRef]
35. Berkes, F. Restoring unity: The concept of marine social-ecological systems. In *World Fisheries: A Social-Ecological Analysis*; Ommer, R., Perry, I., Cochrane, K.L., Cury, P., Eds.; Wiley-Blackwells: Oxford, UK, 2011; pp. 9–28. [CrossRef]
36. Hooghe, L.; Marks, G. *Multi-Level Governance and European Integration*; Rowman & Littlefield: Boulder, CO, USA, 2001.
37. Fairbrass, J.; Jordan, A. European Union environmental policy and the role of the UK government: Passive observer or strategic manager. *Environ. Politics* **2001**, *10*, 1–21. [CrossRef]
38. Ostrom, E. Polycentric systems for coping with collective action and global environmental change. *Glob. Environ. Chang.* **2010**, *20*, 550–557. [CrossRef]
39. Ekstrom, J.A.; Moser, S.C. Identifying and overcoming barriers in urban climate adaptation: Case study findings from the San Francisco Bay Area, California, USA. *Urban Clim.* **2014**, *9*, 54–74. [CrossRef]
40. HMG. *The National Adaptation Programme: Making the Country Resilient to a Changing Climate*; Analytical Annex: Economics of the National Adaptation Programme; Her Majesty's Government (HMG), Stationery Office: London, UK, 2013.
41. Cimato, F.; Mullan, M. *Adapting to Climate Change: Analysing the Role of Government*; DEFRA Evidence and Analysis Series Paper 1; Department for Environment, Food and Rural Affairs (DEFRA): London, UK, 2010.
42. Ngwenya, N.; Simatele, M.D. The emergence of green bonds as an integral component of climate finance in South Africa. *S. Afr. J. Sci.* **2020**, *116*, 25–27. [CrossRef] [PubMed]
43. Serdeczny, O.; Adams, S.; Baarsch, F.; Coumou, D.; Robinson, A.; Hare, W.; Schaeffer, M.; Perrette, M.; Reinhardt, J. Climate change impacts in Sub-Saharan Africa: From physical changes to their social repercussions. *Reg. Environ. Chang.* **2017**, *17*, 1585–1600. [CrossRef]
44. Roberts, D. Thinking globally, acting locally Institutionalizing climate change at the local government level in Durban, South Africa. *Environ. Urban.* **2008**, *20*, 521–537. [CrossRef]
45. Peters, B.G. Policy capacity in public administration. *Policy Soc.* **2015**, *34*, 219–228. [CrossRef]
46. Cullmann, J.; Dilley, M.; Egerton, P.; Fowler, J.; Grasso, V.F.; Honoré, C.; Lúcio, F.; Luterbacher, J.; Nullis, C.; Power, M.;*et al. 2020 State of Climate Services*; Risk Information and Early Warning Systems; World Meteorological Organization: Geneva, Switzerland, 2020.
47. Ryan, D.; Bustos, E. Knowledge gaps and climate adaptation policy: A comparative analysis of six Latin American countries. *Clim. Policy* **2019**, *19*, 1297–1309. [CrossRef]
48. Mohmand, S.K.; Loureiro, M. Introduction: Interrogating Decentralisation in Africa. 2017. Available online: https://bulletin.ids.ac.uk/index.php/idsbo/article/view/2856/ONLINE%20ARTICLE (accessed on 29 January 2023).
49. Ampaire, E.L.; Jassogne, L.; Providence, H.; Acosta, M.; Twyman, J.; Winowiecki, L.; van Asten, P. Institutional challenges to climate change adaptation: A case study on policy action gaps in Uganda. *Environ. Sci. Policy* **2017**, *75*, 81–90. [CrossRef]
50. Timilsina, G.R. Financing Climate Change Adaptation: International Initiatives. *Sustainability* **2021**, *13*, 6515. [CrossRef]
51. Gujba, H.; Thorne, S.; Mulugetta, Y.; Rai, K.; Sokona, Y. Financing low carbon energy access in Africa. *Energy Policy* **2012**, *47*, 71–78. [CrossRef]
52. Aligishiev, Z.; Bellon, M.; Massetti, E. *MacroFiscal Implications of Adaptation to Climate Change*; IMF Staff Climate Note 2022/002; International Monetary Fund: Washington, DC, USA, 2022.
53. United Nations Environment Programme. *Future Proofing Infrastructure to Address the Climate, Biodiversity and Pollution Crises*; UNEP: Nairobi, Kenya, 2021.
54. Donner, L.J.; Wyman, B.L.; Hemler, R.S.; Horowitz, L.W.; Ming, Y.; Zhao, M.; Golaz, J.-C.; Ginoux, P.; Lin, S.-J.; Schwarzkopf, M.D.; *et al.* The dynamical core, physical parameterizations, and basic simulation characteristics of the atmospheric component AM3 of the GFDL global coupled model CM3. *J. Clim.* **2011**, *24*, 3484–3519. [CrossRef]
55. Fankhauser, S.; Schmidt-Traub, G. From adaptation to climate-resilient development. The cost of climateproofing the Millennium Development Goals in Africa. *Clim. Dev.* **2011**, *3*, 1–20. [CrossRef]
56. Dannevig, H.; Rauken, T.; Hovelsrud, G. Implementing adaptation to climate change at the local level. *Local Environ.* **2012**, *17*, 597–611. [CrossRef]
57. Anguelovski, I.; Carmin, J. Something borrowed, everything new: Innovation and institutionalization in urban climate governance. *Curr. Opin. Environ. Sustain.* **2011**, *3*, 169–175. [CrossRef]
58. Runhaar, H.; Mees, H.; Wardekker, A.; van der Sluijs, J.; Driessen, P.P.J. Adaptation to climate change-related risks in Dutch urban areas: Stimuli and barriers. *Reg. Environ. Chang.* **2012**, *12*, 777–790. [CrossRef]
59. Larsen, S.V.; Kørnøv, L.; Wejs, A. Mind the gap in SEA: An institutional perspective on why assessment of synergies amongst climate change mitigation, adaptation and other policy areas are missing. *Environ. Impact Assess. Rev.* **2012**, *33*, 32–40. [CrossRef]
60. Wilby, R.L.; Keenan, R. Adapting to flood risk under climate change. *Prog. Phys. Geogr. Earth Environ.* **2012**, *36*, 348–378. [CrossRef]

61. Burch, S. Transforming barriers into enablers of action on climate change: Insights from three municipal case studies in British Columbia, Canada. *Glob. Environ. Chang.* **2010**, *20*, 287–297. [CrossRef]
62. Roberts, D. Prioritizing climate change adaptation and local level resilience in Durban, South Africa. *Environ. Urban.* **2010**, *22*, 397–413. [CrossRef]
63. Storbjörk, S. 'It Takes More to Get a Ship to Change Course': Barriers for Organizational Learning and Local Climate Adaptation in Sweden. *J. Environ. Policy Plan.* **2010**, *12*, 235–254. [CrossRef]
64. Amundsen, H.; Berglund, F.; Westskogs, H. Overcoming Barriers to Climate Change Adaptation—A question of multi-level governance? *Environ. Plan. C Gov. Policy* **2010**, *28*, 276–289. [CrossRef]
65. United Nations Environment Programme. Annual Report. 2022. Available online: https://www.unep.org/resources/annual-report-2022 (accessed on 21 April 2023).
66. Taljaard, S.; van Niekerk, L.; Weerts, S.P. The legal landscape governing South Africa's coastal marine environment—Helpingwith the 'horrendogram'. *Ocean. Coast. Manag.* **2019**, *178*, 104801. [CrossRef]
67. Ampaire, L.; Muhindo, A.; Orikiriza, P.; Mwanga-Amumpaire, J.; Bebell, L.; Boum, Y. A review of antimicrobial resistance in East Africa. *Afr. J. Lab. Med.* **2016**, *5*, a432. [CrossRef]
68. Füssel, H.-M. Adaptation planning for climate change: Concepts, assessment approaches, and key lessons. *Sustain. Sci.* **2007**, *2*, 265–275. [CrossRef]
69. Smit, B.; Pilifosova, O. From adaptation to adaptive capacity and vulnerability reduction. In *Climate Change, Adaptive Capacity, and Development*; Smith, J.B., Klein, R.J.T., Huq, S., Eds.; Imperial College Press: London, UK, 2003; pp. 9–28.
70. Mossler, M.V.; Bostrom, A.; Kelly, R.P.; Crosman, K.M.; Moy, P. How does framing affect policy support for emissions mitigation? Testing the effects of ocean acidification and other carbon emissions frames. *Glob. Environ. Chang.* **2017**, *45*, 63–78. [CrossRef]
71. Füssel, H.M.; Kurnik, B.; Tomescu, M.; Vanneuville, W.; Smith, M.; Gerber, F.; Artola, I.; Adriaenssens, V.; Bigano, A.; Vingerhouts, P.; *et al. Adaptation Challenges and Opportunities for the European Energy System: Building a Climate-Resilient Low-Carbon Energy System*; EEA Report No 01/2019; Publications Office of the European Union: Luxembourg, 2019.
72. Smith, T.F.; Preston, B.; Brooke, C.; Gorddard, R.; Abbs, D.; McInnes, K.; Withycombe, G.; Morrison, C.; Beveridge, B.; Measham, T.G. Managing coastal vulnerability: New solutions for local government. In *Integrated Coastal Zone Management*; Moksness, E., Dahl, E., Støttrup, J.G., Eds.; Wiley-Blackwell: West Sussex, UK, 2009.
73. Clement, F.; Amezaga, J.M. Afforestation and forestry land allocation in northern Vietnam: Analysing the gap between policy intentions and outcomes. *Land Use Policy* **2009**, *26*, 458–470. [CrossRef]
74. Keen, M.; Mahanty, S.; Sauvage, J. Sustainability assessment and local government: Achieving innovation through practitioner networks. *Local Environ.* **2006**, *11*, 201–216. [CrossRef]
75. Measham, T.G.; Preston, B.L.; Smith, T.F.; Brooke, C.; Gorddard, R.; Withycombe, G.; Morrison, C. Adapting to climate change through local municipal planning: Barriers and challenges. *Mitig. Adapt. Strat. Glob. Chang.* **2011**, *16*, 889–909. [CrossRef]
76. Wilhelm-Rechmann, A.; Cowling, R.M. Local land-use planning and the role of conservation: An example analysing opportunities. *S. Afr. J. Sci.* **2013**, *109*, 1–6. [CrossRef]
77. Hardoy, J.; Lankao, P.R. Latin American cities and climate change: Challenges and options to mitigation and adaptation responses. *Curr. Opin. Environ. Sustain.* **2011**, *3*, 158–163. [CrossRef]
78. Ziervogel, G.; Parnell, S. *South African Coastal Cities: Governance Responses to Climate Change Adaptation. Climate Change at the City Scale, Impacts, Mitigation and Adaptation in Cape Town*; Cartwright, A., Parnell, S., Oelofse, G., Ward, S., Eds.; Routledge: Abingdon, UK, 2012.
79. Dalal-Clayton, B.; Bass, S. *The Challenges of Environmental Mainstreaming: Experience of Integrating Environment into Development Institutions and Decisions*; Environmental Governance No. 3; International Institute for Environment and Development: London, UK, 2009.
80. Preston, B.L.; Dow, K.; Berkhout, F. The Climate Adaptation Frontier. *Sustainability* **2013**, *5*, 1011–1035. [CrossRef]
81. Hepworth, N. *Climate Change Vulnerability and Adaptation Preparedness in Uganda*; Heinrich Böll Stiftung, Regional Office for East and Horn of Africa: Nairobi, Kenya, 2010.
82. Rwakakamba, T.M. Examining the nexus between depletion of water catchments systems and the deepening water crisis in Uganda. *IOP Conf. Ser. Earth Environ. Sci.* **2009**, *6*, 292049. [CrossRef]
83. Friis-Hansen, E.; Bashaasha, B.; Aben, C. Decentralization and Implementation of Climate Change Policy in Uganda. DIIS Working Paper 27. 2013. Available online: https://www.diis.dk/files/media/publications/import/extra/wp2013-17_ccri_uganda_efh_web.pdf (accessed on 3 December 2022).
84. Orindi, V.A. *Evaluation of the Status of NAPA/NAP in Ethiopia, Tanzania, Uganda and Kenya*; Climate Change Agriculture and Food Security (CCAFS); ECBI: Sydney, NSW, Australia, 2013.
85. Madzwamuse, M. Drowning voices: The climate change discourse in South Africa. *Policy Brief* **2010**, *5*, 1–8.
86. Nowell, L.S.; Norris, J.M.; White, D.E.; Moules, N.J. Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *Int. J. Qual. Methods* **2017**, *16*, 1–13. [CrossRef]
87. Braun, V.; Clarke, V. Using thematic analysis in psychology. *Qual. Res. Psychol.* **2006**, *3*, 77–101. [CrossRef]

88. Averchenkova, A.; Gannon, K.E.; Patrick, C. *Governance of Climate Change Policy: A Case Study of South Africa*; Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy: London, UK; London School of Economics and Political Science: London, UK, 2019.
89. National Treasury. Annual Report; Republic of South Africa. 2016. Available online: https://www.treasury.gov.za/publications/annual%20reports/national%20treasury/nt%20annual%20report%202016-17.pdf (accessed on 15 November 2022).
90. Hooli, L.J. Resilience of the poorest: Coping strategies and indigenous knowledge of living with the floods in Northern Namibia. *Reg. Environ. Chang.* **2016**, *16*, 695–707. [CrossRef]
91. Pressend, M. Financial barriers to adaptation implementation: A South African case study on financing water adaptation. In *Overcoming Barriers to Climate Change Adaptation Implementation in Southern Africa*; Masters, L., Duff, L., Eds.; Africa Institute of South Africa: Pretoria, South Africa, 2011; pp. 163–179.
92. Goebel, J.M. Risk, return, and performance measurement: A case of unrealistic expectations? *Risk Manag. Insur. Rev.* **2007**, *10*, 51–68. [CrossRef]
93. CoGTA. Annual Report 2009/2010. National Disaster Management Centre Cooperative Governance & Traditional Affairs. Available online: https://www.cogta.gov.za/cgta_2016/wp-content/uploads/2016/06/NDMC-ANNUAL-REPORT-2009-2010-FINAL-14-May-2012.pdf (accessed on 25 November 2022).
94. Khambule, I. Imagining an Institutionalised Social Dialogue in the South African Local Government-Led Development Landscape. *Forum Dev. Stud.* **2018**, *45*, 97–117. [CrossRef]
95. Scoville-Simonds, M.; Jamali, H.; Hufty, M. The Hazards of Mainstreaming: Climate change adaptation politics in three dimensions. *World Dev.* **2020**, *125*, 104683. [CrossRef]
96. Mapfumo, P.; Onyango, M.; Honkponou, S.K.; El Mzouri, E.H.; Githeko, A.; Rabeharisoa, L.; Obando, J.; Omolo, N.; Majule, A.; Denton, F.; *et al.* Pathways to transformational change in the face of climate impacts: An analytical framework. *Clim. Dev.* **2017**, *9*, 439–451. [CrossRef]
97. Ross, H.; Shaw, S.; Rissik, D.; Cliffe, N.; Chapman, S.; Hounsell, V.; Udy, J.; Trinh, N.T.; Schoeman, J. A participatory systems approach to understanding climate adaptation needs. *Clim. Chang.* **2015**, *129*, 27–42. [CrossRef]
98. Lemos, M.C.; Kirchhoff, C.J.; Ramprasad, V. Narrowing the climate information usability gap. *Nat. Clim. Chang.* **2012**, *2*, 789–794. [CrossRef]
99. Kirchhoff, C.J. Understanding and enhancing climate information use in water management. *Clim. Chang.* **2013**, *119*, 495–509. [CrossRef]
100. Roncoli, C.; Jost, C.; Kirshen, P.; Sanon, M.; Ingram, K.T.; Woodin, M.; Somé, L.; Ouattara, F.; Sanfo, B.J.; Sia, C.; *et al.* From accessing to assessing forecasts: An end-to-end study of participatory climate forecast dissemination in Burkina Faso (West Africa). *Clim. Chang.* **2009**, *92*, 433–460. [CrossRef]
101. Pagano, T.; Hartmann, H.; Sorooshian, S. Factors affecting seasonal forecast use in Arizona water management: A case study of the 1997-98 El Niño. *Clim. Res.* **2002**, *21*, 259–269. [CrossRef]
102. Power, S.; Sadler, B.; Nicholls, N. The Influence of Climate Science on Water Management in Western Australia: Lessons for Climate Scientists. *Bull. Am. Meteorol. Soc.* **2005**, *86*, 839–844. [CrossRef]
103. Loring, P.A.; Gerlach, S.C.; Atkinson, D.E.; Murray, M.S. Ways to help and ways to hinder: Governance for successful livelihoods in changing climate. *Artic* **2011**, *64*, 73–88.
104. Owen, S. Learning across levels of governance: Expert advice and the adoption of carbon dioxide emissions reduction targets in the UK. *Glob. Environ. Chang.* **2010**, *20*, 394–401. [CrossRef]
105. Keskitalo, E.C.H.; Kulyasova, A.A. The role of governance in community adaptation to climate change. *Polar Res.* **2009**, *28*, 60–70. [CrossRef]
106. Mpandeli, S.; Naidoo, D.; Mabhaudhi, T.; Nhemachena, C.; Nhamo, L.; Liphadzi, S.; Hlahla, S.; Modi, A.T. Climate Change Adaptation through the Water-Energy-Food Nexus in Southern Africa. *Int. J. Environ. Res. Public Health* **2018**, *15*, 2306. [CrossRef]
107. Du Plessis, A.A.; Kotzé, L.J. The Heat is on: Local Government and Climate Governance in South Africa. *J. Afr. Law* **2014**, *58*, 145–174. [CrossRef]
108. Alemaw, B.F. Framework of best practice for climate change adaptation in Africa: The water–development nexus. In *Climate Variability and Change in Africa: Perspectives, Experiences and Sustainability*; Sustainable Development Goals Series; Springer: Cham, Switzerland, 2020. [CrossRef]
109. Baarsch, F.; Granadillos, J.R.; Hare, W.; Knaus, M.; Krapp, M.; Schaeffer, M.; Lotze-Campen, H. The impact of climate change on incomes and convergence in Africa. *World Dev.* **2020**, *126*, 104699. [CrossRef]
110. Cacho, O.J.; Moss, J.; Thornton, P.K.; Herrero, M.; Henderson, B.; Bodirsky, B.L.; Humpenöder, F.; Popp, A.; Lipper, L. The value of climate-resilient seeds for smallholder adaptation in sub-Saharan Africa. *Clim. Chang.* **2020**, *162*, 1213–1229. [CrossRef]
111. Biermann, F.; Bai, X.; Bondre, N.; Broadgate, W.; Chen, C.-T.A.; Dube, O.P.; Erisman, J.W.; Glaser, M.; van der Hel, S.; Lemos, M.C.; *et al.* Down to earth: Contextualizing the Anthropocene. *Glob. Environ. Chang.* **2016**, *39*, 341–350. [CrossRef]
112. Ostrom, E.; Janssen, M.A. Multi-Level Governance and Resilience of Social-Ecological Systems. In *Globalisation, Poverty and Conflict: A Critical "Development" Reader*; Spoor, M., Ed.; Springer: Dordrecht, The Netherlands, 2005; pp. 239–259.
113. Serrao-Neumann, S.; Harman, B.P.; Choy, D.L. The Role of Anticipatory Governance in Local Climate Adaptation: Observations from Australia. *Plan. Pract. Res.* **2013**, *28*, 440–463. [CrossRef]

114. Hobbs, R.J.; Hallett, L.M.; Ehrlich, P.R.; Mooney, H.A. Intervention Ecology: Applying Ecological Science in the Twenty-firstCentury. *BioScience* **2011**, *61*, 442–450. [CrossRef]
115. Araújo, M.B.; Alagador, D.; Cabeza, M.; Nogués-Bravo, D.; Thuiller, W. Climate change threatens European conservation areas:Climate change threatens conservation areas. *Ecol. Lett.* **2011**, *14*, 484–492. [CrossRef] [PubMed]

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