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Evaluating the impact of drought on rural communities

– A case study of Umuziwabantu Local Municipality in KwaZulu Natal, South Africa

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Abstract

Droughts are a natural phenomenon that occur in hydrological cycles. However, the effect of climate change will increase the frequency and severity of drought. It is therefore, important that communities and the ecosystem learn to adapt to these abrupt changes. The rural households are negatively affected by the impacts of drought on their livelihoods. The rural households have limited or basic level of access to water and droughts further impact on their ability to access water. While droughts are natural, the impact may be worsened by human activity. In this thesis, the linkages between agricultural exports and water shortages are assessed. The impact of the water shortages on rural households and their coping strategies are also assessed.

The research was undertaken in *Umuziwabantu* Local Municipality through semi-structured and informal interviews with rural people, commercial farmer and government officials. The analysis was done using the Adaptive Governance Framework and linking it to Sustainable Livelihood Framework. The research findings showed that rural households employ different strategies to cope with the drought and create resilience. It also showed that there is more research needed on the linkages between agricultural exports and water shortages. The governance institutions were also found to not being flexible enough to adapt to the shocks.

Keywords: Resilience, Rural Livelihoods, Coping Strategies, Subsistence Farming, Water Security

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To my village, my family, especially my mother and three sisters, I am nothing without you. You ensured that my daughters were loved and cared for while I was in Sweden living my dream. It truly takes a village and you are mine. A special gratitude also goes to my relatives and friends, your support will always be appreciated. I will be wrong to exclude my church family, especially in my home parish of St Catherine, your prayers carried me through.

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Ngiyabonga.

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Abbreviations

CMA	Catchment Management Agency
CO-OP	Cooperative
DM	District Municipality
DAFF	Department of Agriculture, Forestry and Fisheries
DWS	Department of Water Affairs and Sanitation
EPWP	Extended Public Works Program
FAO	Food and Agriculture Organisation
GWP	Global Water Partnership
IDP	Integrated Development Plan
IWRM	Integrated Water Resource Management
KZN	KwaZulu Natal
KZNDARD	KZN Department of Agriculture and Rural Development
LED	Local Economic Development
NWA	National Water Act
SAMAC	Macadamia South Africa
StatsSA	Statistics South Africa
SIWI	Stockholm International Water Institute
ULM	Umuziwabantu Local Municipality
UN	United Nations
WSA	Water Service Authority
WUA	Water User Association
WWF	World Wildlife Fund

1 Introduction

1.1 Background

The United Nations (UN) Sustainable Development Goal six is to "*ensure availability and sustainable management of water*" (United Nations, 2019). The first target and indicator of this SDG is that by 2030 everyone should have access to safe and drinking water (UN, 2015). In 2015, 844 million people lacked a basic level access to safe drinking water globally (UN, 2018).

"more than 2 billion people are living with the risk of reduced access to freshwater resources and by 2050, at least one in four people is likely to live in a country affected by chronic or recurring shortages of fresh water" (United Nations, 2019).

The burden of gathering water in Sub-Saharan Africa falls mainly on the shoulders of women. It is estimated that in Sub-Saharan Africa, women collectively spend 40 billion hours a year collecting water which severely limits their employment opportunities (UN Women, 2014).

A very popular slogan is that "water is life", it will be a cliché if it was not true. This precious resource is scarce in some areas and abundant in others. In South Africa it is scarce and the drought of 2016 to 2018 devastated large parts of the country, with the government declaring it a national disaster on 13 March 2018 (Business Tech. 2018). A drought is described as a water shortage for an extended period of time caused by a deficiency of rainfall (Islam and Ryan, 2016).

South Africa relies on agriculture for food production and the assurance of food security and water is a vital component in ensuring food security for all citizens. The agricultural sector is the major water user in South Africa at an estimated 62% (WWF, 2016). The agricultural products produced in South Africa are for both the domestic and the international markets. The agricultural exports in the year 2017/2018 increased by 7.5% from the year 2016/2017 despite the drought (DAFF, 2018). The agricultural food export sector is therefore a growing industry in South Africa. Agriculture is important for continued economic growth and this includes

the export of agricultural products. However, it is also true that "*exports of food can be seen as the export of accessible water*" (Farmers Weekly, 2016). The water that is exported is virtual water, which is defined as "*the water required to produce the food, goods and services that we consume daily*" (Antonelli and Greco, 2015). The water that is used for agricultural export products in South Africa is virtual water benefiting the receiving markets. While this is good for the economy of the country, it may prove harmful for the ecosystem and communities during a drought.

This study focuses on Umuziwabantu Local Municipality (ULM), which is one of the six local councils of the Ugu District Municipality on the Southern border of KwaZulu Natal (KZN) Province (Umuziwabantu, 2015). The municipality is largely rural made up of tribal authority areas, i.e. areas under the authority of a traditional council led by a chief, and farms. According to the Integrated Development Plan (IDP), the municipality is 2% urban, 36% farmlands, 20% forestation and 40% tribal areas (ULM IDP, 2014). This translates to 98% of the municipality is rural and sparsely populated with 88 people per square kilometre (ULM IDP, 2014). The ULM rural households have abundant land and some practice subsistence farming.

The ULM was declared a disaster area on the 30 July 2018, due to the drought which saw the levels of Harding Dam fall below 15% and Weza River at an all-time low level (News24, 2018).

"Commercial forestry represents the most significant economic land use by area. Whereas, the area under commercial agriculture is occupied primarily by sugar-cane cultivation" (ULM, 2015)

The primary crop in the municipality is sugar cane, as a crop, sugar cane is noted for its "significant water consumption" (WWF, 2005, p.12). "*In South Africa sugar cane is largely rain fed and only about 20% is irrigated*" (Sugar Association of South Africa, 2019). Cheesman (2004:17) writes that

> "in South Africa, there is even debate over whether non-irrigated cane consumes so much rainwater that it should be classified as a stream flow reduction activity".

A stream flow reduction activity is defined as

> "... any activity … [that] ... is likely to reduce the availability of water in a watercourse to the Reserve, to meet international obligations, or to other water users significantly" (National Water Act, 1998, s36 (2)).

This classification of sugarcane as a stream flow reduction activity has not been undertaken yet in South Africa. Thus, according to Dye and Versfeld (2007),

> "the resultant paradox is that sugarcane is not defined as a 'water use' although it is known to use water, and cane-growers do not have to register or licence or pay for the water they use" (ibid, 2007:124).

According to section 36 (1) (a) of the National Water Act (NWA) only commercial forestry is currently classified as a stream flow reduction activity

(NWA, 1998). However, section 36 (2), gives provisions for the minister to declare any commercial activity reduces the water in a watercourse to the Reserve, as stream flow reduction activity (ibid, 1998). Therefore, even rain-fed agriculture still uses a lot of water which remains unquantified and unregulated under the NWA. Sugar mills are big consumers of water and they sometimes close during a drought due to water shortages. This is confirmed by Cheesman (2004:52) when he opines that "*the processing of sugarcane involves relatively high levels of water consumption*".

This research seeks to understand and evaluate the impact of a recent drought (2018-2019) on the rural livelihoods and households of a rural municipality. It will also evaluate if there are any linkages between the export of agricultural products, particularly the sugar cane and the macadamia nuts from the case study area to international markets and the water shortages during the drought.

1.2 Problem Statement

The drought that affected large parts of South Africa could be blamed on the recent strong El Nino and exacerbated by the effects of climate change and increasing water demand, this is according to a drought expert, Dr Niko Wanders (Utrecht University, 2018). The allocation of water through water user licences disadvantages the subsistence farmers during a drought as they rely on rain and available surface water. This creates water hegemony for the commercial farmers and forestry who export most of their products out of the municipality. Yet Umuziwabantu Local Municipality (ULM), a mainly rural municipality is reliant on agricultural growth for its economic development. The agricultural exports from the area, result in exports of water and this water has not been quantified.

Furthermore, the impact of these water exports on the availability of water during periods of drought has never been studied. The rural households within the municipality who rely on these scarce water resources for their livelihoods are largely forgotten and left to fend for themselves and must dig for springs in search of water. Yet South Africa's legislation and institutions are established to protect the rights of all, including those who live in rural areas. This legislative and institutional framework is set on the pillars of "the most admirable constitution in the history of the world" (Kende, 2003). Indeed, the Constitution of South Africa is often referred to as the best in the world. However, implementation of legislation is slow and lacking in certain areas of society. For example, the National Water Act (NWA) calls for the establishment of Catchment Management Agencies in the 19 Water Management Areas in South Africa. This was later revised to nine due to the slow process of implementation. To date only three have been established. The failure in governance exacerbates the impact of climatic events such as the drought.

In responding to the disaster such as a drought, government often look at a larger geographic area and neglect the impact at household level. There seems to be limited understanding on the level and scale of the impact on rural households and how to holistically address them. The co-operative governance nature of the disaster management framework is not followed by all government institutions involved, at least in ULM. Therefore, the response to the impact of the drought to the rural households has been too slow and, in some cases, non-existent. The rural households in Umuziwabantu have had to learn ways to survive the drought by relying on their own indigenous knowledge and social ties with neighbours.

The aim of this study is to understand the challenges faced by the rural households during a drought; and how they used their capital to maintain their livelihoods.

1.3 Aim and Objectives

This research investigates the interconnectedness of water with resilient rural households. It seeks to understand how agricultural products produced in a rural municipality impact on the rural households during a drought.

The objective of this research is twofold:

i. To investigate the impact this relationship on the livelihoods of rural households, including food and water security, as well as the mitigating measures taken to minimise the impact of drought on rural households.

Emanating from this objective is the need to investigate the causes of the water shortages experienced during the drought. This led to a secondary objective which is:

ii. To understand the relationship between agricultural exports and water shortages in times of a drought and how the participants understand the meaning of this relationship.

1.4 Research Questions

To achieve the above objectives, I used the following guiding questions for this research are:

i. What was the impact of agricultural exports on water shortages at ULM during the drought?
ii. How was water allocated for agriculture during a drought?
iii. How did the drought affect rural households and their livelihoods?
iv. To what extent did the households use their assets to adapt and mitigate the impacts of drought?

1.5 Thesis Outline

This thesis consists of six chapters. The first chapter is the introduction and consists of the background information, problem statement, the research objectives and research questions. The second chapter sets out the contextual background in the form of the legislative framework, institutional arrangements and governance. The third chapter deals with the literature review and theoretical framework. Chapter four covers the methodology. The fifth chapter is the empirical analysis and discussion. In the sixth chapter, I draw conclusions and outline the key findings.

2 Understanding the context

To understand the empirical findings of this study, it is important to understand the water management legislative, governance and institutional framework. I have also highlighted the Disaster Management Framework that is used to respond to a drought. This is to contextualise the legislation and institutions tasked or mandated to respond to the drought.

2.1 The South African National Water Policy

All the water policy in South Africa, as does all policy in the country, gets its mandate from the Constitution of the Republic of South Africa. The Bill of Rights, enshrined as the cornerstone of the Constitution, "*applies to all law, and binds the legislature, the executive, the judiciary and all organs of state*" (Bill of Rights, Constitution of South Africa, Section 8 (1), 1996, p.5). They also ensure that everyone is equal before the law and should enjoy equal enjoyment of all the rights and freedoms (Bill of Rights, Constitution of South Africa, Section 9 (1) and (2)). Furthermore, they afford everyone the right to have access to sufficient water (Bill of Rights, Constitution of South Africa, Section 27 (1) (b)).

The development of the NWA (no. 36 of 1998) which repealed the water act (no. 54 of 1956) was mindful to "reflect the requirements of fairness and equity, values which are cornerstones of South Africa's new Constitution. While also reflecting the limits to the water resources available to us as a nation" (White Paper on National Water Policy for South Africa, 1997, p.3). In developing the national water act, which was exciting for me as the then student in hydrology, the rallying slogan was "Some for All, Forever" (Department of Water Affairs and Sanitation (DWS), 1998).

One of the preambles of the water act "recognises that the ultimate aim of water resource management is to achieve the sustainable use of water for the benefit of all users" (NWA, 1998, p.1). Another preamble of the NWA is that of equitable

allocation of water. Water is allocated for uses as defined in section 21 of the NWA. However, the only guaranteed right to water use is water for basic human needs as defined in the Water Services Act (no.108 of 1997) and water "to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource" (NWA, 1998, p.9). This water is defined as the Reserve. Basic water supply is defined as "the prescribed minimum standard of water supply services necessary for the reliable supply of a sufficient quantity and quality of water to households, including informal households, to support life and personal hygiene" (Water Services Act, 1997, p.5). The DWS is mandated to issue water use licences by section 21 of the National Water Act (NWA) (Act 36 of 1998). However, the same act also mandates that the minister should determine "The Reserve" as per section 16 of the NWA. This is to ensure that water for basic human needs such as drinking, food preparation and hygiene and the ecological reserve is prioritised during a severe drought period.

2.2 Understanding water governance and drought response in South Africa

All legislation is aligned to the Constitution of the Republic as the supreme legislative framework (Constitution, 1997). There are two acts of parliament that govern water in South Africa, the National Water Act and the Water Services Act, both under the authority and responsibility of the DWS. The NWA is concerned with natural water resources management and deals with raw water, both surface water and groundwater. The Water Services Act is concerned with water services delivery including sanitation. South Africa has a three-tier government system, i.e. national, provincial and local governments. The governance and the protection of natural water resources falls under national government and this water is divided as the Reserve as explained above, strategic water to generate electricity, water to meet international agreements for shared water resources, allocable water including raw water in dams and reservoirs and runoff water that goes into the ocean (NWA, 1998). The provision of water and sanitation services falls under Water Services Authorities (WSA) which are metropolitan municipalities and district municipalities that service and provides water for all local municipalities within them (Water Services Act, 1997). The act however, mandates DWS to set national norms and standards for water services and regulations for water service institutions including WSA and water boards who serve as Water Services Providers (WSP) for WSA.

To ensure that IWRM principles are adhered to, there are several local institutions, statutory and non-statutory, that play a role either natural water resources management or water services management. These institutions play a role

in water governance and where they exist and working they ensure that all stakeholders have a voice in managing the water in their areas. The statutory institutions other than the ones already discussed are Catchment Management Agencies (CMA), established per chapter 7 of the NWA and Water User Associations (WUA), chapter 8 of the NWA. These institutions are established to decentralise natural water resource management from national government to water management area and catchment level and encourage public participation. Although the proposal for uMvoti to Mzimkhulu CMA was drafted and submitted while I still worked for DWS in 2001, it has yet to be established. Even though the farmers refused to meet with me and be interviewed, the chairperson of the farmers union told me that there is no WUA in this catchment and this was confirmed by the participant from Ugu DM and DWS. There are also non-statutory catchment management fora which go to an even micro catchment level to encourage all water users to have a voice. These fora are supposed to be established by CMA and in their absence are only functional in areas where municipalities work closely with DWS to establish them but often flounder due to lack of capacity within these institutions. I mention this because it becomes relevant when I discuss my findings through adaptive governance theoretical framework.

Drought response is the mandate of the Department of Cooperative Governance which is responsible for declaring a drought as a disaster by the Disaster Management Act (Act 57 of 2002). The Disaster Management Act provides for a coordinated and integrated response in preventing and reducing the risk for a disaster and mitigate the impacts of disaster (Disaster Management Act, 2002). It is a cross-cutting legislation that requires all the government department and all three tiers of government to be prepared for disaster. There are also other government institutions that play a role in the mitigation of the drought situation to ensure resilience of communities and the ecosystem. These will be discussed during the data analysis stage.

The legislative, governance and institutional framework for water management is adequate to protect the rights to the basic level of service to all citizens and the environment. It protects the water needed for basic human needs and the health of the ecosystem, the Reserve. The legislative framework implies that all citizens have access to basic level of water, however, the lived experience of some rural communities does not support this. The communities within the study area experienced severe water insecurity during the drought.

3 Theoretical Orientation

To understand the impact of the drought and the resulting water shortages on the rural livelihoods and to show the inter-linkages of this effect with agricultural exports a combination of the Sustainable Livelihood Framework (SLF) and Adaptive governance will be used. This analytical framework is the tool through which the empirical data will be analysed and discussed. In this chapter the guiding literature and research of other scientists on the subject is discussed and then linked to the analytical framework.

3.1 Water security

The causal effect of drought is the resulting water shortages. Regardless of the water resource and supply legislative and institutional framework in place if it does not rain, the rivers and streams will run dry and both the people and ecosystem will suffer. This will cause water insecurity among the affected communities.

The poet Mazisi Kunene once said: "*from water is born all peoples of the earth*" (South African Government, 1995). All life needs water for survival. It is truly the birth and the driving force of planet earth, and a reason why every time we hear the news on whether other planets can sustain life, the first question is about the availability of water. Yet, as Biswas et al. (2010:11) correctly opined,

"*today only 15% of the world's population lives with relative water abundance, and the majority is left with moderate to severe water stress. About 1.6 billion people live in areas of economic water scarcity where lack of human, institutional, and financial capital limit access to water even though water is available locally to meet human demands, particularly in South Asia and much of sub-Saharan Africa*".

The empirical data will show that rural communities such as those in KwaMbotho lack access to water despite the strides made by the post-apartheid government in the provision of basic services. They still walk for long distances for water and the quality of the water they get from the local stream is not of drinking

quality as they must share the resource with livestock. The communities in my study differ from those described by Biswas, et.al., in that for them, the drought meant there was very limited water available. The drought was the key difference here, in that there was no water abundance. I agree with the authors though, KwaMbotho still experienced water insecurity due to institutional failures. So, it may be that "from water born all peoples of the world" but not all people of the world have equal access to portable water.

Most available water resources are used for agricultural purposes. According to World Wide Fund (WWF), in South Africa, agriculture uses approximately 63% of allocable water (surface water and groundwater) (WWF, 2016). Agriculture plays a major role in ensuring sustainable food security and this implies that since water drives agriculture, food security relies almost exclusively on water security.

Water security is defined in many ways; however, for this thesis I use Abedin, Habiba and Shaw (2013:5) definition of water security as:

> "the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socioeconomic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability".

According to the key aspects of water security as outlined by Abedin, et.al (2013), South Africa while having water scarcity, is a largely water secure country. This is due to the policies and institutions that ensure a sustainable water management approach. This legislative and institutional framework largely employs the principles of Integrated Water Resource Management (IWRM).

The Global Water Partnership (GWP) define IWRM as:

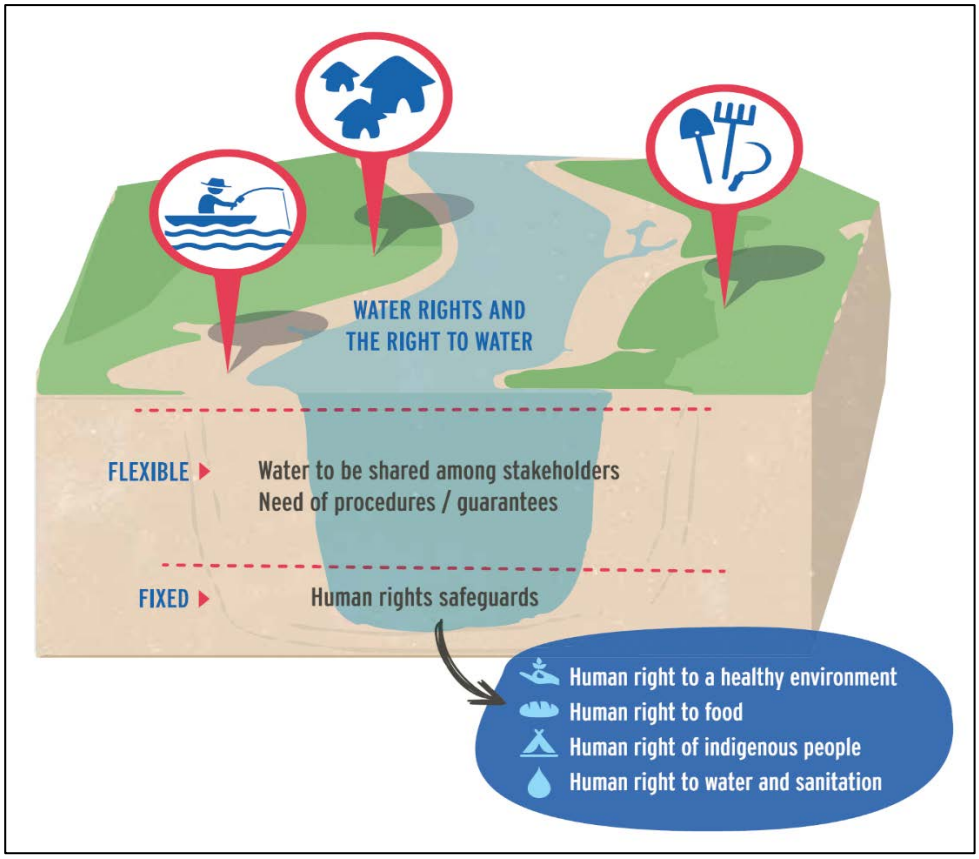
"a process which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and the environment" (GWP, 2011).

The policies and institutions, through the Constitution's Bill of Rights, assures everyone in South Africa the right of access to sufficient water. However, the Stockholm International Water Institute (SIWI) in linking IWRM to human rights go further to describe the difference between right to water as assured by the Constitution to water rights as assured by water use licences. They argue that

> "water rights have been defined in areas where water is scarce and where the use of water by one individual or group affects the quantity and/or quality of water used by another individual or group" (Cap-Net, 2014:44-45).

The relationship between the two is illustrated in the figure below.

Figure 1.Water rights and rights to water



Source: (Cap-Net, 2014:45) *Human rights-based approach to Integrated Water Resources Management.* Available at https://www.siwi.org/human-rights-based-approach-iwrm-training-manual-facilitators-guide/ {2019-05-07}).

Furthermore, as Biswas et al. (2010) correctly opined, agriculture as the major water use is also responsible for

> "adverse environmental outcomes, including excessive water depletion, particularly of groundwater resources, pollution of freshwater resources, and waterlogging and salinization of formerly productive crop areas" (ibid, 2010:12).

The bulk water usage in ULM is stream flow reduction for forestry and sugar cane crops. As highlighted in chapter 1 above, dry land sugar cane, the kind grown in ULM is not classified as a water use and is not even estimated on the quaternary catchments' water balance. The impact of this lack of unquantified water on the

Reserve has therefore not been studied and understood. Stream flow reduction impact both surface water (water that we can see on the rivers, streams and dams) and groundwater. The recent drought in South Africa has exposed the lack of this accountability as a challenge that has to be addressed through policy and institutional review. Water security is achieved when the citizens have an enabling legislative and institutional framework that ensures a service for everyone. However, a good legislative framework needs to be responsive to shocks such as a drought. The water rights of commercial farmers and foresters should not impede the right to water of rural communities.

3.2 Rural Livelihoods

To understand the impact of the drought on livelihoods of the case study communities, a review on what are livelihoods is required. In this section I will be analysing the literature available on rural livelihoods,

Due to the strange apartheid town planning, I grew up in all black rural area on the edge of a white resort town. My neighbours were mostly poor with limited education, I was lucky to have educated parents in professional jobs, even though they were paid very poorly, we were still better off than most of our neighbours. According to the World Bank collection of development indicators, in 2016, 34.7% of the South African population lived in the rural areas (Trading Economics, 2019). In defining rurality, Wiggins and Proctor (2001)illustrate the ambiguity of the term. Rural areas

> "constitute space where human settlement and infrastructure occupy only small patches of the landscape, most of which is dominated by fields and pastures, woods and forest, water, mountain, and desert" (ibid, 2001:427-428).

Rural areas in developing countries are also characterised by poverty, i.e. the incomes are lower in the rural areas than in the urban areas despite the abundant natural resources (Madzivhandila, 2014). In 2017, Statistics South Africa (StatsSA) reported that,

> "in general, children (aged 17 years and younger), black Africans, females, people from rural areas, those living in the Eastern Cape and Limpopo, and those with little or no education are the main victims in the ongoing struggle against poverty" (Statistics South Africa, 2017).

The poverty prone rural people often try to maximise their livelihoods through subsistence farming, where I grew up my neighbours and my family had gardens,

we grew mostly maize, beans and vegetables, but we also had an abundance of fruit and avocado trees. We ate our produce but shared surplus with neighbours and friends and sometimes sold the rest. Following (Ellis and Freeman, 2004). Livelihood is defined as not just

> "what people do in order to make a living, but the resources that provide them with the capability to build a satisfactory living, the risk factors that they must consider in managing their resources or capitals, and the institutional and policy context that either helps or hinders them in their pursuit of a viable or improving living" (ibid, 2005: 2-3).

Therefore, the policy and institutional context in South Africa support the livelihoods of South African households.

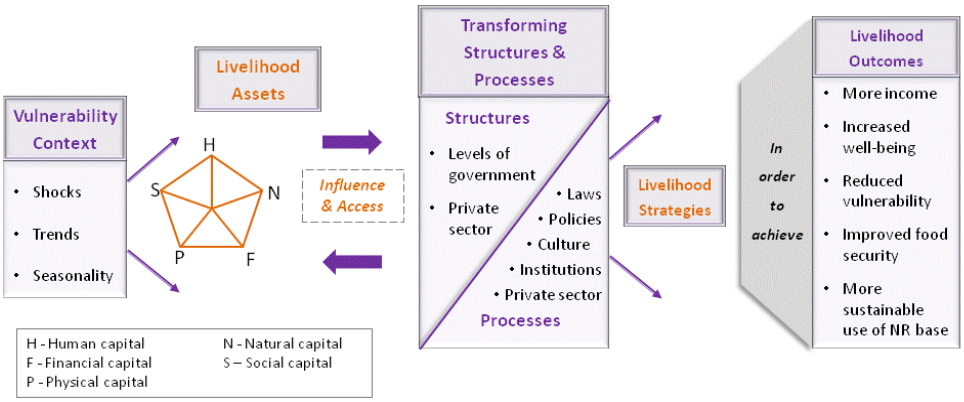
However, according to Ferguson (2015) the success of the South African "welfare" system or social grant system as it is known locally has seen "households experiencing hunger decrease from 29.3% to 12.6%" between the 2002 and 2013 national censuses" (ibid, 2015:7). However, the social grants system as a livelihood strategy is not sustainable for all households because of the criteria for the grants. Therefore, some households might not qualify because no one within them meets the criteria, while for some, although getting social grants might not be enough.

Traditionally the source of livelihood for the people residing in the rural areas have been equated with agriculture but Ellis in his book highlights that rural households are diversifying their income to include off-the farm income (Ellis, 2000). They often do this out of necessity or out of choice. He defines rural livelihood diversification as "the process by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living" (Ellis, 2000:55). The reason that households diversify their livelihoods is either by necessity or by choice (ibid,2000). In the case study communities, not much diversification was observed. However, households seem to use the assets available to them to ensure resilience during the drought.

The participants in my research sites utilise their capitals (social, natural and human) to create livelihoods by either household food gardens, cooperatives or small-scale commercial farming, this materialises into physical and financial capitals. However, their natural capital can also be a hindrance and impede their ability to farm in times of drought (Ellis and Freeman, 2004). For sustainable livelihoods, the rural households in ULM need to adapt with their environment to be resilient during periods of drought.

This is depicted in the figure below on SLF (DFID, 2001:3). The drought is the vulnerability in this context, and the community's reliance on their assets, the land, water, grants, neighbours, etc, and how they use these assets through the enabling support of policies and institutions (the governance structure) will result in stable livelihoods.

Figure 2.Sustainable Livelihood Framework



Source: Department for International Development (DFID, 2001:14) Sustainable livelihoods guidance sheets.pdf. Available at: http://www.livelihoodscentre.org/documents/20720/100145/Sustainable+livelihoods+guidance+sheets/8f35b59f-8207-43fc-8b99-df75d3000e86. Accessed: {2019/05/20}).

The SLF is important to analyse how the rural communities from ULM coped with the drought. It will show how successful were the strategies they adopted ensured that their livelihoods remained stable. Looking at figure 2 above, the vulnerability context is the drought. The participants in the research area had various assets they could rely. These are, human capital (the health of participants), financial capital (social grants and income from selling surplus harvest), natural capital (the land to farm), physical capital (tools for farming and digging for water)and social capital (neighbours and networks). They also relied on the support from government through legislation, governance and institutions. This part of the SLF is why I chose to couple it with adaptive governance of social-ecological systems. To reduce the vulnerability to rural livelihoods, adaptive governance is a strategy that can be adopted.

3.3 Adaptive Governance

In this section I will set out the theoretical framework I will use to analyse and make sense of the collected data. Theory is important in that it guides the researcher to focus on those issues that are important and the people that need to be studied

(Creswell, 2014). Furthermore, theories are concepts that focuses the researcher's inquiry on meaningful data that can also provide flexibility and guidance for the researcher (Tracy, 2013). The use of theory in my case study approach will also be useful because it will help me to draw generalised conclusions and recommendations (Yin, 2014). I have chosen the Adaptive Governance of Social-Ecological Systems as a theoretical approach to analyse the data in later chapters.

The positive outcome of communities who on being faced by an abrupt change or crises, or shock (as in SLF) is resilience. Resilience is defined as "the quality of being able to return quickly to a previous good condition after problems" (Cambridge English Dictionary, 2019). In rural livelihood terminology, this could be compared to livelihood diversification. (Folke, Hahn, Olsson, & Norberg, 2005) describes rural livelihood diversification as *"process by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living"*. This is further justification to combine SLF with adaptive governance. The rural communities studied had to find diverse means to acquire water during the drought.

Since my research focuses on the impact of drought on rural communities, I have chosen Folke et al. (2005)approach to adaptive governance of social-ecological systems which focuses on periods of abrupt change or crises such as a drought (ibid: 2005). Adaptive governance provides a platform to analyse how a flexible and inclusive governance framework ensures that rural communities recover from a drought. It advocates for the participation of all stakeholder groups to work collaboratively to ensure the recovery of both the communities and the ecosystem they rely on for water resources. This collaboration is a determining factor in whether the socio-ecological system can recover from abrupt shock such as a drought.

This approach acknowledges ecosystems are under constant pressure and may be unable to continuously generate resources as before, which then impact on the developmental capabilities of societies. This ecosystem approach is ideal for my research because it "*recognises the role of the human dimension in shaping ecosystem processes and dynamics*" (ibid, 2014:5). The drought had an impact on the water resources, the streams dried out and the rural communities at ULM relied more on groundwater. The empirical data will show that they dug out holes to access the springs. It is therefore that with the recovery from the drought, the groundwater also recovers. The second preamble of the NWA as discussed in chapter 2, calls for the protection of water resources. The protection of the not only surface water but also groundwater in ULM, will ensure that these resources are utilised when the next drought occurs. The adaptive capabilities of these rural communities were realised through their reliance on their ecosystem.

These dimensions tend to outline the institutional arrangements and interactions between the various actors (ibid, 2014). For example, the water used in the cultivation and growth of sugar cane is not licensed as already mentioned above. However, in periods of drought the unaccounted-for water use of sugar cane can be one of the factors that impact the ecosystem and cause water shortages. The institutional arrangements for this are in place but lack implementation. (Cosens and Gunderson, 2018) argue that

> "to be effective, tools for flexible management must be imbedded within systems of law and governance that will address not just the feedback from ecological systems responding to change but from complex social-ecological systems. Governance itself must be adaptive".

Therefore, for adaptive governance to be effective, it is not enough that the local actors who interact with the ecosystem adapt to changing conditions, but also adapt the laws and institutions should follow suit and the legislative framework reflect that (cf ibid, 2018).

This adaptive governance approach requires the interventions for both ecosystem and human dimensions for sustainable resilience during periods of abrupt change or shock. The rural communities who participated in my study have had to learn coping mechanisms to ensure sustainable livelihoods by adapting to the drought and trying to ensure their water resources provide for them. The institutional response should ideally also adapt to the shocks and enable the communities to respond in ways that will ensure the sustainability of their common pool resource.

Koontz et al. (2015:140) outlines the factors for adaptive governance,

> "informal networks, learning, leadership, evolving rules, information, conflict resolution, rule compliance, infrastructure, institutional preparedness for change, nested institutions, institutional variety, dialog, social capital, memory, knowledge, cross scale interaction, multi-level governance, and organizations".

The socio-ecological system survived the shock of the drought because some of these elements were present in ULM. The social capital that allowed for neighbours to share surplus harvest. The knowledge of where the springs might be available for water supply. The institutions that exist to ensure water management and disaster management. These and other factors are what ensured a stable socio-ecological system during a drought. This study aims to encourage adaptive institutions for continued resilience, to cope with climate change.

Brunner and Lynch (2010:5) explain that

> "Adaptive governance is characteristically more responsive to differences and changes on the ground; often but not always it proceeds from the bottom up rather than the top down".

Hence, adaptive governance is a tool that fosters good neighbourliness when using common pool resources, while also improving natural resource management

(Folke et al., 2005). With adaptive governance therefore, systems can reconfigure without experiencing significant decline during periods of abrupt change (Koontz et al., 2015). (Folke et al., 2005) also point out that knowledge in this field of managing rapid change in ecosystems is still in its infancy at the time of their publication. They emphasised that

"…the complexity of adaptive management that comes with the "collaboration of a diverse set of stakeholders operating at different levels, often through networks from local users, to municipalities, to regional and national organisations, and international bodies" (ibid,2014; 14).

The above implies that complex institutional arrangements where power and responsibility may lie with different entities. Adaptive governance is therefore the management of conflict that may arise between the diverse stakeholders while also adapting this social aspect to dynamic ecosystems. Following (Folke et al., 2005) therefore, adaptive governance calls for adaptive institutions to be able to maintain a stable ecosystem state. This is supported by (Koontz et al., 2015) who write, "*adaptive institutions are those that actors are able to adjust to encourage individuals to act in ways that maintain or improve to a desirable state*". (Folke et al., 2005) went further and identified the following four critical factors

"required for dealing with social-ecological dynamics during periods of rapid change and reorganization (Ibid, 2014:21):

i. learning to live with change and uncertainty;
ii. combining different types of knowledge for learning;
iii. creating opportunity for self-organization towards social-ecological resilience; and
iv. nurturing sources of resilience for renewal and reorganization"

With the above in mind, adaptive governance provides a solid base through which my research data can be analysed. It will assist me in analysing the impact on both the water resources and the stakeholders in adapting to drought. Particularly it will assist me in analysing the resilience of the water resources and the impact on the rural livelihoods impacted by the drought in my study area.

The adaptive governance for social-ecological systems as outlined above will be a tool to illustrate how the impact of the drought has caused not only rural communities in Umuziwabantu municipality adapt to the water shortages, but also the farmers to change their farming outputs for the international markets. Normally, rural communities in South Africa have had to get their water from the rivers and streams within their communities.

Growing up in Bhekulwandle, Amanzimtoti, I remember waking up every morning at dawn in search of water and then doing it again in the afternoons after school. Fetching water for household use, as I can attest, is a time consuming and

hard work that is undertaken by mostly women. However, it is also a very social activity. Fetching water, especially in remote rivers with a lot of tree cover can be unsafe for women from both mother-nature (snakes, crocodiles and fast-moving streams) and human alike especially in war-torn areas. My village was also embroiled in the political violence of the 1980s and early 90s in KZN, so I also know first-hand how perilous a trip to fetch water can be.

With changing climate and circumstances, the people in my village adapted in our relationship with the ecosystem. There was the 100-year flood, cyclone Demoina, in 1987, I remember the year because my dog died the day the flood started. Then there was the drought of 1982, that yielded inadequate maize and we had to import yellow maize which we called ‘ubhokide’ (yellow maize flour) that was nationally hated for its taste and cooking properties. We adapted to too much water and the associated problems, to too little water and the associated problems, the water resources adapted with us. The analysis below will illustrate how the rural communities, commercial farmers and government institutions have through adaptive governance have responded to the drought, it will outline both successes and failures and I will also put forward recommendations on how to limit the impact on rural livelihoods.

3.4 Concluding remarks

The drought caused water shortages which resulted in water insecurity. The rural households and commercial farmers alike needed to adapt to this insecurity through various strategies and the support of governance institutions.

The linking of the SLF and adaptive governance provide a framework to analyse the empirical data (Creswell, 2014). I combined the two theories because they provide a more holistic approach in achieving the research objectives. Rural communities employ different strategies to diversify their livelihoods to rebound to an original state or improved one, when faced with shocks. They achieve this state by utilising their assets and on the ground adaptive governance. This ensures the whole socio-ecological system adapts and rebound to a stable state.

I will use adaptive governance to analyse how all the stakeholders responded to the drought. Furthermore, this framework will be used to determine whether the responding institutions were flexible to address the impact and mitigate it. The impact on livelihoods will be analysed through the combination of SLF and adaptive governance. The next chapter is on methodology where I explain why and how I collected my empirical data and how it was coded for analysis.

4 Methodology

In this chapter I will discuss the research approach I used, present participants' profile and explain how they were chosen. I will also describe the case study site. The definition I used as a basis of my research is taken from Creswell, "*qualitative research is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem*" (Creswell, 2014:32). As envisaged in my research design, my research approach was unstructured interviews with some participants in the two chosen rural areas within Umuziwabantu LM. I also conducted semi-structured interviews with various participants who are civil servants in agriculture, water management, local economic development and the municipality in their work setting (Creswell, 2014).

4.1 Case study site description

My study site is Umuziwabantu Local Municipality (ULM) which falls within Ugu District Municipality (DM) on the province of KZN (KZN). Umuziwabantu is a rural municipality with a small town of Harding as the only urban area. It is made up of commercial forestations, farms and traditional authority areas. The rural communities that are a focus of my study are KwaMbotho and KwaMachi.

> "Apart from the town of Harding, which is the seat of the municipality, 56% of the municipal area is occupied by individually-owned commercial farms and the Weza afforestation region. The six tribal authority areas (KwaMachi, KwaJala, KwaMbotho, KwaFodo, Dumisa and Bashweni) make up 42% of the municipality's land" (Municipalities of South Africa, 2019).

I chose these two villages because they are the two biggest settlements in ULM. The choice was made with the assistance of the ULM's GIS officer, who kindly mapped the area for me and pointed out where each village was located. I also chose two

villages instead of just one because I wanted to contrast how they coped with the drought. Both areas are beautiful, with rolling hills that rural KZN specialises in. KwaMbotho is smaller than KwaMachi and has no paved roads, whereas KwaMachi the main thoroughfare road once you get to the village, is paved. The drive to KwaMachi though from the main highway is unpaved road between sugar cane fields and timber plantations as far as the eye can see. The lead road is deserted during the day with an occasional farmworker on the fields. Interestingly, although some men in the village I grew up in, Bhekulwandle, hunted monitor lizards while I was growing up, I had never seen one before. On the drive to KwaMachi, I thought I was hallucinating when I spotted what appeared to be a miniature Komodo Dragon, right there in the middle of the dirt road between sugar cane fields. I was so frightened and quickly figured out that it was a monitor lizard and waited until it moved on.

Like most rural areas in South Africa, both areas are sparsely populated with most households built along the road. There is livestock in the form of cows and goats all around with some homestead boasting kraals for their livestock. Most households I noticed have a garden with mostly maize, although I was told that beans will soon follow.

Figure 3. Map of KwaMbotho Area, South Africa

Source: Google Earth (23/03/19)

Figure 4. Map of KwaMachi Area, South Africa

Source: Google Earth (23/03/19)

4.2 Philosophical Considerations

Using Creswell's (2014) concept of philosophical worldviews, I went with the social constructivism approach where "individuals seek understanding of the world in which they live and work" (Creswell, 2014). This approach will allow me to let the participants' understanding of the drought and how they lived it be the basis of the empirical results and discussions. While I did not set out to use the transformative approach, it became evident during my field work that there was no way I could do justice to the participant's worldview, especially those in rural areas affected by the drought, without incorporating this approach in my thesis. Mertens (2012:806) opines that

"The transformative research perceives that different versions of reality are given privilege over others and that the privileged views need to be critically examined to determine what is missing when the views of marginalized peoples are not privileged".

This thesis looks at how the water hegemony of few commercial farmers and foresters may have an impact on the livelihoods of under-privileged rural communities. It further recommends transformation of existing institutions to be responsive to shocks to improve resilience in rural households. This transformative view will be anchored by IWRM, Sustainable Livelihood Framework and Adaptive governance framework.

4.3 Research Design

I had set out to conduct a phenomenological study as described by (Creswell, 2014)and in my design I had opted against using case study as described by (Yin, 2014). However, in the field I realised that combining the two will be the best way to present my participants lived experiences. My research questions are ‘how’ and they are exploring a contemporary event, according to Yin (2014) the case study method is suitable for this study. This geographical location of my participants is as important in this study as their lived experience. The locality of the participants is linked to their lived experience, a rural municipality with predominantly commercial forestry and agriculture belonging to a few and subsistence agriculture for many rural communities. The drought is the contemporary event, even though hydrologically drought have historical contexts.

4.3.1 Semi-structured and unstructured interviews

Informal interviews were a preferred data collection method amongst the rural participants as I went to the areas of KwaMbotho and KwaMachi with no planned interviews except to knock on some doors. Unstructured interviews were suitable as it allowed the participant to be in control and the researcher to allow the interview to run its course along some pre-conceived themes (Braun and Clarke, 2013). The households visited, and the participants interviewed were similar in many ways (in that they were rural, mostly poor, mostly female and all affected by the drought) while being diverse in others because of the way the participants viewed and felt the impact of the drought.

Semi-structured interviews were used for the government officials from various departments and tiers of the government as this allowed me to structure some questions, while leaving the door opened for follow up questions and let the participant to raise issues I had not anticipated (ibid). For example, after keeping me waiting for an hour and making me feel impatient, a department of agriculture official who works in the study area was a fountain of information because I allowed him to lead the interview. This allowed me to probe where I needed while letting him do most of the talking, this was a good source of useful data on agricultural practices in the area and in South Africa as a whole.

The interviews with the participants who live in the rural areas were entirely in isiZulu and transcribed as such. I however translate the quotations used in the data analysis in English. To ensure accuracy, I requested my mother who holds a Master’s degree in linguistics to check my direct quotes for accuracy.

4.3.2 Observation

I also observed the behaviour and surroundings of my participants during my field study. The gender dynamics were observed through my interaction with the participants and their interaction with each other and their environment. The race dynamics within this researched were also through observation and processed through the eyes of a black woman who grew up during apartheid. The separation of big sugar cane farms and plantations from the dusty villages of KwaMbotho and KwaMachi. All these behaviours were observed and formed part of my empirical data.

4.3.3 Participants profile

I decided to meet with one of the highest-ranking members of the Department of Water Affairs and Sanitation (DWS) first to get an overview of the drought impact countrywide. I then opted to go to the study municipality and drive around because the area is unfamiliar to me. I made a spontaneous visit to the municipal offices and spoke to the GIS officer who printed topographical maps of the two rural communities used as my case study with a couple farms that are transitioning from sugar cane to macadamia nuts.

I then went to one of the communities, KwaMbotho, where I started knocking on doors and interviewed a female small-scale farmer and forester who is a widow, 2 rural women who are head of their households one is a subsistence farmer and one is not, a school security guard who is also a subsistence farmer in his household right next to the school and the school deputy principal on the impact to his school and pupils. I also visited the local clinic after the data gathered from the participants suggested an increase in water-borne ailments.

I also had a meeting with the district agricultural specialist and she recommended an agricultural specialist and extension officer working in the municipality. I then went to meet with the acting responsible official for ULM on water services for Ugu District Municipality as the Water Services Authority for all local municipalities within the district. I also met with the agricultural specialist responsible for ULM, who gave me a very solid overview of the area and the impact the drought has had on it.

I then visited KwaMachi to meet the farming cooperative (co-op) in that area, the group was made up of both males and females. While there I also interviewed a group of women sitting by the road discussing women issues and a lady, I gave lift to as it was a very hot day. I then went to visit the farming cooperative in KwaMbotho. I got lost but I also managed to interview an old woman while asking for directions. I also interviewed two ladies I gave a lift to after asking them for

directions and finding out they were headed the same way I needed to go. They pointed out the lady I was told will give me information on the co-op. Since it was already past midday and a hot day, the co-op members had already dispersed. She showed me the fields and we had a long chat which I recorded as I was driving for most of the time.

I also interviewed the Local Economic Development (LED) official and Municipal Manager from ULM. I also met with a DWS official responsible for water use licenses in the area and two of my friends, one is a water conservation and demand specialist and the other specialises in water resource planning, both with DWS.

Coincidentally, the five random households in KwaMbotho that I chose to knock on were all either female headed or only had females and children in the homestead at the time of my visit. In KwaMachi, I did not go to individual households except for one where I was to meet the gatekeeper for Ushikishi Irrigation cooperative. However, a woman I assumed to be his wife came to the door and she told me he said I should go meet with the group by the fields. The Agricultural Extension Officer had told me that on Wednesday they meet at this house. I was also lucky that while I was on my way to this house I saw a group of women by the road who were discussing their issues and they agreed to talk to me and answer some questions. At KwaMbotho, Mathenjwa Secondary School, I managed to interview the school security guard who was male, but I did not set out to interview him. While he was opening the gate for me to leave, he asked me what my inquiry was about and when I told him, he informed me that he is also a subsistence farmer and his house was right next door. I then decided to ask him questions on the impact of the drought. The details of the participants in my research are given below.

Table 1. List of participants from ULM

Participant (Coding)	Gender	Occupation	Interview Type	Date
KwaMbotho Village				
Participant 1 (NDF)	F	Small-scale farmer	Individual+ Informal	12/02/2019
Participant 2 (NMM)	M	School Security guard/ Subsistence Farmer	Individual+ Informal	12/02/2019
Participant 3 (SMM)	M	Deputy Principal	Individual+ Informal	12/02/2019
Participant 4 (NSF)	F	Subsistence Farmer/ Unemployed	Individual+ Informal	12/02/2019
Participant 5 (NMF)	F	Unemployed	Individual+ Informal	12/02/2019
Participant 6 (MKF)	F	Clinic Nurse	Individual+ Informal	12/02/2019
Participants 8 and 9	F	Unemployed	Together+ Informal	07/03/2019

Participant (Coding)	Gender	Occupation	Interview Type	Date
Participant 10 (MSF)	F	Farming cooperative member/ subsistence farmer	Individual+ Informal	07/03/2019
Participant 11	F	Unemployed/ elderly	Individual+ Informal	07/03/2019
KwaMachi Village				
Participant 1 (NJF)	F	Unemployed/ Grandmother is a subsistence farmer	Individual+ Informal	06/03/2019
Participants 2-6 (EWF)	F	Unemployed/ Elder Women's Group	Group+ Informal	06/03/2019
Participant 7 (TSF)	F	Ushikishi Cooperative	Group+ Informal	06/03/2019
Participant 8 (AOF)	F	Ushikishi Cooperative	Group+ Informal	06/03/2019
Participant 9 (QSF)	F	Ushikishi Cooperative	Group+ Informal	06/03/2019
Participant 10 (NOF)	F	Ushikishi Cooperative	Group+ Informal	06/03/2019
Participant 11 (SKM)	M	Ushikishi Cooperative	Group+ Informal	06/03/2019
Participant 12 (IMM)	M	Ushikishi Cooperative	Group+ Informal	06/03/2019
Participant 13(TNM)	M	Ushikishi Cooperative	Group+ Informal	06/03/2019
Participant 14	F	Ushikishi Cooperative	Group+ Informal	06/03/2019
Participant 15	F	Ushikishi Cooperative	Group+ Informal	06/03/2019
Commercial Forester and Farmer				
Participant 16 (BSM)	M	Commercial forester/farmer	Telephonic	04/05/2019

Source: this thesis

Table 2. List of participants from government institutions

Participant	Gender	Occupation and Organisation	Interview Type	Date
Participant 1 (NMF)	F	Deputy Director-General, DWS	Semi-structured+ Individual	08/01/2019
Participant 2	M	GIS Officer- ULM	Semi-structured+ Individual	11/02/2019
Participant 3 (NSF1)	F	Agricultural Officer- KZNDARD	Semi-structured+ Individual	15/02/2019
Participant 4 (BGM)	M	Water Services Officer- Ugu DM	Semi-structured+ Individual	15/02/2019
Participant 5 (NNM)	M	Agricultural Extension Head (ULM)- KZNDARD	Semi-structured+ Individual	05/03/2019
Participant 6 (SSM)	M	LED Officer- ULM	Semi-structured+ Individual	13/03/2019
Participant 7 (KMF)	F	Water Conservation Specialist- DWS	Semi-structured+ Individual	17/04/2019
Participant 8 (CMF)	F	National Water Planner- DWS	Semi-structured+ Individual	17/04/2019

Source: this thesis

4.4 Data Analysis

Data analysis often happens simultaneously with the interviews and writing of other parts of the thesis, according to Creswell (2014). While I transcribed interview data after every interview, I did not start analysing it straight away, at least not actively. However, I noticed a few themes beginning to emerge. For example, I had not set out to use a transformative approach but on my very first day on the field when I noticed the struggle of rural women especially, I changed my approach. I had also planned on concentrating on maize and bean farming but after my interview with the municipal spatial planning official and the Department of Agriculture official responsible for ULM, I changed this approach to look at macadamia nuts and sugar cane farming as export products. The themes were further grouped under the objectives set out for this study to check if they address the research questions or whether I needed to conduct further interviews or go back to my participants for follow up questions.

Creswell also points out that in qualitative research we do not use all the data collected because of the narrative nature of the study some will be discarded as it is not relevant for this study (Creswell, 2014). The nature of the Zulu culture is that you do not go into someone's house and just start questioning them. You get comfortable with the participant, talk about current events, the weather and all those things. Some information I needed tended to creep out of those ice-breakers. For example, the discussion about the weather was a good introduction to lead to questions about the drought. However, that also means, when I started recording, I also recorded some unnecessary information or information not relevant enough Therefore, I transcribed only the information as it related to the research.

My data coding was done manually by identifying the themes and sub-themes that emerged from the interviews. The various sub-themes were grouped together to structure and direct the empirical analysis.

4.5 Fieldwork Experience

This field study was very informative for me, it not only confirmed my own pre-conceived ideas and experience with rural communities, but it also taught me important lessons. I liked the friendliness, cooperation and welcome shown by my participants. The commercial farmer and forester who cooperated with me at the last minute, to give more meaning to my study. The visits to KwaMbotho and KwaMachi were the highlights of my research as they helped me to understand the resilience of African women. My only disappointment was what I saw as rejection of my research by the commercial farmers. I was left, maybe wrongly, feeling that had I been white and male, they might have been more willing to participate. I will

never know, but with the history of apartheid in this country, this was my personal feeling.

I tried through the chairperson of the local farmers association to get commercial farmers to interview but I was told that after the issue was tabled at their meeting, they declined to meet with me as they felt that they are always blamed for water shortages. Even after trying to give the chairperson certain assurances, I still could not get through to him. It was always going to be hard for a black female doing a study of this emotive nature to gain trust overnight from this group of stakeholders. I decided to work around this issue and have the data I have collected speak for itself. I tried to be as unbiased as possible in analysing the data and not report it from a single view-lens.

However, just when I thought I could not get any of the commercial farmers to speak to me, I decided to contact a farmer's association member I had initially spoken to while doing my research design at the end of 2018. He was the one who recommended that I speak to the chairperson of the association to get to the other farmers. On a hunch, I called him and explained my dilemma and that I did not want to have a one-sided study. He confirmed that my request was tabled at the meeting, but the farmers were not interested. He agreed to talk to me on the phone and answer my questions. I really hope that the fact that he is not white had nothing to do with him agreeing to speak with me compared to his mostly white colleagues, but then again this is South Africa.

The study area was also a limitation because ULM is a small municipality and sparsely populated with big commercial farms and huge tracts of land under traditional authority administered by the iNgonyama Trust. The findings in this area might be different in a mixed municipality with both rural and urban areas. However, I felt that its small size and mostly rural area will bring more understanding on the impact and adaptive qualities of rural households during a drought.

4.6 Reflexivity

I have strived to guard against my biases to have any influence on my treatment and dealings with stakeholders, I do however acknowledge that they exist and have shaped some of my handling of this thesis topic. As mentioned above, I had set out to use the constructivism approach but also let a somewhat advocacy position leak out in the form of transformative approach because my rural participants lived experience touched me in a way I could not help but empathise with them. I empathise because I was them growing up, my mother and all the women in my family before the end of apartheid were them. As I wrote in my research proposal,

“My work has been in various forms within the water sector and I have an extensive network in this field. While working in the field I have grown to understand and form opinions about various water users and as the biggest water user, commercial farmers have been part of that”. Creswell recommends that as a researcher I need to “explicitly identify reflexively their biases, values, and personal background, such as gender, history, culture, and socioeconomic status that shape their interpretations formed during a study” (Creswell, 2014, p.235).

My race, gender, professional background, culture and history all form the kind of biases that I need to guard against. The participants in my research will consist of people I may feel hold too much power and water hegemony, commercial farmers and those that hold too much patriarchal power, traditional leaders who are gatekeepers to rural households and those I feel are marginalised, the rural women”. Indeed, in my research this came through clearly as the burden of the drought seem to have affected the livelihoods of women the most.

5 Empirical Findings and Discussions

In this chapter I will be presenting the empirical evidence from the field research. I will be guided by the research objectives in chapter 1 and will use the participants lived experience to address the research questions. I will advance my findings based on the interviews conducted with the participants to understand the impact of the drought. I will specifically concentrate on how they viewed the drought and how it affected their livelihoods and their wellbeing. I will be tying the themes that were identified during the field research to the literature and theory to show the resilience or lack thereof of rural household livelihoods during a drought.

ULM was an unknown area to me prior to this project. Therefore, as a starting point to my research into the area, I visited the municipal offices. I spoke to the receptionist about my project and she referred me to a GIS officer. The officer was helpful in not only helping me to focus my study on KwaMachi and KwaMbotho, but he also was the first to inform me that the commercial farmers are phasing in macadamia nuts and phasing out sugar cane. He mapped the area for me and gave useful insights on both villages. He also informed me that the chief of KwaMachi has applied to the government for a permit to farm medical dagga (cannabis) for the export market. However, I could not get any confirmation from the agricultural officials I spoke to on this information. I mention this only because I found it interesting because dagga has been recently made legal in South Africa for cultivation only for personal private use (Constitutional Court, 18/09/18).

Coincidentally, the five random households in KwaMbotho that I chose to knock on were all either female headed or only had females and children in the homestead at the time of my visit. I knocked on these households because of the maize fields spotted on their yards and there seemed to be people around and no dogs in sight. In KwaMachi, I did not go to individual households except for one where I was to meet the informer for Ushikishi Group. Although, I also interviewed the school security guard who was male, but I did not set out to interview him but when I was leaving the school I decided to ask him a few questions. While he was opening the gate for me to leave, he asked me what my inquiry was about and when I told him,

he informed me that he is also a subsistence farmer and his house was right next door.

The participants are coded as illustrated in table 1 and 2 in the participant profile section. The first two letters are the participant's name and surname and the last letter depict gender.

5.1 Linkages between agricultural exports and water shortages

The water shortages during the drought affected the communities of ULM differently. This study had set out to explore on whether there is a relationship between these water shortages during the drought and the agricultural exports from the area. In this section I plan to contrast three types of farmers to answer the first research question. The female small-scale farmer and forester from KwaMbotho and the members of the Ushikishi Irrigation farming cooperative in KwaMachi and a commercial farmer and forester. I will start the analysis by first profiling these three different farmers. I will then analyse their experiences with those of the government officials who have a more holistic picture of the water use in the area.

All participants within the ULM did not link the water shortages in their area with commercial agriculture and forestry, they linked the shortages to the drought. Therefore, they did not link the exports from their catchment to the water shortages in the area during the drought period. I plan on letting their experiences tell the story and draw conclusions from that if this drought's impact was exacerbated by the agricultural exports or not.

5.1.1 The small-scale female farmer

The first house I went to for an interview in KwaMbotho was chosen because it had visible maize garden upfront and a relatively small sugar cane field on the side. I was met by two young children who were playing outside. The homeowner, NDF, a woman who looked to be about 50 years old was not what I expected in some ways and everything I expected in others. She looked the way I expected, talked the way I expected but she also turned out to be a small-scale commercial farmer and forester which I had not expected. She told me that she is a widow and farming was her source of income.

She is supporting her six children, only one of them is working in the town of Pietermaritzburg, the administrative capital of KZN Province. One is studying in a tertiary college in Durban and she did not forward information on four of her

children. She also had eleven grandchildren who accounted for the five children who were in her home at the time of my visit. I asked her if she runs a day-care centre and that is when she told me that all five were her grandchildren. A side note on the Zulu culture here, eleven grandchildren does not mean they are all from her biological children, some may have been from her nieces and nephews. For example, I have five grandchildren because who are children of my four older nieces and nephews but there is no distinction in my culture between my children and those of my sisters.

She is also a subsistence farm and had a maize garden and livestock in the form of goats and cattle. Compared to other members of the community that I interviewed, she seemed better off. She indicated that she does not sell her livestock and the maize and the beans she grows are for her family's consumption.

She is the only participant involved in commercial agriculture in the two villages, albeit on a very small scale did not even understand the concept of a water use licence of even how big her operation is. When I asked her if she knows how much water she uses for her sugar cane and timber, this is what she had to say:

> "I never irrigate my sugar cane and plantation. I rely on rain alone. I do not know what water use licenses are but maybe you can come back when my son who is at Technikon (technical university) is home because he handles all the paperwork. The forestry office where I sell my timber also has all my information and can help you" (NDF, 12/02/19).

This showed me that she really did not have an idea about water use classification and licencing. This does not mean she was in breach of water use regulations however, nor did it mean she does not have a user licence. It simply meant that she does not know because she has left all the administration of the farm for her more "educated" son to handle. As discussed in chapter 1, the kind of sugar cane in the area is dry land and is not irrigated, and therefore is not subject to stream flow reduction water use charge yet.

Asked about the impact of the drought on her crops, the participant said that the drought was detrimental on her sugar cane. She said: "the sugar cane took longer this year because of the drought. However, as you can see it is growing now that the rains are falling again" (NDF, 12/02/19). The sugar cane she told me, takes just over a year to grow and then it is burnt and transported to the sugar mill. The drought had had a negative impact on her crop because it was taking longer to yield an income for her

On being asked what happens when she harvests the timber and sugar cane, the participant says she sells the timber to one of the big timber companies in the country and the sugar cane is sold and transported to the sugar mill for processing. The final markets for both products as described in chapter 1, are both national and international.

5.1.2 The farming cooperative

The chiefs in both KwaMachi and KwaMbotho have made land available for farming cooperatives. UShikishi Irrigation Group is a farming cooperative working in KwaMachi who have 18 hectares of land that they can potentially farm but are only using a fraction of that due to challenges with water supply. They are professional in their approach and have a committee and weekly meetings. They were going to have their weekly meeting after our interview. The group has 18 members, ten males and eight females. They had recently invited six youth to join the cooperative. The youth were not there on the day of the interview because they are still undergoing induction on the group activities. The co-op is a member only organisation and the members must pay a joining fee to become members. They are equally responsible for the operation of the garden.

The co-op was established in 1987, during the old apartheid dispensation. The membership has changed over the years, but the mandate remains the same. They have been supported by various government agencies over the years. The first thing I noticed when I was approaching their garden was the Extended Public Works Program (EPWP) poster that was erected on the site. The EPWP is "*a key government initiative, which contributes to Governments Policy Priorities in terms of decent work & sustainable livelihoods, education, health; rural development; food security & land reform"* (Department of Public Works, 2019). However, when asked if they are supported the EPWP the group indicated that this support was only temporary. "*They only supported us in 2008 for eight months. They paid us a stipend for those months and then they moved on*" (SKM, Ushikishi). KZNDARD is also providing agricultural extension services to this group and all the other co-ops within the province. They provided fencing for uShikishi and technical advice services.

The co-op used to rely on irrigation for their garden. On the day of the interview the cooperative, members were concerned more about the aging irrigation infrastructure of their irrigation scheme to worry too much about a drought they felt was over. The infrastructure was installed in 1987 and the pipe is asbestos, a product that is no longer sold in South Africa. They have been repairing the pipe whenever they can on their own but felt it needed replacing. On this day they were digging around their pump to check what could be done to repair the irrigation pump.

The aging infrastructure coupled with the drought has had a detrimental effect on the output of the co-op garden. One of the members lamented:

> "…while our irrigation system worked properly, we never had to worry about water shortages, even in winter, we were able to produce some vegetables. The drought hit us hard because we had no way to irrigate our crops and the harvest was very disappointing this year" (TNM, 06/03/19).

The co-op members seem to blame the aging infrastructure for the impact caused by the drought on their garden. They could not make the connection that even the farmers with the working infrastructure had their water curtailed, including the municipality because of severe water shortages. They also did not make the inter-linkages between themselves and other water users within the area.

The co-op garden is classified as subsistence and therefore does not require a water use licence even though they use irrigation (Schedule 1, NWA, 1998). They grow food for their own families and sell the surplus to the community and the vegetable vendors in town. The food produced by this co-op is used locally in the village and within the municipality. Their produce is produced and consumed locally. Therefore, they could also not make the connection between the products produced commercially and exported and the water shortages.

5.1.3 The commercial farmer/ forester

This participant, BSM, was a life-saver because without his valuable input this thesis might have appeared one-sided. As it is, he was the only commercial farmer I could speak to within the municipality. He is both a commercial forester and livestock farmer, although he also grows maize and grass which he uses for cattle feed. He is a committee member for the farmers' association and has been for more terms than most members because of his ability to communicate in English, IsiZulu and Afrikaans.

He has a water use license for six hectares of timber, which he referred to as a very small operation. His water use license is renewable every five years, when DWS takes aerial photographs to verify that the license conditions are adhered to. On the complexity of stream flow reduction use, he was worried that it was unfair and unconstitutional. He complained, "…we are paying for rain water that is what we are paying for". He went on to say that some other foresters do not even bother to apply for their water use. "I think DWS knows that they cannot win in court because of the ambiguity of stream flow reduction". However, later in our conversation he contradicts himself on how much water is used by forestry. "Gum tree in the worst, a single gum tree sucks 60-75l of water per day". He tries to minimise his water use by having a drainage system to ensure that his forest "is not too wet".

He was also aware of the plan to classify dry land sugar cane as a stream flow reduction use. "The opposition that DWS is encountering is that sugar cane grows within

18 months maximum, compared to approximately seven years for timber." The sugar cane farmers are opposing the measure are citing that "sugar cane is a reed, a member of the bamboo family, which occurs naturally in the coastal region of KZN" (BSM). The water use by sugar cane is therefore minimal, according to this argument.

The timber from his plantation is sold through a national cooperative, one of the two big ones that foresters can belong to. The cooperative acts as a broker and a technical adviser to the foresters. The participant is aware that most of the timber is exported out of the municipality. "The wattle trees are exported to Japan", he informed me. Therefore, he is aware that the water that is used in growing timber is exported for both national and international markets. However, he could not connect this to the resulting water shortages, and instead blamed government for poor water management.

5.1.4 Is there a relationship between agricultural exports and water shortages?

In this section I will tie in the experiences of the three case participants with the narratives from government officials to show the relationship between water shortages and agricultural exports.

According to the KZNDARD participant and an ULM official, 95% of the total municipal revenue is from agricultural business, i.e. commercial agriculture and forestry. "I can only give estimates in percentages, 70% of the total agriculture in ULM is timber. We have the largest untreated and treated poles for fencing and building in the country" (NNM).

The timber grown within ULM is exported nationally and internationally, however, the participants could not quantify how much of this is exported. According to the forestry information sheet on the government website (South African Government, 2014), the international exports are 99% converted products, and it makes up 1.9% of international exports (gov.za, 2012). It is estimated that 35% of forestry products are exported per annum (DWS, 2000:10).

The second is sugar cane, which is also for international markets. 75% of all sugar cane produced in South Africa is exported internationally (DAFF, 2018). Both these products are rain-fed and as mentioned above only forestry has been classified as a water use that is regulated. In South Africa, there are 14 sugar mills, 12 in KZN and two in Mpumalanga provinces, since these are the two sugarcane growing provinces. "The mills require a steady water supply for operation and in KZN during the drought 2 sugar mills were closed" (NNM, 05/03/2019). This uncertainty in water supply for sugar milling has caused farmers to look at other crops. The farmers in ULM are starting to turn parts of their sugar cane fields to planting macadamia nuts.

> "The farmers are only partially farming sugarcane now, they are moving towards nuts and essential oils because the market is open with very little competition and they don't need as much water as sugar cane. Globally there is a huge demand for nuts" (NNM).

Indeed, macadamia nuts are said to be the most lucrative crop in South Africa today with 95% exported. The farmers are adapting by curtailing their sugarcane growing in favour of macadamia nuts, however in ULM this transition is still in its infancy. DWS through their planning directorate have plans in place to deal with assurance of supply during a drought period. They have long-term and short-term plans. The short-term plans are structured to be able to respond when the assurance of water supply needs to be decreased, and thus decrease the amount of water allocated to users.

> "During water shortage periods, we start at lower categories of users, and most agriculture falls within this category, this is when the levels of restrictions come in. We start low and increase as required per category, water for basic human needs is the outmost top category and should we ever get to an actual Day Zero, this category will be assured. We are always aware that as a water scarce country, water restrictions are always imminent and work with System Operating Forums (SOF), representatives of major water users around the country to ensure that water users are aware of water usage versus availability" (CMF, 17/04/2019).

Timber and sugar cane as the primary crops and water users in the area. The two as stream flow reduction activities are difficult to monitor and limit water use during a flood because it is a natural process. This means that in periods of water shortages there is no way for government to limit the use of these two activities short of cutting them down. They continue using water and compete with domestic water use and thus the Reserve.

The export of these products may not be responsible for the water shortages that occurred in ULM. However, the fact is 35% of timber products, 75 % of sugar cane and 95% of macadamia nut are exported internationally and are produced in areas that suffered water shortages during the drought. The fact is government institutions do not have the correct volumes of water used classified as stream flow reduction. Not all water users are compliant with the licensing as per the narrative from the emerging farmer (NDF) and commercial forester (BSF). The water rights of commercial farmers and foresters during the drought severely impacted on the rights to water for the rural households. Stream flow reduction as a water right cannot be restricted, and thus even in in periods of severe water shortages, it continues to draw water, thus causing water insecurity for domestic water users.

Therefore, I have concluded that while it cannot be conclusively concluded that there is a relationship between water shortages and agricultural exports in ULM, it

is possible. This requires a more extensive study. I have shown above that stream flow reduction use is impossible to restrict during a drought because it is a natural process. Therefore, during a drought, this water use for exports may have caused streams to dry out during the drought at ULM.

However, government and commercial farmers are continuously working together to conserve water and use it efficiently. DWS has programs to create awareness on ways to reduce water footprint for the agricultural sector, commercial sector and the domestic water use sector as the major water users. The DWS water conservation specialist explained, "…we encourage farmers to use their allocated water efficiently and to adopt technologies that will reduce the water usage" (KMF, 17/04/2019). DWS work together with other government institutions in this program to ensure the efficient use of the water resources. The farmers' association in ULM has a standing agenda item on water on their meetings, according to BSM.

> "Farmers are conservation sensitive, we realise that water is the main driver of our business, therefore we are committed in conservation. We work with the DWS in alien vegetation management and ensure that wetlands on our land are conserved." (BSF, 04/05/2019).

5.2 The impact of water shortages on rural livelihoods

Driving around ULM, it is hard to believe that the area was hit by a drought just a few short months before. The area is green with sugar cane fields everywhere, green forests, maize fields and green rolling hills. However, behind every door I knocked on there were tales of hardship caused by the drought. I have divided the structured the impacts to cover food security and water security. The section on water security will also have subsections on social, financial and health. This will be done by applying the Sustainable Livelihood Framework and illustrate the use of assets by the villagers to maintain their livelihoods.

5.3 Food security

In this section I will discuss how the food security of households reliant on subsistence farming experienced the droughts and its effects. I will also discuss the strategies they employed to ensure continued food security. "Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life" (Pinstrup-Andersen, 2009:5).

In asking the participants in rural areas how the drought affected them, I quickly realised that almost all of them had a different timeline on the exact time they had the latest drought spell but the answers all fell between August 2018 and January 2019. This was when the participants felt the effect of the drought because this was the beginning of their planting season. They noticed that they were in a drought when the spring rains did not materialise. The participants are so used to their farming methods that they have become routine. For example, almost all the participants could not tell me exactly when they usually started planting maize until I prodded with events like school holidays, or other events such as Christmas.

I decided to depict their planting seasons in an agricultural calendar to illustrate the normal planting and harvest seasons. Although according the South African Weather Service website, there is no agreement in both the scientific and the ordinary communities on the season dates in South Africa. However, they recommend the use of the seasons for the Southern Hemisphere. Using this data, the interview responses and my own experiences with a mother who plants maize every year even in the suburbs where she currently lives, I have produced a calendar to depict the planting season in the area.

Table 3. Planting Calendar for ULM subsistence farmers

Planting Calendar in KZN												
Months	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Seasons	Summer			Autumn			Winter			Spring		
Rainfall	Rainy				Dry					Rainy		
Maize												
Beans												
Legend		Planting			Harvest							

Source: this thesis

Most of the participants said that their households rely on subsistence agriculture for their food. The drought caused the fields to be farmed much later then the participants usually start their planting, causing food shortages in some households. "The maize you see on the fields was planted in December when we usually start harvesting maize and prepare the fields for beans" (NDF). Most households eat the maize before it dries out, however they also save some to dry and eat later as izinkobe (dry maize dish usually prepared with beans). The beans, red speckled but popularly known sugar beans, a popular staple for most households, are left to dry and then picked and stored for use to cook. The drought which abated around late December with

some much-anticipated rains meant that the rural communities of KwaMboto and KwaMachi had to delay the planting of maize to a time when they usually start harvesting it and therefore had to push the bean season for a later period. One rural farmer remarked,

> "We usually plant maize in with the beginning of spring rains, however some people are still planting maize now. Beans are planted about this time (February/March) however, due to heavy rains we have not been able to plant the beans" (NMM).

The rural women adjust their sowing/planting schedule according to the arrival of the rains. In general, if the rains come early, then they will start planting the maize early. If the rains arrive late, then they adjust accordingly. To survive, they have learnt to adapt with their climate. The survival of their households depends on the women being able to understand the climate changes and adapting to it. The maize and beans are an important staple in rural diets and the survival of the households. The participants understood that they could not stick to the normal planting calendar as depicted above but had to adjust their schedules. The drought forced the participants to think adapt or starve, they chose to adapt. Some of the households were supported by the agricultural extension officers but mostly they made these decisions based on how well they know their land.

KwaMbotho also has a cooperative of 30 members, and only two are male. Their situation is different from Ushikishi, as they do not have an irrigation system yet. The agricultural extension officer in the area is working on getting the infrastructure for the group. Currently they fetch water from the river to water their garden and this causes them to come back from the fields extremely tired. The drought affected their crops, they usually cultivate vegetables such as carrots, cabbage, spinach, beetroot and onions. All the vegetables died except for onions because of the drought. The co-op farmer remarked on their adaptability,

> "…we had a very good onion harvest which the agricultural extension officer takes with her to sell on our behalf and the rest we take home and sell to the community from our home. Onion are a good crop in a drought" (MSF, 07/03/19).

The drought has taught the members of the community to use their land wisely and choose those crops that do not need water, in this case, onions, during a drought. Onions prove to be a crop to cultivate and these farmers learnt this and adapted to the situation.

The two villages had to learn to adapt to the drought or suffer from food insecurity. They adapted by adjusting their planting schedules. Their maize crop survived this but since the beans had not been planted at the time of the field visit, I

cannot be sure if they survived this adjustment. The quick adaptability of the KwaMbotho co-op to concentrate their effort on the onions when the drought caused their vegetables to fail, is also another example of this communities' resilience.

This is exactly the kind of adaptive governance described by Brunner and Lynch (2010) as described in section 3.3. above. Rural communities adapting to the changing environment in a bottom up. The impact as felt by the communities forced them to adapt and diversify through planting when the rains eventually began and changing the kind of crops to cultivate (Ellis, 2000).

5.4 Water security

In this section, I will be discussing how these communities experienced the water shortages and what strategies they employed to ensure ongoing water security.

In KwaMachi, water is reticulated to standpipes around the village, within 200 metres to most households. This is the government's basic level of service according the Water Services Norms and Standards (DWS, 2017). The households receive portable water to meet their basic needs. However, during the drought the water in the reservoirs, dried out. According to the participant from Ugu DM, the municipality had to ration water, and everyone was affected including the residents of the town of Harding. The Ugu DM Official commented, "in Harding the residents had a water cut schedule, where water was cut every other day and they could store water for the dry days" (BGM, 15/02/19). However, for the villagers in KwaMachi, there was no such schedule and they went for weeks without water. As one female participant lamented,

> "…during the drought, the taps were dry for weeks, maybe over a month, and we had to travel to the hills and dig up springs for water. We spent a lot of hours every day just looking for springs where we could get water. There were a lot of people and a queue to get to the water" (NJF, 06/03/19).

The hills around KwaMachi have several springs that were a source of water for the community during the drought. The quality of the water was not verified for this research, but the participants reported that they boiled the water and were not affected by any water-borne diseases. As NJF put it, "…the water from the springs was of unknown quality, even though we think it is clean, my family still boiled it before we could drink".

The real issue for the participants were the long distances they had to travel for water. This curtailed the movement of the women interviewed who carry the burden of fetching water for their families. Indigenous knowledge was key in ensuring

continued water security for the kwaMachi community. The villagers used this knowledge to pick places where they could dig, their make-shift boreholes and these yielded enough water to see them through the drought. The villagers know through information passed through generations that if you dig around certain parts of the village, there is water underground.

In KwaMbotho, the part of the village from the highway to Mhelane High School has the basic level of service, was depicted above, i.e., 200m from a standpipe. From the school to the end of the village, they rely on water from the stream. Ugu DM as the water service authority supply the area with water trucks. However according to the participants these trucks rarely come to supply water and since their schedule is erratic, the community cannot rely on this supply. When they do come, they quickly run out of water. One informant noted,

> "…it is a form of house arrest, because when we hear that the trucks are coming, we cannot go anywhere and have to wait for the water. The trucks never have enough water for everyone and we have to queue, some days we are lucky and get the water before it runs out, and some we are not" (NSF, 12/02/19).

However, when I asked the official from Ugu DM in in charge of water supply seemed surprised when I asked him about the water situation in KwaMbotho, he expressed surprise. He did not seem aware that the trucks did not go to the area every day as reported by the participants. He also seemed unaware that there are parts of the village without water supply at all, and who feel that they cannot rely on water trucks that come occasionally. It could be because he was acting in the position of his supervisor who was away on leave. He informed me that the trucks are contracted to deliver water according to a schedule he showed me on his phone.

The problem with the schedule is that it is a trust system as these are independent contractors and the municipality trusts that they make the deliveries as contracted. The district municipality relies on ward committees, which are service delivery committees run by ward councillors, to report the tucks if they do not deliver as contracted. He was adamant that there had been no such reports from these committees. I went to the village three times and spent a lot of hours in the area and I did not see a single water truck. It could be that they came earlier in the morning before I got there. Another member of the village said,

> "…we share this stream with livestock, especially cows that also drink from the same source. They pollute the water with their excrement and yet we still must use the same stream. It is very sad that so many years after democracy in this country we still live like this." (NMF, 12/02/19).

From the above citations, it is apparent the villagers rely on the water they fetch from a stream/river. This involves a substantial distance according to all respondents from KwaMbotho. It impacts on the economic freedom of the women in the area as they walk long distances to fetch water. During the drought, the stream used for supply ran dry. Consequently, the travel distances increased as the only source of water was a hole that had been dug out of the ground. A female informer narrated,

> "…the drought really put a huge strain on us, we had to first walk to our regular stream to check if there was any water on the day. If we do not find any, then we had to walk to the other side where there is no stream, just a hole we dug on the ground. The problem with that is that there is always a long queue as people come from the other villages too. The whole walk is approximately an hour from here to the stream and then another hour to the spring on the ground. This means walking over four hours on some days" (NMF).

Even schools and pupils were not spared. The Deputy Principal of Mathenjwa Secondary School said,

> "…the school has been lucky that it has reticulated water from the municipality. However, a lot of our pupils come from a drought-stricken area and they were affected. We experienced a lot of absenteeism because the pupils were helping their families secure water or find drinking holes for the livestock" (SMM, 12/02/2019).

The drought affected the attendance of pupils to school. This absenteeism was attributed to water shortages. This meant the children had to also bear the burden of this water scarcity. The Deputy principal and confirmed by the security guard added that

> "…the water shortage meant that on some weeks the reticulated water ran dry, this happened during summer months during exam time. The students were short of drinking water. We survived by rationing what we received from water trucks" (SSM)

The effects of the drought also impacted the pupils during the final exam time. School pupils in South Africa write final exams in November, the height of the drought in ULM. The water shortages may have been an added stress to pupils who had to worry about their families' water security as well as doing well in their exams.

The drought also affected those households within the municipal supply area as they had no water for weeks. One female interviewee said that

> "…during the drought we had to travel long distances to look for springs where we can dig for water. It was not easy and was back-breaking task for little bit of water. We had to learn to live on as little water as possible, it was not easy I tell you" (MSF, 07/03/19).

This area with the basic level of service was affected by the water shortages as the supply was severely affected by the drought. This resulted in the taps running dry in the supply area and the villagers having no other recourse but to head to the hills to dig for water.

The water supply in the study area while still the basic level, ensures that the villagers get adequate portable water supply 200m from their households. The drought caused this water to run dry and the supply was unreliable. This forced the villagers to walk long distances in search of water. The users in town, Harding, rightly had a schedule when the water cut-offs will occur, therefore they were prepared for the days when there will be no water. The lack of schedule in the rural areas caused uncertainty in users.

The situation was even worse for the parts of KwaMbotho without the basic level of service. The trucks that supply their water, are unreliable on the best of days. These users supplement the water from the trucks with water fetched from the stream, where they share the resource with livestock. During the drought even the stream ran dry, and the villagers had to share the dug spring with people from neighbouring villages. This caused anxiety for the participants, who had to wait in queues to get water from the hole.

The situation created by the drought in the study area goes against the definition of water security by use Abedin, Habiba and Shaw (2013) used in this study. The villagers in the study area lacked access to adequate quantity of water and had to use water of unknown quality. The participants' accounts show the severity of impact on their households. However, due to their resourcefulness, they managed to get water by digging up the springs. This water while inadequate in both quality and quantity sustained these communities during the drought.

5.4.1 Social Impact

When I was growing up in a rural area of Bhekulwandle, I knew all my neighbours for kilometres around. There were few people in my village I did not know, and they knew me and my family. Then my family moved to the suburbs, and now the only neighbours I know by name are those I go to church with. Spending a few days in KwaMbotho and KwaMachi, I cannot say with certainty that they are that close to their neighbours. However, I not only base this on my experience but also on Ellis (2000). "*Rural households in developing countries are observed to devote a lot of attention to personalised networks*" (Ellis, 2000:9)

In the study area, the farming cooperatives are formed along these networks. These networks have ensured that the co-op members are not only able to work together in their farming endeavours but can also sell their surpluses at affordable prizes to their communities. As one Ushikishi participant puts it,

> "…before our pipes were damaged, the whole community benefitted because we had cabbages and other vegetables, and now they must go to the white people (commercial farmers) for them, you see the whole community is hungry. We used to even provide temporary jobs for the community to help us with weeding and other services we cannot perform on our own but now we can no longer provide employment" (SKM, 06/03/19).

The members of the community are disadvantaged by the drought as they must get their fresh produce at higher prices from town or the neighbouring commercial farms.

The neighbours usually share the surplus harvest with neighbours who cannot farm because they are too poor to afford a fence. As one participant explains it, "...my family eats most of what we harvest but if we have a surplus we usually share with some neighbours and feed the rest to the goats" (NDF). This is done because as abundant as land is in the area, some families lack the infrastructure to farm and rely only on social grants for their survival. One such participant said,

> "…I cannot farm because my property is not fenced, and the neighbours' livestock eat whatever I try to cultivate. We are suffering because I am the only adult with three children and I have no income except social grants for the children" (NMF).

These social networks have also contributed in creating resilience of these communities. The sharing of surplus harvest with neighbours who are unable to farm contributed in keeping some households food secure.

5.4.2 Health Impact

In this subsection I will discuss how the water insecurity resulted in health complaints from the participants. The participants reported that they suffered some ailments because using water of unverified quality. A participant had this to complain about, "…the children get a rash from this water and we all have diarrhoea from drinking this water" (NMF). This was also reiterated by another participant "I almost died because of diarrhoea, because we have to share with animals" (NSF).

The impact of the drought on the community has been felt by the clinic that stands next to Mhelane High School. The nurse at the clinic who could not speak to me officially as her boss was away and she did not have the authority to answer my

questions, confirmed that they have seen a spike in water-borne diseases since the beginning of the drought. When I asked her asked whether this information is shared with the other spheres and departments of the government, she said as far as she knows it is.

It could be argued that this part of KwaMbotho that shares their water with livestock even when there is no drought. However, the difference is that during the drought the stream, which is running water, ran dry. The water sourced from the hole dug on the ground is not flowing water, causing the pollutants to be concentrated in one area.

The legislative and institutional framework for disaster management calls for cooperative governance. I asked the nurse about the sharing of information on the spike of water-borne diseases to see if this works in practical terms. Ideally a spike in water-borne diseases should trigger a response from governance institutions, to react before it becomes widespread.

5.4.3 Financial Impact

The participants' finances were impacted negatively by the drought. For the members of the farming cooperatives, the reduced yield has meant they could not sell to their community members and the surplus to vendors in town. The participant from Ushikishi lamented,

> "…we were really hit hard by this drought. Our children cannot go to school because we have no money for school. We used to be able to sell our harvest at Harding (the only town in the ULM), and sell to our community here. However, this year because of the drought even the community is suffering because they must buy their fresh produce from other sources further away" (TNM).

I was wondering why the children could not go to school due to their parents' non-payment as they could apply for fee exemption, until I discovered that some of the children in question were already at tertiary level in the city of Durban. The passion on the members' faces for their craft and the frustration of not being able to feed their families and be of help to their community was very evident.

The Ushikishi claimed that they used to be able to hire 600 community members when things are going well and because of the drought and damaged irrigation system they must do all the work themselves, which means they cannot farm as large an area as they are used to. One member explains,

> "…we used to even provide temporary jobs for the community to help us with weeding and other services we cannot perform on our own but now we can no longer provide employment" (TNM).

600 seasonal work opportunities were lost to the members of the community. Other subsistence farmers in the area sell their surplus maize already cooked or grilled on coals, on the side of the main highway or in town. This results in more income for the households with surplus. With the drought in the area, this income was late coming in for these families, which made the festive season (December) and schools re-opening (January) hard for some families.

For subsistence farmers the drought has been detrimental. The effect was felt by the whole community because the late harvest has left many households short of their staple diet which they rely on to supplement the food they buy from the shops. This saves them money as most of the fresh food they usually grow in their own gardens or buy from the cooperatives within the area. One of the subsistence farmers commented,

> "…the drought robbed us because instead of being able to grow my own food, right here in my yard, I have had to travel to the supermarkets in town to get vegetables, luckily I still had some beans from the last harvest. This costs me a lot of money in taxis and supermarkets in town are not as cheap as our village suppliers" (EWF)

The main employer in the area is the agricultural and forestry sector and jobs have been cut due to the drought. One participant lamented, "…there are no jobs in this area, we survive through farming and social grants" (NSF). The KZNDARD official attested to these job losses. He said, "…the farmers in the area are laying workers off as they also feel the pinch of the drought and this affects all the communities that rely on agricultural employment" (NSF1). According to a survey conducted by AgriSA in 2018, 31 000 jobs have been lost nationally because of the drought(AgriSA, 2019) .

5.5 What impact did the drought have on livelihoods?

The sustainable livelihood framework and adaptive governance are used to test the resilience of the two communities during the drought. As evidenced by the participants' narratives, the drought had a negative impact on their livelihoods. Their food supplies, water security, health and finances were affected by the drought. While the impact of the drought was negative to their livelihoods, the adaptability of the stakeholders involved ensured that the communities and ecosystem alike recovered.

The participant's willingness to adapt to the drought by adjusting their planting schedules and crops ensured that they maintained their food security. The resilience was also created by their use of capitals and livelihood diversification. The use of their knowledge of their area, ensured that they could be able to locate where to dig for springs when streams ran dry. They used their capitals to absorb the impact of the drought. The physical health required to walk longer distances to get water called on the participants' human capital. The neighbours helping each other and cooperatives selling to their neighbours at lower rates is an example of how they used their social capital. Financial capital was strained though as they had to rely more on social grants during the drought and there was less surplus to sell.
Cooperative governance in dealing with the drought could have been better. For example, the water trucks that were unreliable and the ward committees that did not report this unreliability. This ensured continued water insecurity within the area. The government have programs to deal with disaster management, however, the participants did not experience these interventions.

5.6 The engendered nature of the impact on rural households

The burden of collecting water and subsistence farming seemed to fall on the shoulders of the women. It is more an observation from my interaction with the participants then based on the participants narratives. This is because for the rural women, fetching water and gardening is viewed as part of their daily activities and they do not view it as a burden. This research study did not set out to include the gender aspect. However, I noticed during field research that women were more impacted upon by water shortages.

The interview participants engaged for this study in the two rural villages were mostly women. I pondered over this for a while as there seem to be very few men around the villages. I then decided to ask a few women I spoke to about this. The first participant I spoke to told me that she is a widow, unprompted in relation to another question I had asked. She said,

> "…I farm to put food on the table. My husband died leaving me with six children. I was lucky that I inherited his properties which included the sugar cane timber plantation. I also grow maize and other vegetables for my family's consumption" (NDF).

She was one of the lucky ones with regular income because although she is very small scale, she farms sugar cane and has a timber plantation. The only impact from

the drought was on her sugar cane, she lamented that the harvest will be later than she anticipated.

The other women were either single or the heads of their households or the husbands were off to work or out looking for work. The women were the ones who had to make the sacrifice of not going to the clinic when feeling sick but to go look for water for their families. One woman said,

> "…I have diabetes but sometimes I have to miss my clinic appointment dates to fetch water for my family…. My husband is out looking for work, the children have school, so they cannot always help, and my mother-in-law is sickly. It falls on my shoulders to walk to the river and fetch water but what can we do, we must survive" (NSF).

This participant took the burden of ensuring that her family ha water on her shoulders. She did not indicate whether she has any aspirations outside the home other than caring for her family's needs.

On the day I interviewed the members of Ushikishi cooperative, there were three males and 6 females, with one female tending the fields. All the other members present took turns in going into the trench and digging around to expose the irrigation pipe, only one person could do this at a time. Normally in my culture, males tend to undertake the more physically demanding jobs, like digging the trench, this left me pleasantly surprised. However, of the 9 members present, excluding the lady tending the fields, two of the males dominated the discussions, with the third male also contributing here and there. The females were mostly quiet and talked very little. They seem to defer the role of the communicator to the two men. At first, I assumed they are just fine and did my best to draw them into the conversation. They responded when asked directly and rarely offered more than this. However, this changed when we were leaving the site. As we were walking away, they started talking more animatedly to me. I concluded that they may have felt intimidated in answering what may have seemed like technical questions in a group setting and were more comfortable discussing general issues with me. The members assured me when I asked that, since they all pay a joining fee, they all have an equal voice and divide duties equally amongst themselves, hence everyone digging the trench. They had also invited eight young adults in their community to join the cooperative and were inducting them on the work they do.

The drought seems to have added a burden for the rural women and girls. They must walk longer distances to look for water. The drought has also caused competition in places, the queues that the women in KwaMbotho must wait in for a limited amount water. There is also the competition with the livestock, which pollutes the limited supply available.

6 Conclusions

In this chapter, I summarise the key findings that emerged from this research. I will also outline how this research contributes to the existing knowledge on the impact of drought on rural communities. Finally, I will recommend areas for further research based on the shortcomings identified through the theoretical framework.

6.1 Summary of key findings

The field study and empirical findings from this research have given me an insight on rural communities and how a shock such as the drought can have impact on their livelihoods. The findings are aligned against the aim and objectives of this study. I will start with the secondary objective and then move on to the primary one.

The stream flow reduction water use in the quaternary catchments within ULM was a factor in water shortages during the drought. How much of a factor though will need to be determined by a more comprehensive study. The rural communities relying on the area streams for their water supply experienced this impact. The declaration of the drought in ULM as a disaster by Ugu DM lead to water restrictions on all water users. However, as discussed above, while it is impossible to restrict stream flow reduction. As a result, the commercial forests and sugar cane continued to compete for the resource with the users from the rural villages. This had a negative impact as the villagers had to then dig for groundwater. The ecosystem also suffered with the water shortages as both the surface water (streams and rivers) and groundwater resources were under strain.

The allocation for water use licences by DWS for stream flow reduction and the conditions attached to them will need to be evaluated more rigorously. The taking of the aerial photographs for license review is a tool for DWS to identify those plantations that do not comply with the law. This will not be enough to restrict stream flow reduction during a drought but it will make for better monitoring. There also ned to be a monitoring mechanism for communities such as those at ULM who

rely on the streams for water supply. The impact on their ecosystem and their households is often overlooked.

The drought in ULM was a period of abrupt change for the residents. This abrupt change had a socio-ecological impact and required adaptive governance to ensure resilient ecosystems and ecology alike (Folke et al., 2005). The participants adapted to the drought and learnt to live with it. They did this by adjusting their farming methods and schedules. They did not connect the shortage of water in their area with any other factor but the drought. The rural communities are used to adapting to changing environment and they do this either out of choice or necessity (Ellis, 2000). The drought made it necessary for them to adapt to the change. In doing so they ensured that the impact of the drought was not permanent.

The communities were able to "*combine the different types of knowledge for learning*" (Folke et al., 2005:21). This combination of knowledge was the key in identifying water resources when the shortages were experienced. Without this knowledge, the water shortages may have had a much more negative impact on the villagers. In the absence or inadequacy of government support in providing water, the villagers identified alternative sources based on their knowledge of where the springs occur. They came together in digging for these springs. The indigenous knowledge in this case proved valuable and this knowledge base is often ignored for more technical one. DWS as a custodian of water resources, should ensure that the groundwater resources in these areas are protected as an alternative water supply for future droughts. They need to work together with the communities in the protection of the resource.

The role played by women in ensuring the resilience during drought is not recognised because in rural areas, fetching water is a woman's duty. However, the willingness of these rural women to walk for long distances, to stand in queues, all in search for water ensured the resilience of their households.

The two frameworks discussed in the theoretical section, i.e. the adaptive governance framework and sustainable framework, require adaptive governance institutions to work with communities towards resilience. The South African legislative and institutional framework was promulgated to be responsive and adaptive to ensure resilient socio-ecological systems, during shocks. This flexibility is embedded in the legislative framework. However, in this case while there were areas where the governance responded to adapting the drought, there are areas that implementation was absent.

The institutions for public participation for communities have not been established, therefore the response to the drought was inadequate for rural communities. The institutions exist for the major water users, the farmers union can mobilise government institutions to attend their forums. Whereas, the rural

communities must rely on Ward Committees, to air their concerns. The governance structures were not consistent in responding to the drought.

Furthermore, the government should accelerate the provision of at least basic water services to all communities. It is distressing to listen to participant lament about sharing water with livestock and walking for hour to fetch water. The mandate given to the post-apartheid government to ensure "Some, for all, forever", should still be driving the water governance framework. When President Cyril Ramaphosa gave his first State of the Nation address, he invoked Hugh Masekela's song, Thuma Mina (Send Me) as a call to action. "Let us continue to embrace the spirit of citizen activism in line with the injunction, Thuma Mina, in the onward march towards equality, freedom and prosperity for all" (The Precidency of South Africa, 2019). This is a call to all of us government institutions, communities, civil society, business and all South Africans to work together to improve the quality of life for those in rural areas.

The IWRM principles can only be achieved when the water management legislation is implemented fully. The slow implementation results in less flexible and adaptive legislative and institutional framework. Cooperative governance is also an important factor in ensuring resilience. Cooperative governance ensures that the socio-ecological system is flexible and adaptive to recover from shocks.

6.2 Areas that need further research

I believe that the legislative and institutional framework is adequate and there is no need for policy review. The implementation of the policy is slow, however. This means that the required institutions are not established and hence the stuttering response by government institutions. However, there are parts of the water resource management legislation that is ambiguous. The issue of stream flow reduction and the role it played in water shortages during the drought is not understood by government and all the stakeholders. There needs to be more research on stream flow reduction and its impact on the water resources. The inclusion or not of sugar cane as a stream flow reduction activity also needs to be concluded.

The secondary objective of this thesis is an area that still needs more extensive research especially for South Africa as a water scarce country. There is very little research in this area and none exists in South Africa. Climate change will cause more and more droughts. Therefore, knowledge around the linkages between agricultural exports and water shortages need to be created and soon.

6.3 Concluding Remarks

Climate change will cause longer and more severe droughts and severe flooding as it intensifies. The survival of rural communities who rely on subsistence farming will rely on how they adapt to the water shortages. It is imperative for government institutions to ensure that these communities receive the support and aid they require to recover from the shocks of climate change.

Another disaster was declared in the province of KZN, covering ULM, when severe flooding occurred (TimesLive, 2019). Climate change requires adaptive governance to protect vulnerable rural communities and their ecosystem.

This research aimed to understand one of these activities, i.e. agricultural exports. In trying to link agricultural exports to water shortages, I discovered that it was difficult to show this relationship without more extensive research using mixed methods. I had not anticipated that the major water use in the case study area is stream flow reduction. The ambiguity of this use complicated the issue. Unlike irrigation, wherein water can be restricted during a drought, stream flow reduction occurs naturally and hence cannot be controlled.

The impact on rural communities was the second objective of this study. The rural households were found to adapt different strategies to ensure resilience of their households and environment, during the drought. However, the governance structures were not fully responsive and flexible to ensure resilience. Moreover, the role of women and gender mainstreaming in ensuring adaptive systems, is very important. The rural women in ULM, sacrificed time and a lot of effort to ensure that their families were water secure.

It is regrettable that commercial farmers and foresters, except one, declined to participate in this study. I feel that they have invaluable information and strategies to cope with the drought that this study could have benefitted from.

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