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**Water scarcity and citizen welfare in a context of climate change
in the case of Engonyameni village in KwaZulu Natal**

By

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Abstract

Water is a very important resource that is essential for human beings to survive. Around the world there are millions of people who do not have access to adequate water. If they have water, in some instances, that water cannot be used. There are many challenges faced relating to water such as scarcity of clean water and access to clean water, and sometimes community members must walk long hours and distances to fetch it. Water scarcity denotes water shortages, water crisis, water stress and water deficit. There is a dearth of evidence on how water scarcity and climate change contemporaneously impact on rural people's livelihoods. In essence, this study investigated the experiences, responses to and interpretation of the compound relationship between water scarcity and climate change, and variability of the livelihoods, well-being and welfare of citizens in the context of climate change in the case of Engonyameni Village in KwaZulu-Natal. The sustainable livelihood approach guided this study because of its links to the well-being of people in order to understand the nexus between climate change and water scarcity. The study adopted a qualitative approach and used a purposive sampling to select the participants. Data was collected using in-depth interviews in which twenty-one in-depth interviews were conducted in the study area. The study found out that water scarcity is caused by issues such as negligence in water use, its overuse, mismanagement of water by the government, the community as well as the municipality, pollution of water, drought due to climate change, conflict and, lastly, distance (when community members use alternative sources such as river water). The results revealed that citizens are still denied access to water due to political issues, corruption in institutions, conflict over land, its overuse and the unfair treatment of people of the Engonyameni area. The study also found that declining water resources affect access to water in the area. Therefore, people are forced to find other alternatives, sometimes unhygienic sources of water such as rivers and dams. The study postulates that it is possible to mitigate water scarcity through water education and conservation. Evidence found in this study show that people do not know how to save water and they heavily rely on truck water whilst there are other alternatives such as water harvesting and the re-use of water for chores. And lastly, it found out that those who have water misuse it recklessly.

Declaration

I, Nomfundo Zama Mshololo (Student number: 216073226), declare that the thesis titled: **Water scarcity and citizen welfare in a context of climate change in the case of Engonyameni Village in KwaZulu-Natal** is my original research. All citations, references and borrowed ideas have been duly acknowledged.

1. This thesis has not been submitted for any degree or examination at any other university.
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Dedication

This study is dedicated to my family.

Most importantly, I dedicate this study to my loving mother, Miss M.N. Mshololo, who believed in me during my university years. I dedicate this study to my grandfather, Mr B.W. Mshololo, and my late grandmother, Mrs E. Mshololo, as well because without their support and prayers, I would not have completed this research. Thank you for believing in me.

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I would also like to acknowledge the contribution made by the research participants who took time out of their day to be interviewed.

I thank the community of Engonyameni.

Abbreviations

AGTs	Above ground tankers
DFID	Department of Foreign and International Development
DWAF	Department of Water Affairs and Forestry
DRWH	Domestic Rainwater Harvesting
IISD	International Institute for Sustainable Development
IPCD	Litre per capita per day
KZN	KwaZulu-Natal
LED	Local Economic Development
MDG	Millennium Development Goals
NGOs	Non-governmental Organisations
OECD	The Organisation for Economic Co-operation and Development
RWH	Rainwater harvesting
SDG	Sustainable Development Goal
SL	Sustainable Livelihoods
SLF	Sustainable Livelihoods Framework
SSA	Sub-Saharan Africa
RGUU	Regulatory Guidelines for Urban Upgrading
UGTs	Underground tankers
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	The United Nations International Children's Emergency Fund
WHO	World Health Organisation
WWF-SA	World Wildlife Fund-South Africa

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CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1 Introduction

“Amanzi ayimpilo” - water is life - it is essential for survival. There can be no growth, no economic development and no livelihood in the absence of water. Due to droughts and water scarcity in South Africa, it should be our responsibility to ensure water security all the time (Stein, 2004). In 1996, The South African Constitution included that everyone has the right to sufficient water (Muller, 2008). The South African National Water Act (Act 36 of 1998) supports the involvement of all South Africans in making decisions regarding the right to access water and water problems. Concurrently, the Water Service Act (Act 108 of 1997) stipulates that sanitation and water are to be provided affordably, equally, effectively, efficiently and sustainably to all South Africans (Sigenu, 2006). Perret (2002:8) states that the Water Act also advocates for the formation of Water Users Associations which must ‘enable a community to pool financial and human resources to carry out more effective water-related activities.’ However, most of the rural population struggle to secure the right to water which is still dominated by those with access to land and economic power (Gabru, 2005).

Moreover, water rights are defined as the rights to use water from water sources such as rivers, streams, ponds or any groundwater source (UDWR, 2009). The problem in Engonyameni is not necessarily climate change, but is the result of private owners owning land and having power and acquisitiveness over the majority. However, partnerships can have positive impacts on service delivery. Osumanu (2008) describes the challenge of dealing with negative perceptions of private sector involvement, resulting in the public sector becoming a preferred service provider especially in water and sanitation provision. Osumanu (2008) further argues that there needs to be political commitment, strong support for community driven initiatives and stakeholder ownership.

The central focus of this study is on how climate change affects the livelihoods of the community which include agricultural practices such as not being able to water the garden because of water scarcity. This study also looks at how water scarcity affects citizens living in Engonyameni and how water services, such as trucks, fail to deliver their services adequately and on time for the community members of Engonyameni. The goal of this study is to examine and investigate the state of water in the area, and how water affects their wellbeing such as health and hygiene. Furthermore the study investigates the challenges

faced by the participants and the successes of partnership that these service deliveries have on the citizens. This study was undertaken in a semi-rural area or a village with some parts of the area having running water taps, and a large part of the area had no water and, as alternatives, relied on water service delivery trucks and polluted rivers. Adequate water supply is necessary for the needs of the community for cooking, cleaning, drinking, washing, farming, watering the garden, healthy lifestyle and healthy environment (both have psychological implications for the citizens' well-being).

This chapter outlines the background information which introduces the statement of the problem and rationale for the study. It also presents the aims, objections and research questions of the study. Lastly, it includes the organisation of the chapters of this study.

1.2 Background of the study

Water scarcity is a global challenge affecting billions of lives and societies on each continent. Around 1.2 billion people, or almost one-fifth of the world's population, live in areas of physical water scarcity. However, the demand for water usage globally is growing against the rate at which the world population is increasing. Regardless of factors causing water scarcity, whether it is a natural or human-made phenomenon, the situation is negatively affecting people's livelihoods. For example, climate change and industrial pollution are contributing to the depletion of reliable water sources (UNDP, 2006). South Africa is not spared in this problem by being ranked amongst the 30 driest countries in the world. The department of sanitation acknowledges the water scarcity problem by estimating that national water storage in 2015 was 64.3 per cent lower than the 73 per cent recorded in the previous year as indicative of hydrological and metrological drought. Currently, water storage in KwaZulu-Natal in which the study area of Engonyameni falls is at 57 per cent due to increased abnormal heat waves (Republic of South Africa, 2015). This situation, therefore, has negatively affected water resources to meet the demands of daily water usage in the Engonyameni.

All three sections of Engonyameni have some common and different sources of water. People in the informal and formal settlements of **eziMpisini** depend on rivers, boreholes and water trucks while their counterparts in the reconstruction development housing area of

Ezinyathini, depend on water tanks and tapped water though most often the taps run dry for longer periods. The semi-urban area of **Yobe** gets water from the trucks and water taps. All water trucks are provided by the municipality and private water trucks which differ in amount and regularity depending on the area. Therefore, the lack of consistent availability of water to people affects most of the daily operations that depend on water and this study explores the extent of this effect on livelihood.

Climate change is defined as an event caused intentionally and unintentionally by humans. According to the (Stocke, Plattner, Tignor, Buschung, Nauels, Bex and Midgley, 2013) (Climate Change, 2013), climate change is a long-term change in the distribution of weather patterns. Furthermore, changes in the conditions of weather can cause more rainfall or less rainfall, and higher or lower temperature. Furthermore, climate change is defined as a weather condition that can escalate badly; these weather conditions are namely hurricanes, tropical storms, cyclones and severe droughts. Climate change is one of the imperative issues that has national and global effects. Knegtel (2014) states that climate change has affected rural and urban areas, particularly within agricultural systems settings. Hence, the community is finding it difficult to adopt through the unpredictable climate condition for their survival and needs. Such consequences can have detrimental effects in their daily lives, these effects of climate change can be felt in the short term due to hazards such as soil erosion, deforestation, drought, landslides, floods, hurricanes and long-term through landslides and cyclones. The effect it causes is felt through people's health, agriculture, on its availability, biodiversity and ecosystems.

Stern (2006) states one of the impacts of climate change may escalate warming further, and when the escalation happens, it triggers the release of greenhouse gases. If the increase happens, it will cause a more severe risk of the temperature going higher that causes changes in the atmosphere and weather patterns. In the case of Engonyameni, when temperature escalates higher, it causes negative effects on the fauna and flora, and the environment in the area. The major effect is the issues of drought which threaten crops, animals and freshwater supply. Stephens, L'ecuver, Forbes, Getelmen, Golaz, Budas-Sakedo, Suzuki, Gabriel and Haynes (2010) write that one of the most serious impacts climate change is how it will affect water resources around the world. Furthermore, water is tied to other resources and social issues such as food supply, health, industry, transportation ecosystems integrity. Climate change can also be caused by human activities such as air pollution from the burning of fossil

fuels, woods and burning of the veld which is very common in the area. Climate change triggers health issues, for instance, in circumstances of inadequate fresh water supply, there is a high chance of community members getting communal diseases such as cholera and malaria.

Florke, Kynast, Barlund, Eisner, Wimmer and Alcamo (2013) describe several domestic attachments of water to daily living which include minimum drinking water and water for sanitation, bathing, food preparation and natural ecosystems. In addition to this, (Mulwafu, 2003) the definition of water in Malawi context includes watering and dipping stock as domestic uses of water. However, water use varies in amounts depending on activities. For example, cooking uses less water than bathing, hence attracting different economic demands on households. Sometimes water is put to productive uses that results in another kinds of livelihood as in agriculture where people use water in home gardens to grow vegetables and other crops mainly for subsistence consumption. In such occasions, water becomes a basic need and a catalyst for other socio-economic activities that support household survival.

1.3 Statement of the problem

Rijsberman (2006: 6) defines water scarcity in the following manner, “When a person does not have access to safe and affordable water to satisfy his or her needs for drinking, cleaning, washing or their livelihoods, we call that person water insecure”. Moreover, this means that when a large number of people in a given area are water insecure for a considerable period, we can name that area water scarce (Rijsberman, 2006). It is with evidence from the above that poor access to water supply or having no access at all regarding water affects citizens or community members negatively health wise and their livelihoods in general. This research investigated the issue of water scarcity and climate change.

The area investigated is in a rural and semi-rural setting at Engonyameni just outside Durban, in Umlazi, which has less rainfall per year and rapid dry, humid seasons. During the period of humidity and drought, a greater population in the village is susceptible to water scarcity mainly caused by climate change leading to inadequate livelihood options. In this area, dry seasons are usually from February to September, and the lack of water infrastructure is a major issue. During this season, citizens in the village of Engonyameni are faced with

numerous challenges such as the lack of water which is caused by rivers drying out and water pollution caused by citizens dumping waste into the water resulting in the water remaining unconsumable. Another issue that arises from water scarcity is lack of service delivery such as the water truck not delivering their services to the citizens on time, and, at times, never delivering at all. The problem is about water scarcity in the study area and how it is linked to climate change.

1.4 The rationale for the study

Most researchers focused predominantly on water scarcity rather than looking at other core issues of how water scarcity affects community members. Rasmussen (2009) states that people all over the world are affected by water scarcity. People who are most affected and are more prone to water scarcity are the poor who live on a subsistence basis in Sub-Saharan Africa (SSA). Furthermore, studies were undertaken and proved true that climate change has contributed exceedingly to the increase of water scarcity, therefore, will continue to make things difficult for the people in SSA to produce food.

Others posit that the problem of water scarcity puts the well-being of women and children in jeopardy, they are more prone to being injured, attacked by wild animals in the bush or drowning when collecting water from water sources due to harsh weather conditions. For those children fetching water during school days, this hinders their life negatively, some of the children do not get the opportunity to attend school or they arrive late due to fetching water before the school day begins. Women, especially young girls, are customarily responsible for each family's water supply and spend a lot of their time and energy fetching water from different sources which include rivers, dams and water trucks. Momsen (2004) states that on average, a Sub-Saharan African woman spends about four hours fetching water from any water source and performing water-related errands. Moreover, this is evidence that women and young girls could have spent this time being at school learning rather than fetching water. Even though this study is not mostly based on gender differences, it is imperative to note that women and female learners are traditionally responsible for water collection and household chores. It is common in the area of Engonyameni that young girls are the ones who solely collect the water from the river, dam and water trucks early in the morning before they go to school due to the fact there is no water in the taps.

Asomaniwaa (2013) proclaims that by 2025 about four billion people will survive under severe water stress conditions. This means that the growing world population will struggle to increase water storage and fend for itself. A billion or more people worldwide will continue to have a lack of access to direct water supplies. This is not because there is a water shortage, but because governments are failing in providing it. It is with evidence from the above studies that prove that the issue of water scarcity does not lie in the fact that there is a shortage of water in the area, but that the government is not playing its role in providing the water services knowing well that the issue in the rural area of Engonyameni is water. These are the factors which provided the impetus to this study.

1.5 Objectives and research questions

1.5.1 Aim

The aim of this study was to investigate the issue of water scarcity with a focus on citizen welfare in the context of climate change at Engonyameni village in KwaZulu-Natal.

1.5.2 The objectives of this study are:

- To explore the perceptions of people of Engonyameni on the role of water in their welfare
- To unpack the challenges people in Engonyameni experience in accessing water
- To assess people's perceptions of climate change and its effects on their welfare
- To investigate the alternative sources of water for people in Engonyameni
- To investigate people's suggestions on how to address water scarcity in Engonyameni

1.5.3 Research questions

The main research question for this study is:

How does water scarcity and climate change affect citizens living in the Engonyameni Village?

1.5.4 The subsidiary questions are:

- What are the perceptions of the people of Engonyameni on the role of water in their welfare?

- What challenges do the people of Engonyameni experience in accessing water?
- What are the people's perceptions of climate change and its effects on their welfare?
- Which alternative sources of water do people in Engonyameni use to sustain their livelihoods?
- What are people's suggestions in addressing water scarcity in Engonyameni?

1.6 The organisation of the study

The thesis consists of five chapters; Chapter One covers the introduction and background of the study by outlining the scope of water scarcity and climate change in the Engonyameni village. It also consists of the problem statement, rationale for the study and the objections of study.

Chapter Two is a presentation of a literature review which consists of a theoretical framework and literature from various authors stating their views about the issue of water scarcity and climate change.

Chapter Three presents a detailed outline of the methods and methodology of the study. Chapter Three explains the research design, sample and sampling methods and the data collection methods used in this study.

Chapter Four is the overall outcome of the study. It presents the analysis and interpretation of the results from this study which are discussed thematically.

Chapter Five presents the conclusions deriving from the findings found, and culminates in the discussion of the key results and the presentation of the recommendations.

CHAPTER TWO: THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

This chapter presents the theoretical framework and review of literature of the study. This chapter also presents a review of various literatures on how climate change contributes to the problem of water scarcity and the subsequent effect of water scarcity on people's welfare. The chapter discusses the available literature on the global status of climate change and, in particular, the situation in South Africa. The chapter further highlights the global situation of water scarcity and how it affects various aspects of human living and welfare. The last section of the chapter discusses the effect of water scarcity on the daily lives of people in relation to the role water plays in the domestic arena and alternative ways people engage in responding to the situation. The theoretical framework guiding this study is presented in this chapter. It will guide the understanding of the interplay between water scarcity and climate change. The theoretical framework used for this study is the sustainable livelihood approach. Firstly, this chapter will go into detail to describe and discuss the theoretical framework, so that it reveals its relevance to this study.

2.2 Theoretical framework

The research adopts a sustainable livelihood approach which Serratt (2017) describes as a composition of capabilities, assets and activities required for a means of living. Bohle (2009) highlights six core principles of the sustainable livelihood approach that emphasise on people-centeredness, participatory and responsiveness to people's needs, dynamic and supportive to factors affecting people's lives like climate change in ways that are multilevel, holistic and ensuring sustainability. The sustainable livelihood framework regards a household as a basic unit that produces various socio-economic activities and helps to understand people's way of life. According to (Tao and Wall, 2009), the sustainable livelihood approach is concerned with the creation of livelihood opportunities and strategies of poor people who get socially and structurally excluded in matters of their concern, and the livelihood approach emphasises their visibility in access to basic services and the needs available to their counterparts. Tao et al. (2009:138) emphasize that "sustainable livelihood approach is in line with sustainable development thinking, as it provides a practical way to address the complexities of multiple survival strategies because it focuses on people, their

resources and their activities”. Krantz (2012) stresses that water plays a crucial role in enhancing a better living standard for people, as most of life-sustaining aspects depend on water. Therefore, this study adopts a sustainable livelihood framework to interrogate the effects of climate change on access and availability of water which is a necessity for better household welfare. The structural representation of the livelihood framework is presented in the next section.

2.2.1 Background to Sustainable livelihoods

Rakodi (2014) mentions that the term livelihoods are the assets, activities and entitlements where people make a living out of them. In this context, assets can be defined naturally and biologically. For example, water that we drink, the land we live in, flora and fauna and property resources. There is also the social aspect which consists of the community at large, household, humans, participation of the community and empowerment. Examples are skills which create knowledge and, lastly, there are the physical assets which include infrastructures such as roads. The 1987 Brundtland Commission introduced sustainable livelihoods regarding the ownership and access to resources, and livelihood security as being important in rural areas such as, in this case, Engonyameni. Sustainable livelihoods, according to the International Institute for Sustainable Development (IISD) (Ayre, 2013) are concerned with people’s capacities that generate and maintain their livelihood and enhances their well-being and that of future generations. The Department of Foreign and International Development (DFID) (De Haan, 2012) argues that livelihoods comprise of assets, capabilities and the activities which are a necessity for means of living. Furthermore, a livelihood is only sustainable if it can cope with stresses and recover from said stresses and shocks. Lastly, a livelihood is sustainable when it enhances and maintains its assets and capabilities for current and future generations, and in doing so, not subvert the natural resources base (De Haan, 2012)

2.2.2 Livelihood assessment

Livelihood assessment is a way of looking at how a person or community member, household, or a community conducts themselves accordingly under specific conditions (Morse, 2013). There are various ways in which to understand livelihood systems, and one of the ways to understand livelihood systems is to analyse the coping and adaptive strategies

pursued by individuals and communities as a response to external shocks and stresses such as drought, civil strife and policy failures (Tao et al., 2009). There is, however, an important distinction between coping and adaptive strategies. Coping strategies are often a short-term response to a specific shock such as a drought. Actions could include switching to the cultivation of drought-resistant crops or reliance on external food aid. Adaptive strategies, on the other hand, entail a long-term change in behaviour patterns as a result of a shock or stress (Opiyo, Wasonga, Nyangito, Schilling and Munang, 2015).

2.2.3 Sustainable livelihoods framework

According to Morse, 2013, related to sustainable livelihood framework is the fact that some of the problems that poor people in urban South Africa face include the inappropriate regulatory frameworks, dysfunctional land markets, failed policies, cumbersome administrative procedures, unresponsive financial systems, corruption and bad governance. All these problems are the main cause of failures of livelihoods strategies which deny the community of Engonyameni opportunities to benefit from urbanisation and prevents human development. It can be argued that these failures are also the initial cause of water scarcity and impede sustainable livelihoods in the area of Engonyameni.

Tao et al. (2009) further mention that, in order to achieve sustainable livelihoods, there are several approaches that can be drawn from it. For people, sustainable livelihoods may mean different things, but the author emphasises that there is a commonality with these various approaches which is “a call to reduce the complexity and uncertainty that gives rise to the demand for sustainable livelihoods in the first place”. Sustainable livelihoods, therefore, can be a tool of thinking about objectives and priorities for development, and as a way to amplify progress in the elimination of poverty (Serrat, 2017). The initial goal of the sustainable livelihoods approach was to help poor communities achieve and maintain livelihood improvements that last. In the case of Engonyameni, the approach applies as many households are poor in a rural context.

Within the sustainable livelihood approach are five assets that link to this study, namely, natural, also known as environmental capital. These include all the natural resources such as land for the people, water including consumable water, biodiversity and environmental resources. The second asset is physical capital which is basic infrastructure that includes

communications, water, sanitation and equipment for production. The third capital is human capital which includes knowledge skills, labour, information and the health of the citizens. The fourth asset is one of the most important assets which is social capital, and links deeply to the study in terms of institutional and traditional leaders with evidence from Chapter Four failing to produce water resources for the community members of Engonyameni. Serrat (2017) further emphasises social capital, as they are social resources such as the relationships or connections of members of formal and informal groups, trust, networks and wider institutions. The last asset is financial capital where financial resources are available such as income, savings, supplies of credit and access to employment (Horsley, Prout, Tonts and Ali, 2015). These assets types are also important for the people of the Engonyameni Village.

2.2.4. Sustainable livelihood framework diagram

Figure 1 is a diagrammatic representation of a sustainable livelihood framework

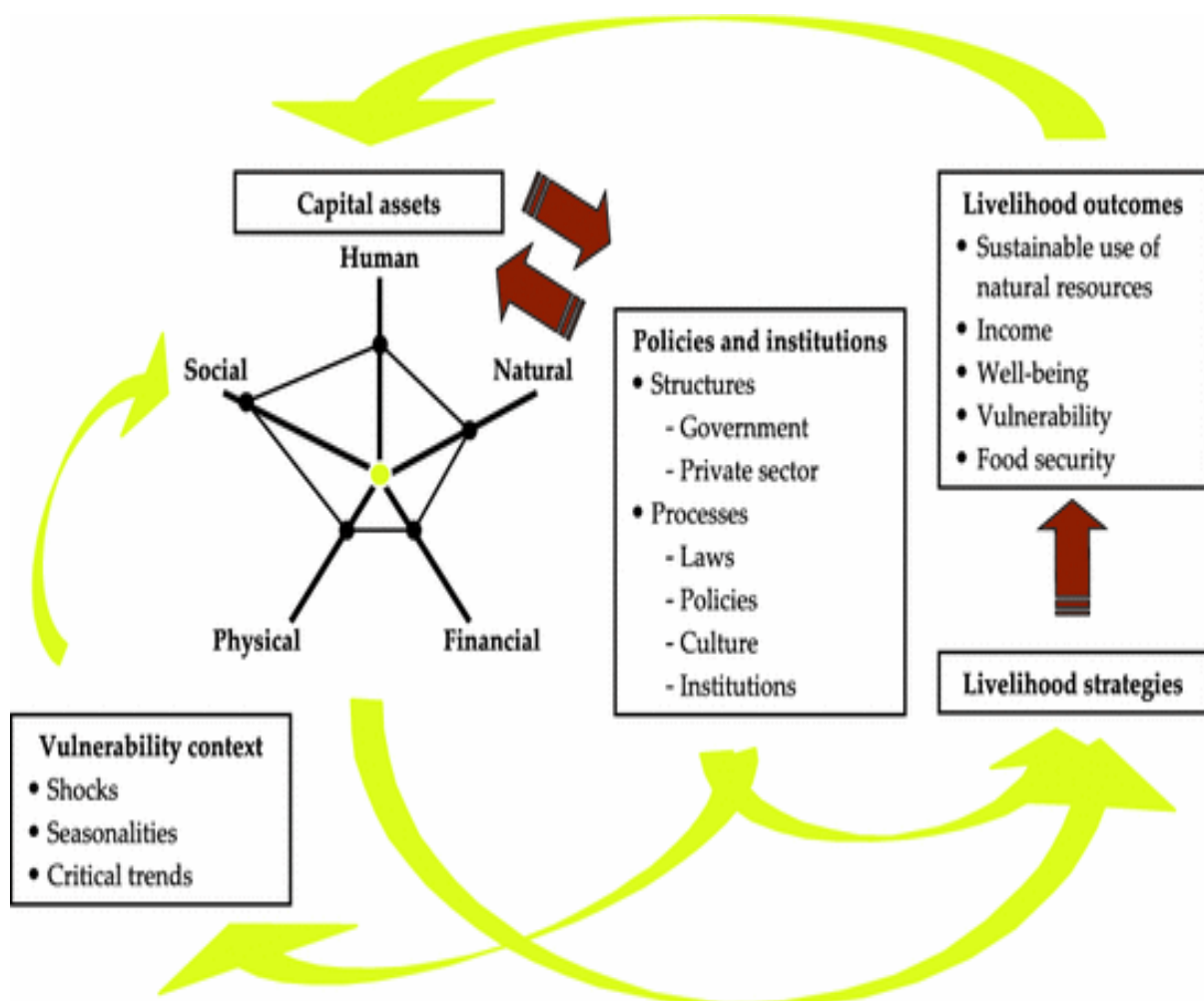


Figure 1: Sustainable Livelihood framework (Source: Serrat, 2017)

2.3. Literature review

2.3.0. Sustainable Development Goals

Water is crucial for all aspects of life; the defining feature of our planet (Corcoran, 2010). In 2015, the Millennium Development Goals were terminated and gave birth to the Sustainable Development Goals (SDGs). Studies prove that by the time MDGs expired in 2015, there was already an increase of improvement on water sources globally (from 76 per cent to 90 per cent), but with the improvement, there still needs to be more improvement regarding water access (World Health Organisation /United Nations Children's Emergency Fund, 2015). SDGs set the 2030 agenda and aim to transform the world by tackling multiple challenges that the people are encountering to ensure environmental protection, economic prosperity and well-being (Pradhan, Costa, Rybski, Lucht and Kropp, 2017). Hoekstra, Chapagain and Van Oel (2017) allude that the goal is water. The authors particularly articulate on the understanding needed to achieve target 6.3 on water quality and pollution. Target 6.4 is on water-use efficiency and water scarcity. Regarding SDG 6, we conclude that it lacks any target on using green water more efficiently, and while addressing efficiency and sustainability of water use, it lacks a target on the equitable sharing of water. SDG 6 is more fitting to the study and provides unhindered access to safe and economical drinking water and sanitation for all.

2.3.1. Climate change in the development agenda

Over recent years, climate change has dominated the development and policy agenda considering the impact on social, economic, environmental and political welfare of the people. In this understanding, Zhang et al. (2011) identified the linkages between climate change and human crisis in a reciprocal relationship whereby economically driven human activities became the ultimate cause of climate change, as influencing the human activities became more harmful to the climate. Furthermore, climate change is understood as a weather condition that can escalate badly and causes the devastating conditions of a hurricane, tropical storm, cyclone and severe drought (Zhang et al. 2011). Levin, Cashore, Bernstein and Auld (2012) address the problems of climate change as requiring policy mitigation programmes because climate change results from the actions and reactions of human activity that could be controlled or limited. Climate change can be caused by human activities such as

air pollution from the burning of fossil fuels, wood and the veld which is very common in the area.

Climate change is one of the imperative issues that have national and global effects. Knegtel and Naidoo (2014) state that climate change has affected rural and urban areas, particularly within agricultural systems settings. Hence, the community is finding it difficult for them to adopt through the unpredictable climate condition for their survival and needs. Such consequences can have detrimental effects in their daily lives. These effects of climate change can be felt in the short term due to hazards such as soil erosion, deforestation, drought, landslides, floods and hurricanes, and long-term through landslides and cyclones.

Regions and countries that mostly depend on rain-fed agriculture experience many adverse effects of climate change (Collier et al. 2008). Such dependency coupled with the limited capacity to adapt to climate change reduces the chances of surviving from the climate change effects. Considering that agricultural production remains the main source of income for most rural communities in the region, the adaptation of the agricultural sector is imperative to protect the livelihoods of the poor and to ensure food security (Bryan et al., 2009)

However, different parts of the continent experience climate change effects differently. For example, some areas in eastern Africa are predicted to be much wetter and colder, while the outer part of southern Africa is extremely hot and has drier areas. Climate change is expected to adversely affect agricultural production in Africa. Similarly, China traces back in the experience they had encountered in the explosive growth of the economy in recent decades. Initially, seven per cent of arable land was available to feed the 22 per cent of the world's population, therefore, China's economy remained vulnerable to climate change itself (Piao, Ciais, Huang, Shen, Peng, Li, Zhou, Liu, Ma and Ding 2010). China's agriculture, despite the growing importance of industry, plays a central role in ensuring the food security and welfare of 1.3 billion people. Piao et al. (2010) state that China is more at risk from heavy rainfalls, heatwaves and drought due to climate change. Heatwaves occur frequently. This goes back 50 years ago in central China. Furthermore, evidence states that winter has been colder than usual and observed that there is a pattern of heavy rainfall which causes severe floods. Even though these weather patterns come from different parts of China, it remains that the frequency of heatwaves and extreme rainfall will increase in the future for most of the country of China (Piao et al., 2010). Drought as the main manifestations of climate variability in China, human life and agriculture are the major concerns given the fact that

China is already severely dry. Warm weather will induce people to take more showers, do their laundry more frequently, water their garden frequently and use swimming pools. Therefore the use of water will increase (Ruijie, Zimmerman and Van dan Berg, 2008). Similarity, (Elasha, Elhassan, Ahmed and Zakiieldin, 2005) state that Sudan has encompassed an area of about 250.6 million hectares of land, many of these areas are desert and arid lands. In Sudan, water resources are the most limited, low soil fertility is prominent, and the major issue is one of drought. Sudan comprises of various human pressures, these latent conditions caused by human pressures causes vulnerability in this country to climate change, and this is a major cause and influence to foreseen climate change. Furthermore, the author emphasises that drought is the major problem this country faces, with the on-going years of recurring series of dry years have become a norm for this country. He further explains that droughts threaten the existing cultivation of 12 million hectares which are rain-fed. A minimum of 6.6 million hectares of rain fed lands that are traditional, pastoral and nomadic groups in the semi-arid areas of this country are affected.

2.3.3. Impact of climate change on resource services

Climate change has an effect on global warming that replicates its impact on water sources and water scarcity (Iglesias et al., 2007), the aquatic populations (Gibbon et al., 2000), food security (Wheeler, 2013), tourism industry (Scott et al., 2008) and drought (Allen et al., 2010). Global warming also affects agriculture (Collier et al. 2008). Stern and Stern (2006) state that one of the impacts of climate change may escalate warming further, and when the escalation occurs, it triggers the release of greenhouse gases. If the increase happens, it will cause a more severe risk of the temperature going higher which causes changes in the atmosphere and weather patterns. Climate change negatively and hugely affects water resources from the availability thereof to the management of the remaining water reservoirs. Intergovernmental Panel on Climate Change (2014) allude that climate change will cause intensification of the hydrological cycle which will cause severe flooding and droughts. Furthermore, since South Africa is a semi-arid drought area and has rainy seasons, due to the rise of weather temperature and increasing variability of rainfall, climate change is the major impact of water being available in South Africa. In conclusion, this can increase droughts and floods in the country (Swinstock et al, 2010). Climate change affects socio-economic sectors, namely, water resources, forestry, fisheries, agriculture, ecological systems, human settlements and human health in the most vulnerable in developing countries (Edenhofer,

Ottmar, Pichs-Madruga, Sokona, Seyboth, Matschoss, Kadner, Zwickel et al, 2011). Water services and authorities need to look deeper into the effects of climate change and water resources and harsh weather conditions.

2.3.4. The global water crisis

During the 1990s, water came to be seen as integral to the environment. The Brundtland Commission 6 Report and 1992 Rio de Janeiro Earth Summit highlighted the need to protect water for the environment: "In developing and using water resources, priority has to be given to the satisfaction of basic needs and the safeguarding of ecosystems" (cited in Cruickshank and Grover, 2012: 169). This subsequently influenced policy, for example, South Africa set aside a reserve to protect the environment and meet basic needs before water is allocated to other uses. Alcamo, Hendrichs and Rosch (2017) highlighted that by 2025, a large part of the global population would be living in countries experiencing water stress. These people will be using more than 20 per cent of their available resources. Alcamo et al (2017) present a figurative picture that around five billion people, out of a total population of around eight billion, will be the likely affected population. It should, therefore, be understood that climate change puts additional pressures in some of the regions. This implies that climate change has a very harsh impact on global hydrological regimes and water resources. The spectre of climate change, together with other global environmental changes such as changes in water availability and land cover and altered nitrogen availability and cycling are strongly influenced by human activities and have increased concerns about achieving food security especially for poor people (Gregory et al., 2005).

The 1990s were also a turning point in terms of viewing water as an economic good (Nichol, 2000). Some argue that this paved the way for commodification and cost-recovery and had a negative impact on the poor (Cock, 2011). Others posit, that it created space for water to be seen as a productive asset which increased awareness about the role of water in livelihood strategies (Rakodi, 2014).

2.3.5. The meaning of water scarcity

There are various definition of water scarcity that various authors have defined. Kumar (2013) states that there are severe tragedies of water scarcity. These tragedies are women and children carrying buckets on their heads and walking long distances on a daily basis to meet household needs. Other tragedies are farmers losing their land due to the fact that they do not

have enough irrigation water to flush salt from the soil, and the loss of wetlands and estuaries due to upstream water depletion. Schreiner et al. (2002:128) conclude and state that water scarcity from a human perspective that human needs for water, both for domestic and production purposes, remain unfulfilled due to quality and quantity. Furthermore, Kumar (2013) mentions that water scarcity is the cause of water quality declining, pollution and impacts fully on poor people. It is appalling that people living in developing countries have no choice but to drink dirty and polluted water. Therefore, after consumption, they get sick and develop symptoms such as skin rashes and sanitary diseases due to the polluted water used for bathing and washing clothes. Redcliff, 2013 adds that experts on the study may agree that the quantity of water is more important than the quality of water in terms of effects on public health. Water scarcity can also be understood in two different ways such as physically and economically.

2.3.6. Understanding water scarcity

Climate change has an adverse impact on water resources by limiting its availability and leading to water scarcity. Water scarcity is a global concern that is affecting billions of lives and is a repeated occurrence (Mekonnen and Hoekstra, 2016). Clarke (2013) describes water scarcity as the deficit in demand between water availability and the demand to meet people's various basic needs. Garrote, Iglesias and Medeiro (2012) describe water scarcity as an unacceptable risk of facing water shortage due to severe water demands in the near future. Water scarcity is the lack of sufficient water or not having access to safe water supplies. Pereira et al. (2009) quantifiably defines water scarcity as a situation where water availability in a country or in a region is below 1000m³ per person per year.

A water-scarce area is depicted when a large sum of people living in that particular area are water insecure for a specific period of time. This then means that water scarcity has a time dimension. White (2014) further describes some criteria for an area to be described as a water scarce area. These indicators include the definition of people's needs, resources that are available and those that could be made available pleasurable to their needs, and 'temporal and spatial scales used to define scarcity'. Moreover, some regions experience the vast amount of scarcity; therefore, they are considered severely water scarce. The problem of water scarcity in the context of climate change has hit the urban areas more than it has done to the rural areas which have resulted in difficulties in managing the little water available water sources for the urban growing population (Vairavamoorthy et al., 2008). In reference, with regard to

the continued water crises, Swain (2001) eludes that in future, the global community will be fighting for water sources instead of the current conflicts over oil. The growing population require the availability of fresh water for various purpose and its scarcity leads to the scramble for other available sources of water like rivers, lakes and groundwater (Schewe et al, 2014).

2.3.7. The social function of water

Water occupies a greater social role in daily life and the welfare of the people. Water for basic needs is given the highest priority in policies and programming: "All peoples, whatever their stage of development and their social and economic conditions, have the right to access drinking water in quantities and of a quality equal to their basic needs" (UN, 1977, cited in Hazell, 2010). The idea of water for basic needs is rooted in the basic needs approach to development. It is domestically used and supports agriculture and industry (Stephens et al. 2010). Black (2016) describes several domestic attachments of water to daily living which include minimum drinking water, water for sanitation, water for bathing, water for food preparation, water for natural ecosystems. Further to this, Mulwafu (2010) in the definition of water in Malawi context includes watering and dipping stock as domestic uses of water. However, water use varies in amounts depending on activities. For example, cooking uses less water than bathing, hence attracting different economic demands on households. Sometimes water is put to productive uses that results in another kinds of livelihood in agriculture where people use water in home gardens to grow vegetables and other crops mainly for subsistence consumption. In such occasions, water becomes a basic need and a catalyst for other socio-economic activities that support household survival.

2.3.8. Domestic importance of water

The supply and the use of water is one of the key environmental challenges that the planet is facing (Levy and Sidel, 2011). The World Watch Institute (2016) emphasises that Africa is one of the countries that has a complex relationship with water and water supply, and experiences cycles of flood and drought. Water in the home is a catalyst for many domestic functions including food preparation, taking a shower or a bath and human consumption (WHO, 2015). Ahluwalia (2013) presents a wide range of water use within the domestic arena and includes drinking, human hygiene, sanitation services and food preparation. In a more technical and biological way, Haas and Levin 2012 analyse water in the body which

functions as a transport model for nutrients in the absorption and elimination of toxins and wastes from the body. Water for basic needs is usually considered for personal consumption and domestic use. Domestic use is understood as including drinking, cooking, hygiene and sanitation (Willis, Stewart, Panuwatwanich, Williams and Hollingsworth, 2011). In Malawi, domestic uses of water encompass watering and dipping stock (Mulwafu, 2003).

According to CSIRO and BoM (2016), “climate change is predicted to further impact rainfall quantity and frequency” which makes it difficult for water managers to meet demand of the growing population in that area (Gregory and Hall, 2011). Domestic water use depends on the quantity and quality of available water. Good quality water is very crucial to sanitation and hygiene that contributes to a healthy population (Esrey et al., 2000). Water that is free of pathogens is vital to the health of humans (Hunter, MacDonald and Carter, 2010) However, WHO (1993) conducted an investigation on the national drinking water standards and the results came back positive with recent faecal pollution from warm-blooded animals and humans. These results are an indication that humans and warm-blooded animals are the main polluters of water and are the major cause of waterborne diseases such as diarrhoea and cholera. Moreover, the WHO guidelines of zero E.coli or thermotolerant coliform bacteria in any 100ml sample of drinking water, was, in this case, management undertaken in field researches conducted in rural Honduran communities (Trevette, Carter and Tyrrel, 2004).

2.4. Accessibility to water

UN Water (2006) states that the population in South Africa is 51 million people. Of the 51 million people, 60 per cent of the population live in urban areas and 40 per cent of the population live in rural areas. South Africa has 77 per cent access to surface water, 9 per cent groundwater and 14 per cent of recycled water. It is with evidence when the UN Water 2006 speaks about the fact that because rural areas have lack of water infrastructure, of the 100 per cent only 74 per cent of people living in the rural areas depend on groundwater such as pumps and local wells. UN Water (2006) argues on the other hand that cities with universal water distribution systems mostly get their water from surface sources such as the Komati and Limpopo River.

Immigration and population growth as well as growth in rural settlements is putting stress on South Africa’s water supply. Currently, about 19 per cent of the rural population lacks access to a reliable water supply and 33 per cent do not have basic sanitation services (Ustun, Bos,

Gore and Jamie, 2008). While rural citizens suffer the most, over 26 per cent of all schools (urban or rural) and 45 per cent of clinics have no water access either.

Despite the apparent lack of water in South Africa, a large portion of South Africa's GDP is directly dependent upon water. For example, over 15 per cent of its GDP comes from agriculture which uses 60 per cent of South Africa's water supply (Pruss-Ustun et al., 2008) Another major use of South Africa's water is energy production (two per cent of the national supply). In fact, South Africa is the world's fourth largest exporter of coal. Finally, South Africa's industry sector which contributes about 29 per cent of the nation's total GDP, uses almost 11 per cent of the nation's water. However, because a large portion of South Africa's industry sector is mining, the sector's impact on water goes far beyond 11 per cent a year. In fact, the National Water Act was created in 1998 to stop the extensive pollution from mine runoff that severely contaminated South African water supplies

2.5. Domestic Rainwater harvesting to improve water supply in South Africa

South Africa is one of the endorsers of the Sustainable Development Goals as mentioned by (Kahinda, Taigbenu and Boroto, 2007). It is mixed with developing and developed regions where about 3.7 million individuals have no access to any form of water supply infrastructures such as rainwater harvesting, deep water cooling, rain gardens, blue seas and aqueduct. Furthermore, 5.4 million of the individuals who have access to water supply infrastructure are at a basic level of services. For example, financing only UGTs, the government will not be able to exploit the potential of DRWH that provides free six kilolitres of water to people living in poor households who consume on a monthly basis. However, AGT requires investigation of the sustainability of rainwater which is collected for consuming. Another example derives from the water legislation, implementing that they should be clear on SRWH, and facilitate its implementation by NGOs. Domestic rainwater harvest (DRWH) is an option to meet the Millennium Development Goals of dividing, in the year 2015, the extent of individuals without sustainable access to safe and clean water to drink and basic sanitation (MGD 7, Target 1) and provide free water to drink per month. In 2015, the Sustainable Development Goal (SDG) targets are related to drinking water, hygiene and sanitation. Goal 6 of the Sustainable Development Goal "ensures the availability and sustainable management of water and sanitation for all" (WHO and UNICEF, 2017:6)

Rainwater is one of the good alternatives to get clean and free water because of the small concentration, storage that is required and the collection on how they use the rainwater runoff as a mechanism for productive purposes (WHO and UNICEF, 2017). Kahinda et al. (2011) describe rainwater harvesting as the collection of runoff that is stored in a variety of ways to prevent evaporation and increase water supply. Aladenola and Adeboye (2010) add that rainwater harvesting is one of the measures for reducing the impact of climate change on water supplies. In summary, water harvesting is a supply source for water implementation. Studies prove that rainwater harvesting can be collected in different ways. These include, water collection from rooftops, courtyards and treated surfaces which are stored in underground tanks (UGTs) and also aboveground tanks (AGTs) which are used domestically to water gardens and small scale agricultural productive activities (De Kwaadsteniet, Dobrowsky, Van Deventer, Khan and Cloete, 2013). Domestic rainwater harvesting is not a new form to get water, as it traces back and it is still used in KwaZulu-Natal. Moreover, the positivity that arises from this practice is that it is spreading widely in the rural areas with financial assistance from Department of Water Affairs and Forestry (Kahinda and Taigbenu, 2011). MacDonald and Carter (2010) put emphasis on the fact that clean water and the provision thereof, improved health and adequate sanitation have a direct link towards each other. Inadequate water supply is the major factor that contributes to poor sanitation. In order to combat this issue, there needs to be an improvement in the quality and quantity of water supply. Overall, sanitation is a very important and key factor of public health measure which is crucial for the prevention of diseases. The major advantage of the DRWH is very useful, as it suppresses the burden of women and children walking long distances and carrying buckets on their heads to collect fresh and clean water. With the quantity of water delivered and that which is used for households, it is one of the very important aspects of domestic water supplies which helps with hygiene and public health (Howard and Bartram, 2003).

2.6. Basic quantities of water for domestic use

Falkenmark et al. (2007) consider 100 litres per capita per day (IPCD) necessary for basic needs which include drinking, cooking, washing and sanitation. For example, water to grow food would add an additional 1600m³/capita/year, equal to 4380 IPCD (Falkenmark and Rockstrom, 2004). Good health standards advise the drinking of at least 1 litre per day. Ersel (2015) mentions that there is a minimum hygiene items pack which consists of water containers, bathing and menstrual hygiene materials. Every household is required to have 10-

20 litres capacity water containers, one for storage and one for transportation. Gleick (1996) suggests 50 IPCD for drinking (5), cooking (10), bathing (15) and sanitation (20). UNICEF/WHO (2000) and UNDP (2006) recommend at least 20 IPCD as a 'social minimum' for drinking and personal hygiene from an improved source within 1km of home. The UNDP says factoring in bathing and laundry would increase requirements to 50 IPCD (2006). Moriarty et al. (2004) assert that people need at least 50-200 IPCD for their livelihood needs. The South African policy recommends a range from 20-60 IPCD. The National Research Council estimates an average of 5 litres per day to meet normal activities (Howard, 2003). However, communities with water toilets, the basic minimum level of water is likely to increase beyond 5 litres per person per day. Similarly, the demand for improved sanitary care increases water demand. Some studies suggest 15 litres per person per day as the basic minimum water requirement (Ersel, 2015). Taking into consideration both developed and underdeveloped countries, the water use for food preparation to satisfy most regional standards and to meet basic needs is 10 litres per person per day. To account for the maximum benefits of combining waste disposal and related hygiene as well as to allow for cultural and societal preferences, a minimum of 20 litres per person per day is recommended. Clarke (2013) makes a statistical presentation that people need at least 3 litres of water to produce a tin of vegetables.

Researchers found rural and urban households used significant quantities of water for productive activities, particularly those with piped water, and suggested access to piped water is beneficial from a productive as well as health and well-being perspective (Devoto, 2012). They noted productive uses outside the home were common but did not include these in their study of domestic use. In fact, a growing body of research demonstrates that, given the opportunity, people use water for productive activities which comprise an important part of their livelihoods (Hope et al., 2003; Moriarty et al., 2004; Mulwafu 2003; Perez de Mendiguren, 2004; Upadhyay, 2005; WaterAid, 2001). Recognising productive uses and making more water available for them could play a role in poverty reduction. Moriarty et al. (2004) suggest the term household water to cover households' domestic and productive water uses.

Howard (2003) argues that defining a minimum volume of water to be used by the households depends on the accessibility. As such, the above statistics prove that if there is no water, there is also lack of food in many areas especially those areas who survive through

farming. Water shortage usually limits various domestic activities and affects the welfare development of the home

2.7. Factors contributing to water scarcity

Falkenmark, Berntell, Jagerskog, Lundqvist, Matz and Troop (2007) view water scarcity as arising from lack of service provision and scarcity of water sources which Martin-Carrasco, Garrote, Iglesias, and Mediero, 2013 have attributed to droughts as one of the causes. Ingram (2011) looked at water scarcity as a governance issue and concludes that good governance is a recipe for water availability. Ingram (2011) implies that bad governance is one of the causes of water scarcity. Considering population growth, Ingram (2011) points out that water becomes a neglected commodity that is only realised when scarcity levels are high.

Jiang (2009) in contextualising water scarcity in China, highlights three factors contributing to water scarcity. These factors are ‘uneven spatial contribution of water resources, rapid economic development and urbanisation containing a large and growing population and poor water resources management’. In studying water scarcity in Malta, Hochstrat, Wintgens, Kazner, Melin, and Gebel (2010) attribute the problem to the overdrawing of water to meet all demands, thus creating the problem of sustainability of water sources. Hochstrat, Wintgens, Kazner, Melin, and Gebel (2010) further argue that an increase in water salinity and water provision service, saw Malta erecting numerous water taps. Unfortunately, failure for government to provide adequate water to the people in some cases leads to water wars through conflicts between people and the government. Garrote et al. (2012) further argue that water scarcity may be caused by government system failures when it fails to mitigate water shortage in infrastructure development. Such failure leads to permanent water scarcity problems. However, on a temporary basis water scarcity may be caused by periodic droughts. As such, most countries, especially developing countries, panic and fail to contain the situation in times of crisis when measured steps should have been taken to contain the situation. Starkloff (1998) in the study on water scarcity in Kitulwatte, Sri Lanka, found that land management and land use is a major factor contributing to water scarcity. The study argues that cash crop cultivation and reliance of trees that absorbs much water like eucalyptus and pine, leads to draining of water resources.

2.7.1. Plants encroachment

Enright (2000) highlights that South Africa faces the critical condition of water scarcity due to the introduction of non-indigenous plants in several catchment areas. As such, when the country is hit by droughts, the country experiences the acute shortage of water in most parts with the Western Cape Province being the worst hit area. As such, rural and urban areas are left with limited storage capacities of water supply that mainly depend on direct river flow. As such, when water flow is low in most rivers, water storage is directly affected. Dzikiti, Schachtschneider, Naiken, Gush and Le Maitre (2013), in the detailed study of invasive plants and water sources in the Western Cape Province, found that apart from the invasive plants, fires, amount of rainfall and changes in biomass also greatly contribute to the shortage of water the government harvests per year, thus limiting its availability to the people as well. Water scarcity sometimes comes as a result of alien and invasive plants that affect water bodies. These include undesirable vegetation that encroaches the bushes changes in the landscape of natural bushes (Bromilow, 2003). The water table lowers and wetlands dry up due to the elimination of natural vegetation which is then replaced with built environments like installation of turfs in sports centres which use chemicals to remove weeds and thus causes weeds to creep into waterways.

2.7.2. Large-scale mining

The emergency of large-scale mining contributes to water scarcity due to the high demand for water in mining, especially the coal mines. Ochieng (2010) in the study on water and mining in South Africa found that most mining sites have poor water treatment plants that are substandard, thus failing to mitigate the impact of mining on water sources. Studies at Blesbokspruit, Klip and Wonderfontein water treatment reveals the lowering of water levels in the nearest streams (McCarthy, 2011). Coal mining requires a lot of water which leads to the easy drying up of rivers once the rains stops, as water is diverted to mines and dams constructed along the rivers to contain more water for mining, thereby affecting the water flow to the effect of local people's use down the stream.

2.7.3. Commodification of water

Water scarcity is also caused by the commodification of the facility whereby it is priced and sold instead of being provided as a free service. As such, the commodification of water

reduces people's ability to secure the resource, thus limiting the amount of water a household may use per day. Jones (1999) has described water pricing as becoming more widespread with the dual aim of expanding supply and encouraging more people to use water responsibly. Bakker (2010) mentions that there is a widespread conflict in the clash between differing conceptualisations regarding the nature of water itself. The author further mentions that water is a public good and a "material emblem of citizenship" by governments and has changed drastically in the neoliberal era. Jaffee and Newman (2012) alludes that water has an economic value in all competing uses such as sanitation, cooking, cleaning and watering the garden. Moreover, because water is framed as an economic value, international institutions, states, private water firms, framed water view it as an economic good rather than a public good. Bakker (2010:322) concludes that "there is a 'stalemate' in water privatisation in the global South".

2.7.4. Water pricing limits available water

Water pricing is increasingly being seen as a better way to contain water scarcity problems in many countries (Molinos-Senante and Donoso, 2016). For this reason, the Organisation for Economic Co-operation and Development (OECD) countries are working toward the goal of "internalising" the full marginal costs (including environment costs) into decisions that affect water use and water quality (Clarke, 2013). Public water supply and wastewater services are the two major areas affected by the pricing principles metering applies to discretionary water use. However, it is seen that the metering effect on water uses comes under the condition that, the more you use, the more you pay. In the case of block metering, the charge increases with each additional unit of water used or wastewater treated, rather than providing discounts to a high-volume user (Jones, 2012). Water pricing is often recommended to reduce demand, and its increase greatly affects the poor and the low-income more than it does to the high-income sections of the community (Ruijie, Zimmerman and Van dan Berg, 2008). Water pricing determines the minimum water a household can use, as it limits its access, thereby, contributing to water scarcity.

Qi and Chang (2011) express agreement with other authors that the domestic demands of water are determined by the price and ability of people to buy the water. Mancur (1987, cited in Lavergne, 2014) speaks about a water demand model, and further suggests that the standard economic theory postulates a household's demand function for water. This is however different for other goods and, therefore, slopes downwards with respect to the real

price and will shift upward with regards to income and household size. Therefore, if there is enough rainfall it will substitute for those who purchase water from the urban utility system by avoiding consumption from the system, a decline with higher rainfall levels takes place.

2.8. Water privatisation

Water privatisation is known as an international phenomenon which also occurs in South Africa. There are two types of debates that have occurred; the first type is people who are in favour of privatisation, argue that the government continues being corrupt, inexplicable, uninventive and trapped financially (Ahlers, 2010). Baer (2014) describes water privatisation as a variety of models of the involvement of private sector in water services. These water services begin from the smallest scale such as installing and reading metres. Water privatisation fails to upgrade water services on their own, especially in a cost effective manner (McDonald and Ruiters, 2005). Furthermore, water privatisation states that the private sector and how they operate should be the central component of water delivery strategies. Those who oppose of privatization argue that the only interest of private companies, as previously mentioned, is that they continue to charge the poor more even though they cannot afford to pay, and their water is cut off if they fail to pay (Bakker, 2010). The other issues that occur is that there is a failure to create health and safety risks for the community. Some may argue that, the same private companies are corrupted, and obtain contracts by using bribes or use “low-ball” bids to get what they want. Once they have excess and are entrenched; they raise the rates.

2.9. Impact of water scarcity

The growing population and rapid urbanisation increases the demand for water whose failure by government to meet the demand bring a lot of challenges to citizen welfare. The UNEP report on challenges to water scarcity highlights the potential financial risks of water scarcity to financial development (Ridoutt and Pfister, 2010). The report highlights that water scarcity leads to financial loss due to operation disruption, increased financial investments in securing reliable water sources and provision and the loss of anticipated revenue due to failure in meeting the water demand from various stakeholders. The growing demand leads to water stress on freshwater systems and challenges food security, as it directly affects agricultural production, human health and aquatic survival (Postel, 2000). Water scarcity reduces quantity

and quality and, as a result, is a source of water-borne diseases. Therefore, water scarcity heavily affects lifestyle and development at all levels (Pereira et al., 2009)

2.9.1. Water scarcity and health

Lack of access to clean and safe water negatively impacts an individual's well-being (Fewtrell, 2004). Inadequate access to safe drinking water and sanitation, combined with poor personal hygiene, causes massive health problems as people become susceptible to diseases like diarrhoea. The disease is estimated to cost the lives of 2.18 million people, three-quarters of whom are children younger than five years old, annually, and an annual global burden of disease measured as 82 million disability - adjusted life years (Prüss et al., 2002). The damage to health caused by infectious diseases was assumed to have resulted from domestic water scarcity due to loss of accessibility to safe water (Motoshita 2011). WHO (1993) guidelines make reference to water supply situation which is common in many countries, water is collected from the ground, standpipe or well, transported home by whichever form of transport then stored in buckets or any containers for domestic use. This can lead to health risk if the water is stored and transported un-hygienically and can be re-contaminated. However, much risk is associated with contaminated water sources rather than water transportation. Many "waterborne" diseases are actually "water-washed" diseases due to inadequate quantities of water available for washing hands, food, laundry and cooking utensils (Shammi and Morshed, 2013). The appropriate intervention to prevent these diseases such as shigellosis, trachoma and scabies, is to provide more water quantity rather than improve microbiological water quality. For example, the increase in water quantity helps to reduce diarrhoea occurrence by 20 to 33 per cent (Santosham, Chandran, Fitzwater, Fischer-Walker, Baqui and Black, 2010). This includes providing household connections or closer public standpipes and setting up hand washing stations and communal bathing and laundry facilities.

However, climate and distance from water sources limit the needed amount to maintain standard hygiene. Further to this, distance to water sources has the multiplier effect on other home activities. The more time people spend to draw water, the less activities per day are accomplished. Similarly, when water supply is higher, home hygiene improves as water is available to wash dirty dishes and clothes, and clean areas in the home. In places of short, rainwater helps to solve the hygiene problem. (Gleick 1996; Howard et al., 2003).

Water for health White seminal study of Domestic water use in East Africa 1972, grouped uses into three categories - consumption, hygiene and amenities - on the basis of their relationship to health. Consumption is water necessary to meet physiological requirements. It includes the water content in beverages and food and can be consumed pure or in other forms (e.g. tea, soft drinks etc.). Bartmram et al. (2010) state that hygiene includes the minimum water required to wash one's body, clothes, utensils and food, clean the home and for sanitation. Amenities are other uses, not necessary for survival or health which a household values. These could include bathing, watering gardens and washing cars. Some amenities uses are necessary for hygiene but the quantity some households use was considered a luxury. White et al. study, and the work of organisations such as WHO who influenced the way water issues were constructed, primarily in relation to health and hygiene during 1970s and 80s (Nichol, 2000; Thompson et al., 2001). The HIV/AIDS pandemic in Southern Africa brings the interface between water and health to the fore once again (Hutchings and Buijs, 2005).

2.9.2. Water scarcity, agriculture and food security

Water scarcity severely impairs food security and economic prosperity in many countries today. Inadequate water supply and availability leads to malfunctioning of irrigated agriculture that in turn lowers productions, hence the threats on food security. For example, Bangladesh is one of the countries that experienced terrible effects of water scarcity on agriculture. As such, to avert the effects, Bangladesh included food security as one of its national goals. In the future, the national goal of achieving food self-sufficiency for Bangladesh might become harder to reach and sustain. New factors such as global warming could make the food security situation more critical for Bangladesh. The National Water Management Plan (NWMP) of Bangladesh, prepared by the Water Resources Planning Organisation (WARPO), recognises a range of potential impacts of climate change on Bangladesh such as increased evapotranspiration, higher irrigation requirement in the winter, reduced transboundary flow, longer and frequent floods, slower recession of floodwater and slower accretion of coastal lands (WARPO, 2001). All of these are likely to have negative impacts on the food production and food security of Bangladesh (Faisal, 2004).

(Rosegrant 2009) Irrigated agriculture is the main source of water withdrawals, accounting for around 70 per cent of all the world's freshwater withdrawals. The development of irrigated agriculture has boosted agricultural yields and contributed to price stability, making

it possible to feed the world's growing population. Rapidly increasing non-agricultural demands for water, changing food preferences, global climate change and new demands for biofuel production, place increasing pressure on scarce water resources. Challenges of growing water scarcity for agriculture are heightened by the increasing costs of developing new water, soil degradation, groundwater depletion, increasing water pollution, the degradation of water-related ecosystems and the wasteful use of already developed water supplies.

2.9.3 Water scarcity and economic development

Water is indispensable for life and economic activities (Blignaut et al., 2009). Water supply in South Africa, however, is limited, unevenly distributed and negatively impacted by both changes in climate and the prevalence and spread of invasive alien plant species (Cullis et al., 2007 and Blignaut et al., 2007). The recognition of the country's precarious water supply conditions has led to innovative initiatives to address it, albeit marginally such as the water neutral scheme developed and operated by WWF-SA (Nel et al., 2009). Studies of the causes of disparity in the level of economic development between the wealthiest countries and the poorest have overlooked a fundamental difference between these sets of countries: the availability of water. The amount of rainfall, and in particular its temporal variability, presents challenges to food production, trade and infrastructure development (Brown, 2006).

Water is a commodity according to studies, therefore, water is sold for profit. To understand water scarcity in an economic sense, this can be understood by the link between supply and demand. Bouguerra (2006) alludes that when water is at a high level and water supply is low, in this case water is the commodity, it will be sold at a higher price. Furthermore, due to economics, water scarcity is a human induced phenomenon and social relation in which capitalism can function. Anil Agarwal (cited in Bouguerra, 2006) emphasises that water scarcity is also fiction and the mismanagement of water resources causes scarcity. Furthermore, Bouguerra (2006) suggests that about twenty countries are two-thirds of global water resources and it can be concluded that water is unevenly naturally and geographically distributed around the world. Moreover, the issue is not about the lack of water, but mainly the issue of variability, water conservation and water losses which is caused by the lack of reduction. Gleick (2014) states that the problem lies to the fact that countries lack the tools and expertise that are needed to address the issues of water scarcity, water loss and water conservation. Furthermore, the author suggests that water pricing works in areas where there

are no water supply constraints. Sinha (2009) implies that water is controlled by politics and economics and if there are treaties which are well established, strengthened water security will be ensured rather than water wars.

Furthermore, there are countries which include Africa that are categorised by economic scarcity, these countries have potential water resources to meet the requirements made for 2025, but in order for this to be successful, these countries need to engage in certain programmes such as water development programmes so that these resources can be utilised (Seckles, Barker and Amarasinghe, 1999). These countries face the major issue of economic scarcity in 2025. Seckles et al. (1999) further mention that there are about 348 million people in Sub-Saharan Africa which posits a huge problem, as it will be very difficult to find financial and other resources to achieve this rapid pace of water development. Calculations prove that by adding the population of the countries which are suffering severe economic scarcity of water and finally those who suffer from absolute scarcity, has the total amount of 1386 billion individuals. Of that number, 26 per cent of the population is from the year 1990 and from that sum, 33 per cent of the population is from developing countries.

2.9.4. Water scarcity and sustainability

Over the next few decades, new constraints will be placed on water supplies available for irrigation as well as for rain-fed agriculture. Demand for water use in agriculture will continue to increase as a result of growing population and economic growth. Non-irrigation demands are expected to grow even faster, putting pressure on supplies available for irrigation. Unsustainable groundwater use is constraining irrigation water supplies in many already water-scarce areas. Environmental demands for water will also vie for scarce water supplies in the future. Water quality problems are another factor that should be considered in water resources management, as all sectors will increasingly compete for unpolluted water supplies as water quality continues to degrade (Rosegrant, 2009).

2.9.5. Water scarcity, social relations and resilience

Our central proposition is that “the creation of social resilience is linked to a community’s ability to access critical resources.” We explore this proposition through an analysis of how community resilience to the stress of water scarcity is influenced by historically contingent mechanisms to gain, control, and maintain access to water. Access is defined broadly as the ability of a community to actually benefit from a resource and, most importantly, this

definition of access includes a wider range of relations than those derived from property rights alone (Ribot and Peluso, 2003). How a community gains, maintains and controls access to a critical resource can be expressed through an analysis of the means, processes, and relations, or “mechanisms” that facilitate access (Ribot and Peluso, 2003), as these are embedded in the social and environmental histories of a region. First, we integrate research on resilience (Gunderson and Holling 2002, Folke et al. 2002, Berkes et al. 2002), vulnerability (Bohle, 2001) and access (Ribot and Peluso 2003) to develop a framework for analysing the links between access and social resilience. Second, we use this framework for mapping the historically contingent access mechanisms of four communities in northern California to one critical resource; water. Access to water is essential for aquatic and human health and survival, and a secure supply of water must be available in sufficient quantities to sustain communities within a social-ecological system. We contrast three communities in the Russian River watershed and the Round Valley Tribal Reservation in the Eel River watershed which are all currently competing for the same water resources. In this politically charged atmosphere, we analyse the mechanisms that influence each community’s ability to access water, illustrate how access corresponds to differential levels of resilience to water scarcity and discuss important policy implications.

2.9.6. Water scarcity and family roles/gender dynamics

Gender is a big subject in the Sustainable Development Goals (SDGs), however, all SDGs depend on the achievement of Goal 5 (Agarwal, 2018). Climate change which is one of the causes of water scarcity, continues to have disproportionate effects on children and women. Therefore, Goal 5 mentions that it is important to give women equal rights to land and property, reproductive health, the internet and technology (Rosche, 2016). Today there are more women in the public office than ever before, but encouraging more women leaders will help achieve greater gender equality. Without access to sufficient and reliable water for productive uses in and around the household, people are excluded from a range of options that would otherwise enable them to secure their sources of food and income (Upadhyay, 2004). In developing countries, girls and women in rural communities collect water to protect the water systems and store the water. As much as it is time-consuming, women determine the use of water and this decision-making has a direct impact on the health of children and other family members. In the past decades, it was assumed that men hold power in the production of water and women held power in the concern of water for domestic purposes.

This assumption has led to unsustainable development interventions around water, but also is the cause of underestimating women's productive roles. This assumption has case controversy, for instance, water projects no longer focus on the need to promote the equal balance of power between men and women nor recognise the need for equity in water allocation. Therefore, women are disadvantaged and are ignored in terms of water access. The allocation of priorities is further deteriorated in times of scarcity and could become the cause of intra- and inter-household conflicts. With recognised multiples uses of water in and around the household, women play a major role in water, agriculture and small-scale activities which will allow women and men to grow crops, vegetables and rear livestock which are satisfying their human needs.

2.10. Alternative sources of water in scarcity situations

The traditional, engineering response to water scarcity has been to construct infrastructure, especially dams, to expand human control over water resources and make a larger share of the total renewable resources accessible for humans to utilise. While that approach has by and large been successful in producing its primary output, cheap food, and has provided water supply and sanitation to large numbers of people, the flip side is also clear (Gleick, 2014). Many people do not have access to safe and affordable water supply despite enormous investments. Close to half the world's population lacks access to sanitation, and many rural poor do not have access to water for productive purposes. Groundwater levels in key aquifers are falling rapidly and many rivers are no longer reaching the sea (Cosgrove and Rijsberman, 2000a).

2.11. Management of water resources

The World Water Forum underscores the importance of water management in development by reducing poverty, especially in situations where rainwater becomes the most reliable source of water. For example, the availability of water for agriculture has proved central to poverty reduction in most Asian countries. However, WHO (2008) and (Omole and Ndambuki, 2014) argue that such evidence is limited, especially to the Sub-Saharan region where most countries experience limited access to safe drinking water, malnutrition, unhealthy hygiene practices and improper water management practices which can lead to water-borne diseases. They also argue that water scarcity in the Sub-Saharan region is mostly a result of political misfortunes and institutional failure rather than technical failings. This

underscores the point that political institutions play a central role in ensuring that water services management systems are effectively implemented.

Management of available water sources is key to the mitigation of water shortage challenges. As such, many countries are making various efforts to ensure proper management of its resources. However, it should be acknowledged that the type of water source has a direct link to the quality of the water available to people. Further to this, the government applies various management efforts and infrastructure of various types of water sources. For example, in the study on the effects of water types on supply and quality of water, (Genthe, Strauss, Seager, Vundle, Maforah and Kfir, 1997) found that people with access to tap water have fewer chances of suffering from waterborne diseases unlike those who get water directly from rivers and other untreated water sources.

In rural Kenya, studies found that some community members were willing to pay for chlorine for point of use water treatment which is effective, cheap and available in developing countries (Ahuja et al., 2010). However, water management services become political warfare when decisions on water supply and management rest in the hands of political authorities. Understanding that water is a basic resource important to human welfare and development, some decisions lean towards ensuring political support. As such, it also turns into a political battlefield with policy contestations between the ruling and opposition political parties. Pohlner (2016) highlights that institutional politics in water management are reflected in budgetary allocations between and within the three levels of government. Others contested theme in water management as the approach between rights-based and needs-based. A needs-based approach regards people as recipients of the services which strips them of the power to demand improved service. However, on the other hand, the right-based approach entails that people are viewed as central users and entitled participants to water service and management. Unfortunately, the rights-based approach calls for accountability and transparency in service provision which most political figures come into disagreement.

2.12. Conclusion

Climate change has negatively affected the availability of water sources and resources including aquifers. Everyday domestic living depends on the quality and quantity of water. As such, the limited amount of available water, described as water scarcity, affects many aspects of daily living. As highlighted in this chapter, water is a need in health and sanitation

including washing, bathing, toilets, drinking and cooking, among others. The non-availability of safe and sufficient water forces many households resort to unsafe water in the rivers and wetlands. Furthermore, numerous readings have revealed that people have knowledge about the essential needs for water, but some have little knowledge on safe drinking water. It also makes the municipality to irregularly provide water in water bowsers which leads to a scramble for water, thus impacting social relations and community cohesion. The lowering of water sources reduces the supply of water to people, a situation that has seen many water taps running dry for longer periods of the year, especially during the dry season.

CHAPTER THREE: RESEARCH METHODS AND RESEARCH METHODOLOGY

3.1. Introduction

This chapter presents the research methodology used in this study. It consists of research design, sample and sampling, data collection, data analysis and ethical considerations. All these aspects were mentioned and explained in this chapter. This study uses qualitative data derived from the interviews that were conducted during the period 2 to 28 September 2018.

3.2. Research Design

Qualitative research

This research uses a qualitative approach to interrogate the topic under study. Creswell (2000) describes qualitative research as an approach that is more open-ended and conducted through intense contact with the situation in order to achieve a holistic overview of the theme under study. Researchers are interested in qualitative studies because the lived experience of individuals and the community cannot be numerically scored (Bless, 2013). Through the use of interviews, observations and document reviews, a qualitative research design makes it possible to look at variables in their natural setting (Astalin, 2013). In this case, this study conducted interviews using questionnaires and were adopted as a data collection method. The study, therefore, adopts a case study method to explore the topic and analytically interrogate the linkage between climate change and water as a factor that determines people's livelihood in the contextualised setting of Engonyameni (Creswell et al., 2007).

Phenomenological case study design

Phenomenology is an approach to qualitative research that focuses on the commonality of a lived experience within a particular group. The fundamental goal of the approach is to arrive at a description of the nature of the particular phenomenon (Creswell, 2013). A phenomenological study has some appeal as it attempts to understand people's perceptions, perspectives, and understandings of a particular situation, making generalisations of what a phenomenon is like from an insider's perspective (King and Horrocks, 2010; Leedy and Ormrod, 2010). The researcher also tries to understand a phenomenology through the individuals or a group of individuals' experiences. This research does not focus only on

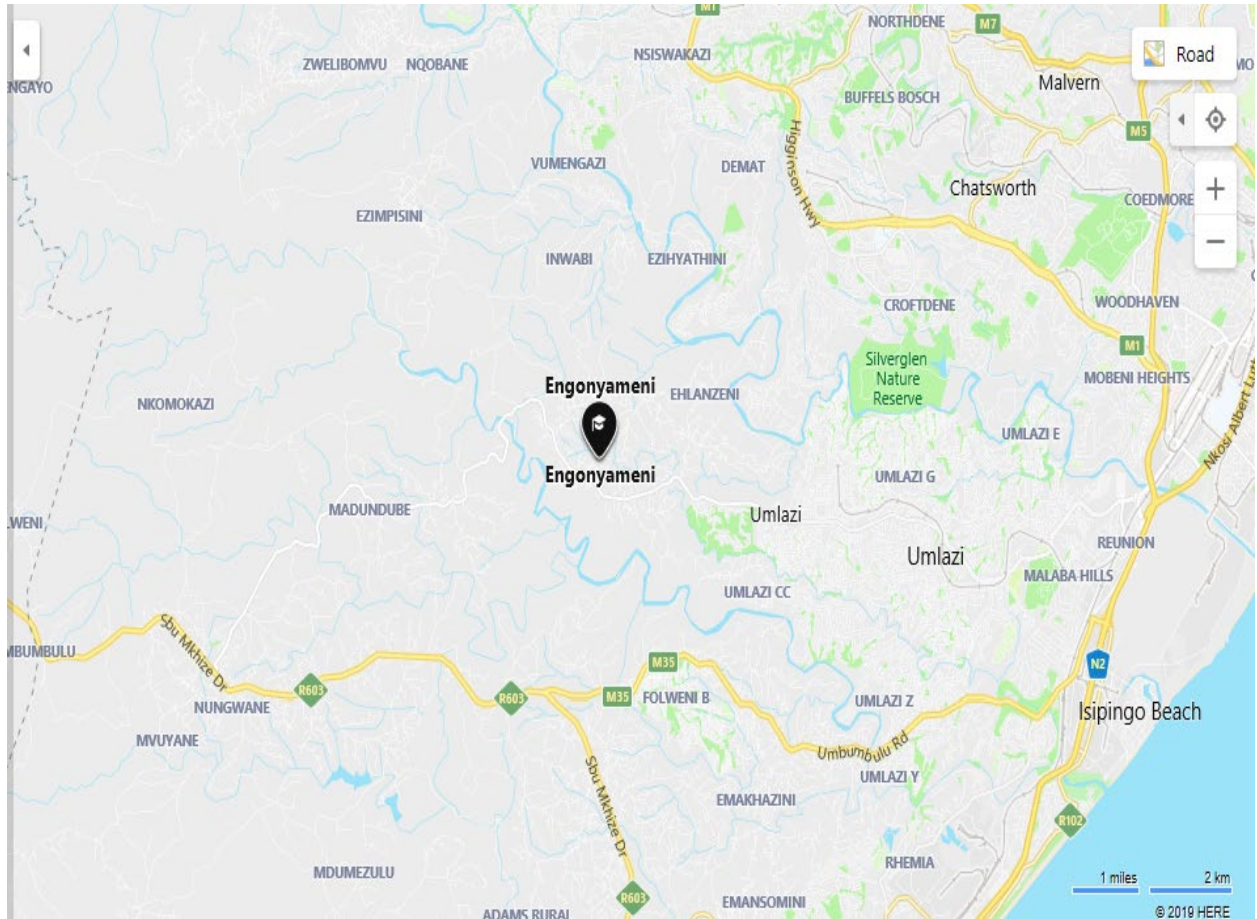
individual interviews but also group interviews to get more insight and perspective on the situation of water scarcity and issue of climate change. The phenomenon is water scarcity and the researcher collected data through interviews on the water scarcity experiences of community members and how this has affected them.

There are five commonly used qualitative research designs, namely, ethnography, phenomenological study, grounded theory, content analysis and case study (Leedy and Ormrod, 2010). For the purposes of this study, a case study design has been used. A case study is a research approach that is used to generate an in-depth, multi-faceted understanding of a complex issue in its real-life context (Crowe et al., 2011). In this study, a case study approach can be used to describe in detail the participants views and explore and investigate real-life phenomenon through detailed contextual analysis and participants of Engonyameni Village experiences and relationship . Yin (2013), asserts that case studies can be used to explain, describe or explore events of phenomena in the everyday contexts in which they occur. With regard to this study, the cases are about issues that citizens encounter in Engonyameni village.

3.3. Location of the study

Engonyameni is a rural area located in Umlazi near K section, eThekweni Municipality, in the KwaZulu-Natal province in South Africa. The area is structured as an informal and formal settlement of **eziMpisini**, the Reconstruction Development Project housing area of **Yobe** and a semi-urban area of **Ezinyathini**. Engonyameni is located 13km south-west of Durban and 19km from the Ocean Coast. It is bordered by Madundube on the north-east and mid-Illovo on the south. It is located on the coordinates of latitude 28°57'34"S and longitude 31°44'49"E. The areas previously depended on sugarcane farming but with the drying up of most wetlands, people rely on small-scale farming supplied by the EziMbokodweni River that runs through the area. Most people in Engonyameni depend on water supplied by the municipality through water trucks, as water taps run dry for longer periods. The area also has some communal boreholes and the Mbokodweni River which runs across the community with dirty water, as the river is mostly used for grazing cattle. Figure 2 shows the map of Engonyameni.

Figure 2: Map of Engonyameni



Source: Bassett et al., (2015)

3.4. Sample and Sampling

The study selected eziMpisini because of its informal settlement structure, Ezinyathini because of its availability of Reconstruction Development project housing structure and the semi-urban area of Yobe because of its low density. Gray (2009) describes purposive sampling as the deliberate selection of participants that have common traits which help to get a reliable representation of the sample. Therefore, the study has a sample size of 12 participants selected from the three social settlement structures of eziMpisini, Ezinyathini and Yobe in Engonyameni, but because the study needed more rich and in-depth responses, the researcher managed to do more interviews with the total of 21 participants. The choice of these areas is influenced by my assumption that differences in the housing structures have a direct impact on livelihood and availability of services like water in an area. Therefore, the 21 participants were invited from all settlements with each settlement contributing four participants who were selected purposively.

3.5. Data Collection

Silverman (2016) describes in-depth interviews as a form of conversation with a purpose through which knowledge about the social world is constructed in normal human interaction or from research participants' point of view. Therefore, in this study, the researcher used in-depth interviews to get more information regarding the role water plays in the daily social lives of people. The in-depth interviews were conducted with a non-structured interview guide that allowed the free flow of factual information, perceptions and expectations. Interviews are most logical in this research in order to get detailed responses and help the participants to be explicit in the narrations of their experiences (Gray 2009). The advantage of using in-depth interviews is that the questions asked can be tailored to meet any situation that the study focuses on. The interview guide in this case of the study contained open-ended-questions. This is important and relevant so that participants can be factual in their responses, especially when it comes to their perspectives on water scarcity and the challenges caused by climate change.

All interviews were recorded using a recorder and the researcher asked participants for the consent of the participants and each session took about 30 minutes. All interviews were conducted in the Zulu language which is a local language for the people. Participants expressed themselves freely and doing face-to-face interviews allowed them to be more relaxed which resulted in unprompted responses that were not premeditated.

3.6. Data Analysis

The study used a thematic analysis that seeks to identify patterns in commonalities and contrasts of the data collected. Thematic analysis proceeds through a series of well-defined steps such as category-building, coding and categorising that are useful for the general understanding of the nature of qualitative analysis (Sgier, 2012). Thematic data analysis involved identifying common codes that were grouped to produce a thematic framework for interpretations and discussions of the results (Braun and Clarke, 2006).

In order to identify themes, the researcher conducted recorded interviews and then transcribed the data. It is during open coding that the researcher identified the themes. After the coding, the researcher managed to find the main themes. This was followed by constant comparisons of categories in which some themes were merged with others.

3.7. Ethical Considerations

Creswell (2013) describes research validity as the intensity to maintain accuracy and buy in trust and conviction from readers as to the reliability of the research findings. It is a way that a researcher should convince its audience that the research findings are worth paying attention to. Therefore, research reliability in this study was achieved by the sampling criteria adopted in this study that targeted variations in the settlements. This helped to understand variations in challenges and explore more factors and effects as to how climate change affects people differently. Furthermore, in this study, the participants were assigned numbers in order to protect their identity.

Research rigour refers to the carefulness and commitment given to the research and controlling factors that may affect the actions of the researcher. Research rigour helps to control researcher bias and improve on the reliability of the research findings. Murphy and Yelder (2009) links rigour to the goodness of the research embedded in the research philosophy, methodology, data collection and control of the relationship between the researcher and the participants. Creswell (2009) provides that the trustworthiness of qualitative research can be established by using credibility, transferability, dependability and conformability.

The purpose of the research was explained as well as informing participants; rights to privacy confidentiality, the right to opt of the study when they feel uncomfortable an informed consent was also considered in the study when interviews were conducted.

3.7.1. Credibility

Credibility looks at how the research findings match the reality and the extent to which data and data analysis are believed and trustworthy. The reader judges research credibility based on his/her understanding of the study. Moreover, the study used an in-depth interview which allowed the researcher to get intensive interviews which resulted in the understanding of the phenomenon under study. This can be evidence to authors (Pilot and Beck, 2012) who state that credibility as the truth of data and respondent's view followed by their interpretations thereof and how the researcher represents the study. The study also used triangulation as a form of enhancing credibility, and through in-depth interviews, the researcher managed to do

observations, questionnaires and in-depth face-to-face interviews. Blessing and Chakrabarti (2009) mention a pilot study which helps the research to identify problems which impact on the trustworthiness of the findings of research.

3.7.2. Reliability

Research findings are transferable or generalisable only if they fit into new contexts outside the actual study context. LoBiondo-Wood and Harber (2014) state that reliability is the ability of an instrument to measure the attribute of a variable or construct consistently. In order to understand reliability, one must understand errors related to the instrument. Cope (2014) argues that reliability can also find similar conditions and it can include negative aspects, especially during interviews, as participants interpret things differently. The researchers interviewed participants on the experiences they encounter during water scarcity.

3.7.3. Conformability/ conformity

Pilot and Beck (2012) state that the data needs to accurately represent the information that is provided by the participants. They further state that the data should not be invented by the inquirer. It is important that during interviews the researcher analyses body language and facial expressions to manifest content because it can result in over interpretation (Elo and Kyngas, 2008). Conformability also looks at the degree to which the research findings can be confirmed or corroborated by others. All the collected data will be archived in a well retrievable form so that it is available to those who may challenge the findings. The in-depth interviews helped to follow up on issues raised and cross check with previous information given by the participants to ascertain its validity. Finally, audio recording and transcription of the interviews helped to ensure an accurate capturing of data through repeated listening.

3.7.4. Transferability

Research findings are transferable or generalisable only if they fit into new contexts outside the actual study context (Houghton et al., 2013). Transferability was achieved when the researcher gave a thorough and detailed clarification of the study method that can make it possible to replicate this study in circumstances typical to the study area. Transferability also allowed reasoning that findings from data collection can be generalised and transferred to

other settings. The study ensured that results and interpretations are consistent with data collected. It helped the researcher in terms of repeating the study.

3.7.5. Dependability/ dependency

Dependability focuses on the consistency of observing the same finding under similar circumstances, and the extent to which the research findings can be replicated with similar subjects in a similar context. Elo et al, (2014) state that dependability refers to the stability and data over time and under different conditions.

3.7.6. Study limitations

One of the problems that the researcher encountered during interviews was the participants' comfortability in sharing their real-life experiences. Moreover, when the interviews involved recordings, many people were uncomfortable about the idea of being recorded, as they feared the leakage of their information given in confidence. This was a major challenge for the researcher. To avoid the challenge, the researcher made prior arrangements with the participants for the following day. The researcher got informed consent for the interview to be voluntary and built trust before the interview session was conducted. One needs to consider that interviews can be time consuming. The study used in-depth interview and, as a result, a lot of data was collected within a short time which became straining. Thus, the research spread across a longer period to give room for rest and recollection.

3.8. Conclusion

The study adopted a qualitative research and used in-depth interviews to collect data. The study also used questionnaires to collect relevant data for the study. The study used a purposive sampling method which is aligned to qualitative research. Furthermore, this chapter explained the sample and sampling as well as how thematic data analysis was used to analyse the data collected during the interviews.

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

4.0. Introduction

The previous chapter presented the research methodology that was used in this study. Chapter Four presents the findings and analysis of the data collected during the study. The aim of the study is to identify different issues the community of Engonyameni are facing due to weather conditions and water scarcity. The focus is mainly on the role that water plays in the community and the citizens' daily lives. Furthermore, it investigates the challenges and experiences that the citizens of Engonyameni encounter daily. It explored how climate change affects them in accessing water.

During data collection, a number of issues and themes emerged from the interviews which were merged as necessary based on similarities and dissimilarities in ideas. Some of the issues that emerged included a lack of knowledge of available transport systems, water quality, where the water comes from, water access, water quantity and traditional authority/institutions (for instance, not knowing the existence of their traditional leader and councillor). Interview questions included some follow-up questions in which participants could broaden their thoughts and answered questions effectively. This chapter will delve into these issues in order to better understand the lived experiences of citizens of Engonyameni village. Prior to the information mentioned above, the discussion in this chapter is based on the data that was collected from face-to-face interviews with the citizens of Engonyameni.

For this chapter, the research findings are presented and are discussed in line with the research objectives mentioned previously in Chapter Two. Sub-themes are presented under the main themes that emerged from the study. A discussion of the participants' viewpoints follows from their perspective on the challenges that they encounter in accessing water, issues of water quality and quantity, water scarcity and challenges that they face due to climate change.

4.1 The study's objectives and research questions were as follows:

The objectives:

- To explore the perceptions of people of Engonyameni on the role of water in their welfare
- To unpack the challenges people in Engonyameni experience in accessing water
- To assess people's perceptions of climate change and its effects on their welfare
- To investigate the alternative sources of water for people in Engonyameni
- To investigate people's suggestions on how to address water scarcity in Engonyameni

The research questions were:

- What are the perceptions of people of Engonyameni on the role water for their welfare?
- What challenges do the people of Engonyameni experience in accessing water?
- What are the people's perceptions of climate change and its effects on their welfare?
- Which alternative sources of water do people in Engonyameni use to sustain their livelihoods?
- What are people's suggestions in addressing water scarcity in Engonyameni?

4.2. Presentation of interviews

The data presented follows a thematic data analysis. The participants who were interviewed had ample time to be interviewed. Some participants volunteered to take part during the interviews which brought the total number of participants to 21, comprising 8 males and 13 females. Even though some participants were not sure about what the questions required of them, they managed to answer the questions after the researcher provided more clarity on what the questions were asking.

4.2.1. Demographic overview of participants

Table 1 below shows the demographic and water status details of the participants who were interviewed in his study:

Table 1: Profile of participants

Household	Gender	Age	Position	Water sources	Water scarcity incidences	Alternative water sources
Participant 1	Male	82	Headman	Tap/tank/truck water	Yes	Rain water
Participant 2	Female	67	Community resident	Tap/truck water	Yes	Rain water and river
Participants 3	Female	58	Community resident	Tap/water truck	Yes	None
	Male	36				
Participant 4	Male	49	Community resident and ward committee	Tap/truck water	Yes	None
Participants 5	Female	32	Community residents	Truck water	Yes	Rain water
	Female	38				
Participant 6	Male	28	Community resident	Truck water	Yes	None
Participant 7	Female	32	Community resident	Truck water	Yes	River water
Participants 8	Female	19	Community residents	Truck water	Yes	River water and dam
	Female	47				
Participant 9	Female	29	Community resident	Truck water	Yes	River water, springs and dams
Participants 10	Female	40	Community resident	Truck water	Yes	None
	Male	42				
Participant 11	Female	24	Community resident	Truck water	Yes	Dams
Participant 12	Male	42	Community resident	Truck water	Yes	None
Participants	Female	44	Community	Truck water	Yes	None

13	Female	78	residents			
Participant 14	Male	54	Ward committee	Truck water	Yes	Rainwater
Participant 15	Male	37	Community resident	Truck water	Yes	Rainwater, neighbour's water
Participant 16	Female	31	Community resident	Truck water	Yes	Neighbour's water

More females participated in the study than males. This was because women were always at home, as it was their duty to wait for water trucks and for them to collect the water. The only reason why these men were available was due to the fact that it was a weekend when the data was collected, and they were not at work. Of the participants who responded to the question regarding water source types, many relied on truck water and this was followed by those who relied on tap water. Furthermore, all of the participants had water scarcity incidences. The study revealed alternative water sources which community members use if water trucks fail to deliver water, namely, rain and river water, with very few using dams and spring water if necessary.

Saldana (2015) describes a code as a qualitative inquiry that is often a short phrase or a word that symbolically allocated a salient, summative, essence capturing and reminiscent attribute for the portion of language-based and visual data. He further reveals that data consists of interview transcripts and literature. The participants that were interviewed were labelled as Participant 1 to 21.

4.3. Six themes (and their sub-themes) emerged from this study:

I. Role of water

- Availability of water
- Distance to collect water

II. Major challenges in accessing water

- Water service delivery
- Time management

- Time allocation
 - Unfair treatment
- III. Human adaptation and vulnerability towards climate**
- Impacts of climate change towards the community's livelihoods
- IV. People's perceptions on the Institution, government and municipality on water access**
- Governance and municipality issues
 - Corruption of institutions
- V. Failure to provide efficient services**
- Structure of water systems
 - Solutions to water scarcity
- VI. Coping strategies adopted by citizens of Engonyameni**

The next section discusses the role of water in the study area.

4.4. Role of water at Engonyameni

The other focus of the study was to investigate how the community has access to water, water allocation and water usage, and how it sustains them even when they encounter climate change. Therefore, while the researcher was conducting the interviews, it was vital for the researcher to ask about the importance of water in their lives, and what role does water play in sustaining their livelihoods for agricultural and health purposes. Overall, the participants who were interviewed regarded water as an important resource and believe that without water, there is no life. The excerpt below encapsulates this conviction:

Water is the source of living, it sustains the livelihoods of people (Participant 1, male, age 82).

Another participant mentioned:

Water keeps us healthy. Water is very important, as without water I will not survive. I cook with water. I wash my clothes with water. I clean. Without water, I can't do anything at all. Doctors say that we need to drink water to stay healthy and live a longer life (Participant 2, female, age 67).

During the interviews, when participants were asked to respond to the question related to the role of water, some were quite puzzled and confused because they did not know what to say, especially because of water shortages. Hence, some were of the view that it plays a minor role and sometimes none at all. Most participants said that they need water to survive. They mentioned that without water, they cannot do any basic chores around the house nor stay healthy and clean. The researcher, therefore, asked the participants why water is important to them, how they use their water, the quality and quantity of water and how they access water. When given examples, the question became clearer and they started opening up and giving the researcher valid responses. One respondent mentioned:

“Oh! Which water are you talking about? The one that is supposed to be running in our taps?” He continued and laughed. “Our bodies need water; without water we can die. (Participant 3, male, age 36).

Another participant said:

I need water to cook, wash my family’s clothes and water my food garden (Participant 4, female, age 58).

Even though the researcher had elaborated on the question, some participants failed to give the researcher rich answers. Their body language was proof that they were becoming agitated. They felt like this question was irrelevant until the researcher mentioned that the idea of the research is to find out the core issue of water scarcity and whether or not the trucks were delivering water effectively. Three participants gave me short responses and said:

We drink water, we cook and we bath using water (Participant 4, male, age 49).

Life depends on water (Participant 5, female, age 32-38).

Oh well, we use it for everything; we cook, bath and wash our clothes and blankets (Participant 11, female, age 24).

The male participant mentioned:

We bath. Even animals and our stock need water to survive, especially in this drought. Most rivers beds are dry or they are polluted. Therefore, we provide water for our livestock (Participant 12, male, age 42).

Another participant had a different response on the challenges that they encounter at home and said:

I can't flush the toilet. I can't bath properly. I have to leave some water for the next person so that they can bath as well. We can't use the washing machine even though the machine saves a lot of water. When we wash clothes with our hands, we use a lot of water. The washing machine really does save water (Participant 10, male, age 42 and female, age 40).

Aroka (2010) addresses the issue of water contamination which affects water quality due to temperatures that are high. Low water quality and scarce water sources influence a great number of people living in the tropics. This predicament is said to go from individual's intensity to the family level. From family level, it goes on to affect people at a national scale and touches human welfare and inhibits development. In developing countries, there is a relationship between poor water resources and poverty. This is the case in the study area. Most families are poor and water scarcity has changed their perceptions of water. They have been forced to place less value on water due to its scarcity. The inability to flush their toilets has serious implications on their welfare/health. Drought has been highlighted as one of the causes for water scarcity. Scarcity also affects livestock upon which people depend for their livelihoods.

However, two participants had a different view. They first mentioned the challenges that they encounter due to water scarcity and the quality and quantity of water. They further mentioned the types of water sources they use and mentioned that they have taps installed but there is no running water. They also have meters but are not receiving water. The male participant was more vocal because he mentioned that he paid to install the pipes and taps and also paid for water when the taps were working. He said:

Water plays no role in my life. It means nothing because we don't have water. The water tastes horrible. They give us disgusting water and when you bath, you get a rash. They give us fire extinguishing water which is not the same as normal water. We had water but the municipality took over water [administration] and now we have no water. Our pipes are dry. We have had six years without water and yet we still pay for our water. I don't understand how we get the water bill and still pay if there is no water (Participant 10, male, age 42).

The researcher further asked the participants about what they meant by fire extinguishing water. This was the response:

I work in the fire department and I drink the water sometimes. It is horrible. I mean the purpose of fire extinguishing water is to put out fires from burning surfaces. It is not for us human beings. It's very unhealthy.

In line with Aroka (2010) in terms of water contamination, one participant mentioned:

Firstly, we get the water from the truck but you find that the water is black and dirty, and sometimes it has grass and insects inside. I get water from Madundube Dam (Participant 5, female, age 32 - 38).

There is a belief that the water is not healthy, as it was likened to water used to extinguish fires. Water from trucks was also condemned for being dirty. This shows the circumstances in which the community lives. Their lives are endangered by the water they use and drink as it could lead to water borne diseases.

When the researcher asked the participants about the role that water plays in their lives, a few participants were ambivalent but mentioned challenges such as health, hygiene and how water scarcity affects them. A participant mentioned that:

A person cannot live without water. Humans need water in their bodies, and without it, we get tired and cannot function physically [properly] (Participant 7, female, age 32).

Another participant said:

Water is very important to me. Firstly, if I drink the water, I can feel some change in my body. When I'm thirsty and there is no water, I panic and get worried because I am an old sick lady who needs water to drink with pills. Even when I bathe, because I'm sick, I feel fresh and better because of water. It's very healthy (Participant 13, female, age 44).

Participants were also asked how they got water for all their daily needs in the home. The aim of the question was to get responses from participants on how they access water and what type of services and water sources they have. One participant mentioned that they have a tap installed but there is no water. The participants said:

We use metered water to get water but because there is no tap water and the meters are not working, we rely on private water trucks which deliver the water to us. Other ways of getting water are by putting out containers and buckets when it rains. This collects rainwater and use that rainwater to sustain us (Participant 1, male, age 82).

Another participant mentioned the availability and distance of water. When participants were asked how they get water, they managed to tell of their grievances. One was the availability of water, as none is available at all due to poor water services. They also mentioned that they walk long distances to collect water, and it is mostly the women and young girls who do this.

4.4.1. Availability of water

The Water Services Act (RSA, 1997) stipulates that water utilities as water services providers (WSP) act as bulk water suppliers to municipalities which are considered to be water service authorities (WSA). The municipalities are responsible for extending water services to benefit individual citizens and other consumers through managing reticulation systems. Van Wyk (1998) points out that although all countries need adequate water Infrastructure, those with dry or highly variable climates like South Africa need greater extension of water resources in order to augment their reserves, and hence the huge backlogs as far as water infrastructure is concerned.

In response to water availability, most participants responded by saying that they get water mainly by water trucks:

We get water from trucks too, and if the water does not arrive, there will be no water. We cannot use rivers because they are polluted. People throw away Pampers and they go into the water even if there is water in the river. Despite this, people use the dirty water; they have no choice.

We only get water by trucks and there are no other alternatives. We can pay someone who has a car to drive to eMlazi to get water (Participant 3, male, age 36).

We get water from water trucks. Now, there is no water in the taps (Participant 4, male, age 49).

Truck delivery services are very poor, trucks are inconsistent, especially regarding the time and day of delivery. This leads to community members with no water, and the only option left is to use river water which is unhealthy. One participant responded and said:

The only solution is going to the river and drinking that dirty water. Even my children have rashes, and it's been days since my kids have had bath. I mean we drink with the cows which is so wrong.

Availability and time are issues. Water trucks come at any time they want and do not care about the citizens' welfare. This is clear when one participant mentioned that:

We get the water from trucks but it's been a week, and the trucks are just passing us by (Participant 7, female, age 32).

Another participant said:

Usually water trucks come on Wednesdays. If it does not come that week, it will come the following week. The fact is that water comes in whenever they want and whatever time they wish. It means there is something wrong with the systems and we have no say about it. Sometimes the water we get is not enough and finishes quickly. We then have none left. We have nothing to do because we don't even have a car to travel and get water elsewhere (Participant 11, female, age 24).

4.4.2. When asked about role water plays in the participant's life, participants mentioned that the distance to collect water was a major challenge because trucks stand far away from their homes and that if truck doesn't come, women and children walk long hours to collect water from river beds and dams. One participant said:

I go to the road and wait for the water truck to come, then get water from there and carry the water with buckets on my head. We have a tap but we have no water. Other ways of getting water include rainwater but it has insects in it. We can't even recall when the water went dry on the taps because it's been that long (Participant 5, female, age 32).

Another said:

The only way I get water is when I use a wheelbarrow and fill it with the water. I have to travel long distances to collect the water and that is the only way that I can get water (Participant 16, female, age 31).

Even the old lady who fetches the water from the standpipes has to walk and wait for the aqua trucks to get the water, and if she misses those water tankers, she does not have anything to drink because the structure that was working is now shut down (Participant 10, male, age 42 and female, age 40).

Other alternatives to get water:

We get water from the truck; we stand there the whole day and trucks just pass us by and maybe stop at night which is unfair, tiring and exhausting. Other ways of getting water is a built-in dam which is not within walking distance of my house and we get tired because it is so far. The good thing about the dam is that we can wash clothes and blankets. Bear in mind that this dam is dirty and is green in the inside. There is algae and fungus in the water, and so, we have to delicately swift the algae aside and get the cleaner water. Worse are the frogs living in the water. Sometimes we get have heavy rains but the dam does not fill up and wash away the dirty water (Participant 8 females, age 19).

This participant said:

We get water from a truck and if we don't get water from the trucks, we go to water ditches and rivers. The dams are okay but the problem is with the river where people throw away dirty diapers and cows drink there (Participant 9, female, age 29).

Another participant mentioned that they must pay to get clean water if water trucks fail to deliver their services:

Water trucks have not been coming for a whole month now, so it was very difficult getting water. The only alternative we have is to ask our neighbor who has a vehicle, and pay them to help us collect water from outside this area (Participant 15, male, age 37).

Furthermore, some participants made assumptions as to why water was not accessible and efficient, and they mentioned that:

We used to have water taps which were clean. We do not know why the water was shut down but rumours say that people stole the engines that bring water in the taps.

Other areas get water, and the sad part is that the area is about three houses away. (Participant 2, female, age 67).

However, another participant argued and emphasised that:

Well, one day a contractor came by our house saying that he was going to fix the water which at that time, there was no need to fix it. After his visit, we had no water at all. They changed pipes we had (Participant 7, female, age 32).

4.5. Major challenges in accessing water and water service delivery and time management

Participants mentioned that:

If water does not arrive at all, it is a major issue. Firstly, they do not warn us if water does not come. It basically passes us even if we have buckets by the road. Water goes to other areas and passes us, and we don't know why. Sometimes we don't get water for more than three days (Participant 2, female, age 67).

Another participant said:

The first issue is that the water truck does not come on Wednesday which was initially the only day. Now the issue is that our community is blocking the trucks from Umlazi coming to Engonyameni because they are saying that "if we block the water trucks and don't get water", the higher authorities such as councillors, chiefs and Indunas will meet our needs. It's a strategy so that the municipality will meet our needs (Participant 3, male, age 36).

This participant mentioned that:

Basically, the water truck is supposed to come Thursday nights, but now it's comes at any time. Sometimes on a Sunday morning when I would be going to church and no one is available at home to collect the water. Sometimes it comes at night and stops very far from my house, so now we have to walk a distance to collect the water using a wheelbarrow (Participant 4, male, age 49).

This female mentioned the health risks she encounters by saying:

I have a toddler. If the water truck did not come, I take the child with me on my back and walk long distances with buckets on my head to collect the water. That can be health risk because my back becomes painful from the strain of 25 literes of water and a toddler on my back (Participant 15, female, age 32).

4.5.1. Unfair treatment

We don't get water the right way, we stand the whole day waiting for trucks to supply us with water. Sometimes we leave our buckets on the road for days, even a week, to send a signal that we have no water and still the water trucks pass us. Sometimes you get two or three water trucks full of water passing us going to other areas and when they come back, they come speeding by and pass us with our empty buckets. This water makes our bodies itchy (Participant 8, female, age 19).

Other participants also mentions that:

The water truck arrives at 8 o'clock at night. That means that I have to wake up in the cold and collect the water. I also need to walk to collect the water (Participant 9, female, age 29).

Another participants confirmed and mentioned:

Water trucks come late and that is an inconvenience when it comes at 8 o'clock at night (Participant 14, male, age 54).

You find that the water truck is here but refuses to come closer to my house so that it will be easier for us to transport water to the house by water tanks and buckets (Participant 15, male, age 37).

The water trucks just go past us, and if we don't get the water from them, the only solution is to get water from the neighbours. This causes the neighbours to grow agitated with us, as water is essential and they have little left for themselves (Participant 16, female, age 31).

4.6. Human adaptation and vulnerability towards climate change

4.6.1. Impacts of climate change towards livelihoods

Suziki (2010) revealed that climate change can be caused by human negligence such as burning the forest. Air and water pollution along with climate change also trigger people's health. If there is no clean water, the community members can obtain diseases such as

cholera. In response to the question, “How do you think climate change has affected your access to water?”, the majority of participants indicated that they prefer rain because that way they can get water in different ways such as rainwater which they drink and use for daily chores. This question was established to find out if climate change affects their livelihoods. One participant responded by saying the following:

Climate change is a major issue. For instance, if there are heavy rains, we get dirty water and when it is too humid, there is no problem at all because we still have water to use and sustain us. (Participant 1, male, age 82).

While conducting the interviews, some participants were not familiar with the concept of climate change. This was witnessed by their body language and facial expression. The researcher incorporated better ways to ask the question so that they could answer the question. A few participants, therefore, responded by stating the following:

One participant mentioned that:

“Climate change is a language of the educated and those who understand it”, he smiles... He pauses a little bit and we laugh. “Climate change does not really play a major role. We are used to this weather and I see no difference. I have nothing to say about it. (Participant 3, male, age 36).

Another said:

Well, let me think. Climate change does not affect me that much because I don't get water from the river. Not unless I have a garden. We need water for the mealies and tomatoes to grow (Participant 4, male, age 49).

Jackson et al. (2001) state that climate change is the cause of intensification of the hydrological cycle causing major heavy rainfall and intense droughts. In response to the question, participants mentioned that rains play a major role because they are rain-fed but intense rainfall causes clean water to wash into the water or become polluted. If there is an intense drought, they have no water which becomes a problem if water trucks fail to deliver their services. One participant initiated that:

If it does not rain, we don't get water, especially because we also use the bucket system where we put out containers to catch/collect rainwater. If it rains too, it's a good thing because we get water but it causes issues for water trucks because they can't come to this area because the road is slippery, as there is no layer of tar. (Participant 2, female, age 67).

Climate change impacts the availability of water because of the rising temperatures which increase the variability of rainfall. Thus causing an increase in drought in some areas and an increase of rainfall in other areas (Swistock et al., 2010). In response to the question, other participants mentioned that climate change impacts the availability of water but if weather patterns are bad, water truck deliver dirty unhealthy water. One participant mentioned:

If it's too humid, we don't get any water but when it's raining, we can get out buckets and dishes next to the house and get rainwater from the gutter. Trucks do come when it rains which is a relief (Participant 6, male, age 28).

As suggested by the participant

Climate change affects us. For instance, since it's cloudy and looks like it's going to rain, truck water comes with dirty black water. We can't cook with the water. We add Jik into the water to purify the water, as we have no choice. My body was covered with a rash and I had to go to the doctor. Now, I have to bath with Dettol (Participant 5, female, age 32).

Another participant mentioned that climate change has a positive impact on us because we get water to drink, and if we have enough water, less labour is required for the collection of water from the river or water trucks. Furthermore, participants mentioned that usually when it rains, water trucks do not deliver water because they assume that the community has enough water from the rain. Therefore, it is imperative that water services and authorities need to be aware and consider the effects of climate change on water resources and weather events. This participant stated that:

Climate change affects us positively because if it rains, we can drink rainwater which we collect by using buckets and containers. Climate change also has a positive impact on rivers, as when it rains, it washes away all the dirt and pollution. Therefore, we get clean water. The other role climate change plays is that we can collect water from the river if trucks don't come, but we don't drink the water and use it only to bath, wash and clean. (Participant 8, female, age 19 and 47).

Climate change also has negative impacts which affect people in the community accessing clean water. This participant responded by saying:

Climate change affects a lot if it rains. Usually, when there is heavy rain, all the water runs off to the rivers and we are left with nothing, but if there is a light rain or drizzle for longer periods, we have water to sustain us for a long time. The main issue is that it does not rain that much. We can't even farm that much due to the lack of water. Furthermore, it is very painful because it's been a long period without no rain. There is no clean water, as the rain helps wash away the dirty water but now because it is dry and there is no water, the water remains dirty. When it rains, it's good for us (Participant 9, female, age 29).

Other participants were on the same page. These participants responded by saying:

Climate change is horrible. It's been dry and there is no rain or water. When it rains, it destroys everything, as it causes floods and usually brings dirty water which we cannot drink (Participant 10, male, age 42).

4.7. People's perceptions on Institutions and Governance on water access

Initially, the main question was, what people's suggestions for addressing water scarcity are. The participants above responded and suggested the implementation of boreholes and water harvesting. Furthermore, the question asked who has the responsibility to implement the suggested solutions made by the participants. Below is what the participants said:

The municipality should ensure that our water is always clean and accessible for drinking, cooking and washing. Apparently, they put in some sort of chemical that cleans the water (Participant 1, male, age 82).

Another stated:

A right-hand man usually helps us and takes our problems to the councillor who then looks into our problems which include water and other issues regarding our livelihoods. (Participant 2, female, age 67).

Some participants were frustrated and angry when asked this question and ended up mentioning that the councillor fail to deliver. One participated stated:

An area councillor is the one responsible but he does not do his job. When you speak to him, he answers us harshly and turns us away. He does not even tell us that his trying, so that we will at least have hope (Participant 3, male, age 36).

Participants were asked who was responsible for looking after them regarding access to water and water scarcity. Most participants responded similarly by mentioning that the municipality and local authorities which include councillors and chiefs should start delivering services to them as appointed from their job positions. Furthermore, a few had their own view.

This participant revealed that:

We have no one to tell if we have a problem. We don't know our councillor and we never see Induna anyway (Participant 4, male, age 49).

Furthermore, it was insinuated that the reason why the area has a problem is that people are appointed jobs that do not fit them. The role of traditional authorities is to continue carrying out the responsibilities entrusted to them and to do their jobs properly.

He is comparing Engonyameni to other villages. He says he's been to worse areas besides Engonyameni but they do not suffer when it comes to water. We're suffering. This is an epic sign of a lack of knowledge and the failure of provincial and local government who are appointed (Participant 4, male, age 49).

The problem is the councillor. I'm assuming that he was not educated which is why we are suffering. He does not know which direction to go. I've never even seen the councillor nor voted for him, but our councillor is a man who tries to meet our needs. It makes me angry that the area where he stays has water. It's not fair. There's something fishy going there, I swear.

With evidence from the interviews, the reason why community members are saying that the councillors appointed are not educated, is due to the fact that there is no relationship between traditional authorities and municipalities. The constitution emphasises that the relationship between traditional authorities and municipalities should be one of co-operative governance.

4.7.1. Governance issues

Water is a scarce natural source and needs to be distributed equally and used efficiently. The role of district and local municipality is to distribute portable water. Water service delivery locally in this areas has been assigned to municipalities because the structures are for the people or community members. Evidence proved, however, that these local water service deliveries of the municipality fail to deliver and perform poorly due to poor management, no funding and technical glitches. Some areas have hereditary leaders, in others the councillor or headman is appointed by the chief of the area and some areas democratically elect their leaders.

One participant mentioned:

Our councillor says that he was not voted by the community but that he was chosen by the state or government to be a councillor. In our understanding, the people vote for the councillor. There is nothing that proves that he did anything in the community. He did nothing at all. Even the pipes that are fitted now, he got help from other councillors and we must strike and vote. The chief is the problem which is why the whole system is not working (Participant 15, male, age 37).

Almost every participant mentioned that the core issue of poor management of water service delivery is due to the corruption of officials, unfair treatment, biases and councillors being appointed jobs they not fit for.

Another participant mentioned that the government is not communicating with them and that they are doing what they please which is why water is a major issue:

They fail to call a simple meeting where the councillor is also engaged with the community. The councillor gets paid for nothing. Imagine if he were to get paid by the amount of work done. He would be poor which is why he is lazy and not taking action at all to help or assist us as community members. I would rather have no electricity than have no water. Without water, we have nothing. It is nice to drink rainwater when it's fresh but after two days it contains bugs and mosquitoes.

Another participant mentioned that the issue lies with leadership:

The problem here is leadership. If the leader is changed then everything will proceed accordingly. Hopefully, we will get our tap water by next year (Participant 10, male, age 40).

Another said:

We don't have anyone to tell but I can tell you that it is corrupted because, for instance, people who can afford to pay for the trucks, pay the truck drivers to fill their Jojo tanks. When he came by my house, I had to force him to stop. I told him that if he goes pass me, I will report him. He then had no choice but to stop, and that's how I got the water (Participant 16, female, age 31).

4.7.2. Corruption by institutions

Water privatization is described as a variety of models of the involvement of private sector in water services, which community members are complaining about. Water privatization states that the private sector should be the central component of water delivery strategies, however (Bakker, 2010) mentions that private companies continue to charge the poor more even though they cannot afford to pay. While conducting these interviews the issue that the researcher found is that, the problem is not privatisation, but commodification because both the WSA and WSP are state institutions, however this participant mentioned that the problem is water privatization and the private sector being more dominant when it comes to their water. Below the first participant said:.

The problem is that the people who own tenders are corrupt. Ever since they came into the area and took part, we suddenly had no water. So, the issues lie there. The sad part is that some areas have clean running water and in this area, we do not have water because of tenders (chief of the area) (Participant 12, Male, age 42).

Furthermore, participants mentioned the manipulation or politicisation of basic services. One participant mentioned that:

After voting in 2016, the water was automatically shut down in our taps that same weekend. We don't know the councillor. E Madundube where the induna stays, has tap water and, apparently, the water never runs out. Those areas that have water, they have water because they come from a different chief. We don't use the same pipes which is why their water is always running. Security is tight, they work as a community and they make sure that they also look after the area where the initial pumps are installed. (Politicisation of basic services) (Participant 14, Male, age 54).

Another participant agreed and mentioned:

You'll see when they are rallying for votes. When there will be elections, they will act like they care about us and have two or three meetings just to get us on their sides for votes. Then after that, they forget about us. They don't care about us! They only care about their tummies (Participant 10, male, age 42).

Most participants agreed on the issue of not knowing whom to inform if problems arise in the area. One participant mentioned:

We don't know the counsellor which is not right. The main issue is not that we don't have water at all but that the councillors are not doing their work to combat the issue.

Another participant clearly mentioned that:

I'd be mad if I had voted for him. People are lazy and they don't want to work on the ground to make that first change. People living in the area are scared to take a step, as they are afraid that they might die or the plan might not work, so it will become a failure (Participant 6, male, aged 28).

Other participants stated that they are familiar with the councillor, but he fails to deliver. One participant said:

We live through our problems but the problem is that we don't know anyone to report our problems to. The councillor is not doing his job and there are no meeting in this community. We have a lot of grievances, but we don't know who to go to when we have problems. We are really clueless on where to go (Participant 5, females, age 32).

One of the female participants added that:

I don't understand because we have a councillor in the area. We don't know him or her, and our needs are not met. We vote as a community yet development is very slow or there is no development at all. We have no electricity for a whole week. Imagine our food in the fridge. The water is worse. This is nonsense and unacceptable! (Participant 5, female, age 32).

From the same interview the other female participants mentioned:

Furthermore, my father called the offices and he asked the councillor questions such as "How do we survive without water?", and the councillor replied by saying there are problems with the pipes and right now their aim is to take out old pipes and install new pipes that will cater for the whole community. My father then decided to stop because he was scared to be the only person complaining and feared for his family (Participant 5, female, age 38).

The male participant said:

When I have an issue, I go tell the councillor. I know him and I've seen him but he does not do his job (Participant 6, male, age 28).

4.8. Failure to provide efficient services

Lack of proper planning by most countries has resulted in inadequate water supply for most families in dry regions (Asmaniwaa, 2013). Poor water management is a major issue. If water is not managed properly, this can provide breeding grounds for waterborne and airborne diseases such as cholera and malaria which is a major epidemic for poor people (Seckles et al., 1999). The lack of proper planning from the private water systems and the local government has an effect on the lack of water service.

One participant mentioned that:

We called in the municipality because of an issue we had and told them our problem. To this day, we still don't have water. They promise to bring the trucks and to this day, we haven't had water delivered by trucks. There is no follow up. One time we called for a follow-up and they gave us a story that didn't even make sense (Participant 7, female, age 32).

Similarly, another participant mentioned that;

We tell the councillor our problems and they come sometimes to hear our problems but still don't fix our problems (Participant 8, female, age 19).

Another participant argued and mentioned that:

We don't tell our issues to everyone. Our councillor stays very far from where we reside. He does not know what is happening. We're just happy when we see water trucks; it's a sense of relief. We don't report our problems to anyone. (Participant 9, female, age 29).

This participant revealed that issues of not having meetings with them include:

You see the problem is that these councillors always have meetings during the course of the week when we are at work. They don't hold meetings when we are available to be a part of the meeting. For example, on Saturdays and Sundays. We are at work then and nobody is there to represent us (Participant 10, male, age 42).

In any areas there should have a working structure so that people's needs are met. Evidence from the interview proves that there is no uniformity with regard to their recognition, appointment, and remuneration.

Due to the corruption that been happening lately, I don't know how many times I have watched neighbours getting water while I we don't. Before there would be no water in the taps during the days and at night; there would be no water. Question Six regarding induna, chiefs and traditional leaders as well as the political leaders who are councillors. They don't follow the protocol and the structure is not enough and not followed. It's not clear who the actual leader is. If you go to the councillor, he/she sends you to another person such as the chief. It is very dysfunctional (Participant 14, male, age 54).

One participant mentioned a very valid point:

They are speaking about radical economic transformation, yet they do not have any cares to collect the water but they want the tender as their own. They don't have the tools to do that transformation (Participant 10, male, age 40).

4.8.1. Structure of water systems

Water systems in any area should work and run effectively so that the area can run smoothly and effectively.

One participant angrily mentioned that:

You can't destroy a structure that is working for something that is not. They changed all the system and gave to people who did not want water. We have meters but we don't have water because they wanted everyone to get water so that we get used to it.

After 5 years, they put in a meter and they then cut it off until you pay them. Now everyone is suffering.

Before Umngeni water was okay. Everything was in order until they took over. They then bought water from Umngeni water and then Ethekwini municipality brought the tender from Umngebi water. They started a project giving their friends tenders to put in water systems for everybody and then disconnected our meters. They put in their own systems which lasted two days and then after that, there was no water; only from the standpipes. Two days before the Municipal 2015 election, there was no water at all; it was cut. We then have these aqua trucks running around because they have tenders from them, as they are friends. So, now we don't have water. It's horrible. It's not a better life for everyone, but for some special people. That is unfair treatment (Participant 10, male, age 40).

Question Six - I'm trying to think. We have none to tell, but if we would have community meetings, perhaps solutions would be easier and people might have different views; that way, maybe the councillor would start working. We have a community hall and busses to take us there. We could have a meeting on a community field.

4.8.2. Solutions to water scarcity

During the interviews, the researcher asked the participants what other solutions can they come up with regards to water scarcity. For example, installing new water pipes and building dams to feed the community. One participant mentioned that:

We take our issues to the councillor who helps us, and he is really doing a great job. Look at the first step he took by installing these pipes for us. It looks like at the beginning of next year, we will have running tap water (Participant 12, male, age 42).

Another participant disagreed and stated that they had to use some sort of force in order to be heard and get these water services:

The two councillors mentioned above, when there was no action made of putting in the pipes, they created a violent riot and went to their offices. They had no choice and

promised us change. Two weeks after that, they started putting in pipes and switches. We are still waiting for water (Participant 13, female, age 78).

Other participants mentioned other alternatives to mitigate water scarcity:

He says the reason why we don't have water is because there is no water in the reservoir to feed the whole village. It only feeds certain areas. Sometimes they say that there is no water or there is to pump the water to us. So many stories. We should be using the water dam from Umlazi, but it only feeds and supplies water for people living in Umlazi (Respondent 12, male, age 42).

Amponsah (2005) gives an example on a dissertation which was about Local Economic Development projects which were in the Lehurutse District of Northwest Province, and he mentions that water plays a major role in the success of LED projects. This study revealed that in order for projects to be successful, they depend on the availability of water for success. The lifespan of the project only depends on water. Otherwise, it would be unsuccessful.

They have a project now, and I hope it will work; it's really hopeful. Before the water would start at the bottom houses then come to an end; that's if we're lucky to get the water. We get water with pressure which we get from reservoirs in Umlazi because the previous one failed in Madundube. Now there are a lot of people living in the area and we can't get water from there.

A better solution for this project is that this area needs to make its own dam/reservoir, so that we take care of our water and not have problems with getting water. We buy our own pipes and put it in our own dam (Kwa CC), and pay for our own meters. We're fine with that. Across the road starts Ward 84, so they will start with our side and fix or pipes while across the road, they don't have water. So, the solution is that it will be better if the wards work together because we all have the same issues. It's all politics and that's why we don't have water. People are aligned with either the ANC or EFF. That's where the issue starts.

Another participant mentioned:

They must finish building the dam that will store our water and feed the entire community. Now we have been waiting for year for the dam to be completed; today we have nothing. Even if they say we must pay for water, we are fine with that because we are so desperate. This is not life at all (Participant 11, female, age 24).

4.9. Coping strategies adopted by citizens of Engonyameni

It was vital to ask participants on how they cope in the area if the issues of water scarcity and climate change arise, and how it affects their livelihoods. The theme emerged from the question of what should be done to ensure that the people in the area of Engonyameni have adequate water and what suggestions citizens have towards addressing the issue. Participants revealed that the best solution is to make boreholes; that way they will have access to clean and safe drinking water that is not limited. Participants also mentioned that the councillors appointed should start doing their jobs properly. Suggestions which the participants made were for the municipality in order to ensure that they get enough water to last them a week.

Firstly, participants were asked how they cope when there is water scarcity. One participant said:

The best days are rainy days because we can get rainwater, and the good thing about rainwater is that we can drink it and cook with it but its only fresh for a while. After that, we use the water to clean the house and because I have a car, I wash my car (Participant 9, female, age 29).

Another participant stated that:

Because I stay by the dam, we usually go there with our clothes and wash our clothes there next to the dam. It saves a lot of water, and the good thing is we never get skin rashes (Participant 11, female, age 32).

When participants spoke about their coping strategies, it was necessary to ask them about what needs to be done to ensure adequate water, so that it will be easier for the participants to access water. One participant suggested that:

The best solution is to make boreholes; water coming from the ground. That water can come from the river since we have a river around the area. The people who are capable of helping us is the Municipality. The chief should ensure that we get the water, but they do not do their job properly due to not having facilities to start their job (Participant 1, male, age 82 years).

Another participant suggested that:

They should install pipes undergrounds, so that we can get tap water and have a storage tank where they can store water near the area. The municipality should check now and then that the system is still working. Usually, women are employed to do the work. Women who work for municipality used to come and do the piping systems but not anymore and we don't know why. The best solution is if they were to bring back the pipes and to tighten the security systems by having security guards (Participant 2, female, age 67).

These participants thought of a different coping strategy which is basically the core foundation for any community or village to survive. The participant said:

The first step is that the community can work together and hold meetings regularly with the councillor, ward committees and the chief of the area present during said meetings. That way our issues that are put forward can be directly heard by the higher authorities which include the councillor, ward committees and chief. The most annoying part is that people are not taking any stance or action to call each other to start the meetings, but they always complaining that they have problems. That is why the higher authorities are not taking action because people are also quiet (Participant 6, male, age 28 years).

One of the participants agreed and supported the above. She emphasised the idea of having community meetings and also mentioned that:

What can be done is that in all the areas, there should be a selected trusted community member, much like a chairperson, who will inform the higher authorities

of water trucks who are late or fail to arrive. This will hopefully cause change and solve the issue (Participant 9, female, age 29).

These two participants had one simple solution which was reciprocal to each other in ways for coping and improvement in the water service delivery. They mentioned that the only way was to:

Fire the councillors and get rid of those corrupt officials from the municipality. Councillors are just selling tenders to their friends; they are horrible and it's pathetic. Another solution is to implement borehole systems where we can get water from the ground. That way we don't get water from the rivers. Firstly, river water is always dirty and causes sickness and rashes to occur on our bodies. We have a lot of water; it's just that people are lazy to make boreholes (Participant 10, female, age 40 and male, age 42).

4.10. Conclusion

The aim of this chapter was set out to present the findings of the study. Moreover, Chapter Four coded, transcribed, thoroughly described and analysed the data collected for the study through questionnaires and interviews. In addition, the study incorporated objections from Chapter One and theoretical framework and literature reviews from Chapter Two. Findings of the data revealed reasons for water scarcity which are due to corrupt officials and institutions. For example, a councillor who fails to deliver water services to the people affects the community members who become angry, sick and distressed due to water scarcity. There is a shift in water provision, involving a change from settlements of community members. People have a right to access clean and safe potable water. This can be done by, for example, installing underground pipe connections to households. Furthermore, the study revealed that climate change affects them more negatively. For example, heavy rainfall is uncontrollable and brings in dirty water and washes the pollution in the river back to them. It does more damage than it would if there was light rain. Lastly, the study revealed that the type of water sources the participants have are taps. A few also have Jojo tanks (water tanks) but have no running water. The following chapter will discuss the findings of the study and present a conclusion and recommendations.

CHAPTER 5: DISCUSSION OF FINDINGS AND RECOMMENDATIONS

5.1. Introduction

The aim of this study was to investigate the issue of water scarcity and focus on the citizens' welfare in the context of climate change at Engonyameni Village in KwaZulu-Natal. The main focus was to investigate how people survive with no access to water in their daily lives and how does climate change affect them in accessing water. Chapter Five will firstly present a summary for all the chapters within the dissertation. This chapter will look into the objection from Chapter one, the findings of the research will be discussed and will conclude with necessary recommendations. In addition, limitations of the study will be mentioned and suggestions for future researchers will be presented. Lastly, the study will present an overall summary of all five chapters including a conclusion.

5.2. Summary of the study

The dissertation was divided into five chapters. Chapter one is the introduction of the study and includes the background of the study, the statement problem, rationale, objections of the research and lastly questions of the study. This chapter highlights the importance and access of water globally and in South Africa. Furthermore, it gives an insight of what climate change is and how it links to people's livelihoods. For example, how does climate change affect a certain place negatively through drought? There will be water shortages which lead to water scarcity while, on the other hand, climate change can be a positive influence, especially when it rains, as it produces water for the community to use to sustain them through the day and through their daily chores.

Chapter two of the study pertains a theoretical framework. The theoretical framework adopted in the study is the sustainable livelihood approach which compromises of six core principles, all supporting the participatory and responsiveness of people's needs and support factors which affect people's lives such as climate change and sustainability. The approach is a breakthrough for the vulnerable and less fortunate whose views are not heard and are excluded socially. These include basic services such accessing clean water which one part of the area has but the other is excluded. The literature review will expand and give knowledge and insight into the challenges of water scarcity and climate change.

Chapter three presents the methods and methodology used in the study. Chapter three gave an overall insight on how the researcher was going to complete the fieldwork. This included research design, sample and sampling of participants as well as how data was collected and analysed. Finally, it included the ethical considerations and limitations of the study.

Chapter four was the core foundation on how Chapter four was going to be done. Chapter four thoroughly analysed the conducted interviews. The study followed a thematic data analysis because it produced trustworthy, detailed and insightful findings during the data collection.

Chapter five concludes the study by presenting discussions of the findings found in the research, recommendations and study limitations.

5.3. Research Findings and Discussion

Below, are the objections used for the study and is part of the discussion, conclusion and recommendations.

- To explore the perceptions of people of Engonyameni on the role water for their welfare
- To unpack the challenges people in Engonyameni experience in accessing water
- To assess people's perceptions of climate change and its effects on their welfare
- To investigate the alternative sources of water for people in Engonyameni
- To investigate people's suggestions and on how to address water scarcity in Engonyameni

5.3.1. Role and importance of water

The study investigated the perceptions of people at Engonyameni in the role of water in their welfare. The study established that community water is a valuable resource for community members, and nothing functions without it. Findings revealed that community members depend on water and because water is scarce in the area, it causes major challenges in hygiene, agricultural practices and household chores. The findings revealed that water is a basic and important need because community members need it to cook, bath, clean the house, water gardens, flush the toilet, drink medication and support subsistence farming.

Furthermore, the constitution mentions that everyone has the right to have free access to water in a certain quantity per day, and that the water must be clean and should not be

contaminated. If water is insufficient, especially in the body, it causes dehydration which participants mentioned in the study, and they are able of function throughout the day which is why water is an important resource for people. The sustainable livelihoods approach suggests that the approach does not replace other tools, such as participatory development, sector-wide approaches, or intergraded rural development (Serrat, 2017), with evidence from the interviews, community members were angry because their needs were not taken as a priority. The sustainable livelihood approach aims to make connection between people and the overall enabling environment that influences the outcomes of livelihood strategies. Despite these reasons, the findings found that community members had no water sources despite their complaints. It also failed to pay enough attention to inequalities of power.

5.3.2. Challenges faced in accessing water

The aim of the study was to investigate the influence of water scarcity on the well-being of community members at the Engonyameni Village. The study revealed that water scarcity resulted in community members experiencing water as a scarce resource. Deteriorating water quality in this place is the most critical problem affecting Engonyameni. The study found that community members experienced challenges such as curricula issues, poor health and hygiene issues. Community members experienced body rashes, diarrhoea and older people were not able to take medication due to no access to water. The finding is in line with the findings of authors such as Motoshita, Itsubo and Inanba (2010), their study established that water scarcity is a critical environmental issues, and poor water quality may lead to damage to health caused by infectious diseases.

Community members also revealed that they could not water food gardens or farm seasonally because of climate change which resulted in droughts, no rainfall and water scarcity. Swedish Water House states that water is a renewable resource around the world, but with the contamination and depletion of water resources, they fail to meet the increasing demands for the community. With regard to Pereire, Cordery and Iacovides (2009), they further explained that water scarcity causes major problems for many communities. The water that is available for the populations is not adequate to alleviate hunger and poverty, food production and water access, especially if the community is large, it is bound that water will replenish easily

because of over-use. The study also revealed that young girls and women are most affected by the lack of water scarcity. They walk to the water trucks to collect water which sometimes causes health risks such as back pain. Other alternatives is if there is no water, women and girls walk long hours to collect water from the river beds or dams which is often unsafe and unhealthy to drink and in some cases causes waterborne diseases.

5.3.3. Human adaptation and vulnerability towards climate change

The study findings for this question revealed that climate change affects the health of community members in many ways such as increasing the cases of skin rashes and diarrhoeal diseases due to water being dirty. Climate change also has some mixed effects, when the temperature rises, there is less rainfall and can lead to drought and then water scarcity. Which becomes a burden to the community. Higher temperatures also causes community members to become dehydrated and effects children the most, they become less active when playing. Furthermore, the elderly people are more vulnerable, especially those who are sick, as they cannot take medication. When there is heavy rainfall and the temperature drops, the effect can be damaging, especially towards vegetation. Heavy rain also causes water pollution and water becomes dirty and unconsumable.

The study also revealed that the positive aspect about heavy rain is that water tanks and buckets become full and that way they get water for well-being. Change Intergovernmental Panel on Climate (2007) emphasises that the balance of positive and negative health impacts vary from a certain location, and there will be changes overtime, especially when temperatures continue to rise.

5.3.4. Perceptions of people towards the institution

The study revealed that corruption could determine the allocation of water. The issue started when water in this area became privatised. People revealed that they cut their tap water and it's been an on-going process for years. The study revealed that there are no rules followed by these private water services because they are not monitored, don't have enough support from local government and they infringe on the rights and well-being of the community and also neglect traditional water rights. Furthermore, community members mentioned that the issue is the local authority and municipality who fail to deliver water services due to ineptitude. Evidence ensures that the issue is that officials who are appointed for the job lack the ability

to produce effective feedback to provide for the community. The study reveals that new people need to be appointed. In response, Deneke, Mapedza and Amede (2011) emphasise that the only way to improve water productivity depends on how local communal water is governed and it involves organisational and institutional issues. The study also revealed that poor communication between the municipality and community members is another challenge for them. Communication is the key cause which makes community members feel important and helps them plan ahead or make necessary arrangements if there will be no water.

5.3.5. Lack of basic services

The study revealed that the first reason for the lack of basic services (water scarcity) is because of commodification of water, findings revealed that water is not commoditized simply by charging money for it, but through a series of discourses and acts that link it to other modern objects and give it value. These particular objects are women, the fact that women participation in activities that link gender and modernity to new responsibilities and increased mobility for village women involving the clean water supply. Water and women are mutually constructed through struggles over water use and its commodification. Even though Ethekwini Water and Sanitation Department is a state utility and Umngeni Water is also a state-owned water board. Finding revealed that water scarcity is also caused by privatisation. This is evidence that those who are for privatisation argue that the government is corrupt, financially strapped and fails to upgrade water services with their own money because it is costly.

The city of Durban provides 9kl of free basic water per month to all households regardless of whether they are indigent or not. The FcBW (free basic water) policy stipulated that municipalities provide household who are indigent with 6kl of FBW. The city of Durban is doing more than what is stipulated in the policy by advocating for a universal access to water instead of providing FBW to indigent households. Even the middle class is benefiting from getting access to 9kl of FBW. The city is providing a subsidy to the Republic of South Africa which recognises this right to water.

Trucks which deliver water during mechanical cut-offs are paid for by the state, the study revealed that the challenges encountered when water is delivered through trucks has to do

with deep neoliberalism and commodification of water. In the past such services was rendered by municipal employees, but now this service is outsourced.

5.3.6. Coping strategies adopted by the people

The study findings aim was to understand how community members cope with water scarcity in Engonyameni. The study revealed that if the trucks delay on delivering water, they have to provide their own water which is costly. For example, they ask neighbours who have a form of vehicle to transport them to places where they can get water, and they pay them but it is difficult for people who have no form of income. They then have no choice but to beg for water. Secondly, the study revealed that some community members use different ways to collect water from sources such as the dam (for washing and watering the garden) and the river (for doing chores and washing). Others use the springs and rainwater which is used for cooking and drinking. It was also necessary to ask community members about more suggestions on how to cope when there is water scarcity. Community members mentioned that boreholes could be made to get water directly from the ground and install new water pipes. The study also revealed that another coping mechanism is that the only way to get access to water is to have piped water. The study also revealed that the area has a large number of water resources but lacks water supply. It was concluded that, in order to combat the issue, proper management of the water supply is required.

Biggs, Bruce, Boruff, Duncan, Horsley, Pauli, McNeil, Neef, Van Ogtrop, Curnow and Haworths' (2015) livelihood assessment suggests that it is how a person and household conducts themselves under certain frame conditions. These are coping strategies made by individuals as a response to external stresses and shocks which include climate change and are usually short term. An example could be switching to the the cultivation of drought-resistant crops. Despite the livelihood approach, the study reveals that as they go through climate change, they only wait for municipal or private water trucks to supply the water in order to water the gardens.

Speranza, Wiesmann and Rist (2014) mention that the approach mentions five assets which include people, but the study found that the community members are the least priority. The second one is a physical asset that includes water, communications and production equipment; these are issues mentioned by participants which the government and private water fail to supply. Human capital is the third capital-skill, knowledge and health hazards.

Participants mentioned that those who for these services lack skills and knowledge of how to do the job, therefore, it jeopardises their health. The fourth capital is the lack of water supply to the community. The last capital is social capital. The study proved that there is no relationship at all between the community members and the local government. The local authorities which include the councillors, ward committees and chiefs reflect that there is a lack of coping strategies. The last capital is financial capital where resources are unavailable due to plan management and private sectors failing to budget so that there will be enough water for everyone in the community. The same applies to the local government where the municipal water fails to produce water for everyone (Serrat, 2017).

5.4. Resulting theoretical framework

In terms of theoretical framework, the study adopted all six core principles. Each of these principles link well with climate change and how people survive during the periods of drought and during the periods of heavy rain. Sustainable livelihoods approach regards household as a basic unit that produces various socio-economic activities. This framework is a people-centered approach which allows community members to express their right to free access of clean water. The study reveals that even though we have free water policies, the municipality and government fail to deliver water services to the community. This principle is the core structure of the livelihoods of people such as community members being able to participate. Sustainable livelihoods approach is people-centred and allows community members and government to participate and be responsive to their needs. Livelihood assessments allow the community members to survive and sustain their livelihoods during the shocks and stresses present in drought seasons. This theoretical framework best fits because it creates livelihood opportunities and strategies for those who are less fortunate, socially and structurally excluded and, in this case, those who have no access to water.

5.5. Discussions and conclusions derived from the findings

5.5.0 Findings of the five objectives

5.5.1. Objective one

To explore the perceptions of people of Engonyameni on the role of water in their welfare

The reason for this objective was to unpack the core issue of why the area of Engonyameni has no access to water. Findings indicate that water is viewed as an important resource for the area. Water plays an important role to every individual in the area. The study shows that the main use of water is through domestic use such as washing clothes, cooking, agricultural use and mostly human consumption. For those who pay for water, they mention that they value water as a resource because they have to pay for the use of water. Therefore, they practice water conservation and never misuse water. According to the study, it was revealed that water mismanagement is the result of water scarcity. The community members are aware of the issue of water scarcity and that the water demand is outstripping supply.

5.5.2. Objective two

To unpack the challenges people in Engonyameni experience in accessing water.

The reason behind this objective was to investigate the challenges that the community experiences due to water scarcity. Based on the research findings, the challenges were mostly from domestic use and few from agricultural use. The aim of this objection was to find out why people are facing challenges due to water scarcity. The aim was to find if the issue is geographically related, for example, no underground water or institutionally related, for example, the government failing to supply an efficient water supply and the corruption of the political officials in the area which becomes a burden to their lives and a barrier. For example, the lack of communication with the community members and the reasons for inadequate service delivery. Most of the experiences encountered by the community members are negative and they vary from the effects of the hygiene and health of community members because of the inadequate water supply. The study had concluded that the severe barriers to water conservation is because of educational levels. In other words, most people have a lack of knowledge and awareness of water conservation.

5.5.3. Objective three

To asses people's perceptions of climate change and its effects on their welfare

The realisation of this objective was to find out how climate change affects the community members and how climate change links to water scarcity. The study indicated that climate

change is the cause of water shortage. It is a geographical phenomenon and as the phenomenon continues to result in the intensification of hydrological cycles, it gives higher rise in intensification and causes frequent floods and droughts in the area. The study revealed that intensive rainfall has two factors. The negative factor is when it rains heavily, clean water washes away and leaves polluted water whilst the positive aspect is that heavy rainfall produces enough consumable water for the community. With the results, this indicates that people are aware of water conservation and a few practices within it. In the location of the area, climate change will continue to result in a physical shortage of water supply.

5.5.4. Objective four

To investigate the alternative sources of water for people in Engonyameni

This objective was realised because the study found that community members have adopted a few coping strategies to survive with climate change. Rural areas go through climate change which causes water scarcity and alternatives which were found are that a few use rivers and dams and those who can afford to, pay people with vehicles to help them collect water in other areas. Another alternative is collecting rainwater and some community members have access to efficient water taps. The study findings showed that community members are accessible to the community and that the municipality maintains and provide for them. Another alternative was that during the study and observation in the area, a few people had JoJo water tanks installed next to their houses. When participants were asked why they do not own them, they stated that you must pay to get JoJo tanks and that the only way to get the municipality trucks to keep them is through payment. The aim of the objective was finding out if the community members were aware that there are other alternatives to get water other than the water sources available to them. While conducting the interviews, it was vital to ask the participants to inform them that there are other alternative sources such as water reuse and rainwater harvesting.

5.5.5. Objective five

To investigate people's suggestions on how to address water scarcity in Engonyameni

This objective was realised after the challenges were mentioned by the community members. Community members face many challenges and the local government and the water private sector needs to form a structure to communicate with the residents so that they can work

together to find solutions for the issue of water scarcity. Firstly, the government and municipal water needs to re-establish its water policy and find ways to supply efficient and adequate water to the community members. It was revealed that not everyone was educated when it comes to the usage of water. Therefore, the municipality should establish a water programme where community members are educated about water conservation because it seems like community members rely only on water trucks and if there is no water, they suffer. This water education programme will teach the community members of how to save and re-use water as well as other alternatives such as rainwater for survival.

5.6. Implications of the study

5.6.1 Recommendations

Globally, water is a major issue, especially in rural and semi-rural areas. Water continues to be scarce in many regions around the world. Water is a form of life and we need water for our sustainable livelihoods. During the study, participants mentioned that one of the alternatives to rectify the problem is through the borehole system. The study revealed that some of the reasons why there is no water is because of inadequate water resources, mismanagement of water, government and municipality failing to plan in order to produce water and the leadership of the area not doing their jobs correctly. Therefore, the study recommendations that will be followed are:

The recommendations of the study will be based on conclusions of the objections of the study. Firstly, the study revealed that people use water for different reasons domestically and agriculturally. The issue found is that people mainly use truck water as their main source of water. Some participants suggested boreholes (i.e. extracting water from the ground). Therefore, the recommendation for objective one is to teach the community on how to make boreholes which means that the water will never run dry. An understanding and classes on water education and water conservation can help the community to conserve the water they have and teach them to conserve it for the future.

The recommendation for objective two is evident when looking at the study that revealed a vast number of challenges and experiences faced by community members, most of which are negative. The community member must be educated by the municipality. The municipality can start a programme on water where they are in partnership with the community members.

That relationship will allow the two parties to express their viewpoints. If they work as a group, water delivery will be managed accordingly.

The recommendation for objective three is evident when looking at the study that revealed that climate change is a geographical phenomenon and that climate change cannot be changed and is unpredictable. What can be done is water conservation and controlling water usage such as when community members have tap water, there should be time allocated for when the water is cut off in order to control the overuse of water. Another alternative is that each resident should have a small tank where the municipality can fill it up with water, so that when they run out of water and there is emergency, they will have clean water to drink and do other activities around the home.

The recommendation for objective four is evident when looking at the study that revealed the main alternatives of water which are mainly the river, rain, dams and water trucks. Even though these may seem to be enough, the community still faces challenges in accessing water and obtaining clean water. The recommendation for this object is to enhance the alternatives they already have. The first step is where the community needs to come together to clean the river and, as promised, the municipality would finish the project where they build a dam for the community and that dam will be able to feed the entire community. The issue that arises here is the water management plan that should be upgraded. There should be more funds given to the municipality so that everyone will have water. Communication is the key so that people can feel important and allows them to make necessary arrangements and prepare them for disruptions.

The recommendation for objective five revealed that community members made many suggestions for water scarcity. Water education is very important. Firstly, people should not rely on government water, but should be taught by the municipalities or anyone from the community who knows about water harvesting. This can save a lot of water through the reuse of water by using the water used for bathing to flush the toilet and using rainwater for agricultural purposes and maybe evening washing the cars. A connection of standpipes would be an alternative for the community, so that when people don't have water, they can use free water from the stand.

What the researcher noticed is that the main issue is the piping system which is why there is no water. The pipes that are installed are very small. If they could expand the pipes and make them bigger, more water with pressure can come in so that the entire community can have

water. Finally, while observing the area, the researcher observed that the pipes being installed are small. Therefore, they should install bigger pipes so that the whole community can get water.

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List of Appendices

Interview guide in English

Biographical information

- a. Gender: Male/Female
- b. Age:

Interview guide questionnaires

1. What role does water play in your daily life?

Probe: What value is attached to water from the roles explained?

2. How do you get water for all the daily needs of the home?

Probe: What are the common sources of water in your area?

What alternative sources of water are available to you?

3. What challenges do you experience in accessing water?

Probe: How do the challenges mentioned affect daily home living?

4. How do you think climate change has affected your access to water?

5. What do you think must be done to ensure that people in your area have adequate water to meet daily living?

6. Probe: Who has the responsibility of implementing your suggested solutions?

Interview guide in isiZulu

Umhlahlandlela wemibuzo

1. Yiliphi iqhaza elidlalwa ubukhona bamanzi empilweni yakho?
2. Kungabe iyiphi indlela oyisebenzisayo yokuthola amanzi ekhaya lakho?
 - Iyiphi indlela esetshenziswayo kulendawo ukuthola amanzi?
 - Iyiphi enye indlela otholala ngayo amanzi ngaphandle kwalena oyisebenzisayo?
3. Yiziphi izinkinga ohlangabezana nazo ekutholeni amanzi?
 - kungabe lezinkinga ozibalile ziyiphazamisa kanjani indlela yempilo nsukuzonke?
4. Kungabe ukuguquka kwesimo sezulu kukuthikameze kanjani ekutholeni amanzi ahlanzekile?
5. Kungabe yikuphi ocabanga ukuthi kungenziwa kulendawo ukuqinisekisa ukuthi wonke umuntu uyawathola amanzi ahlanzekile?
6. Kungabe ngubani okunguyena obhekelele ukuthi imibono yenu iyasetshenziswa ekuthathweni kwezinqumo zokuncishiswa kwezinkinga enibhekene nazo ngokulethwa kwamanzi ahlanzekile?

Questionnaires

1. What are the perceptions of people of Engonyaweni on the role water for their welfare?
2. What challenges do the people of Engonyameni experience in accessing water?
3. What are the people's perceptions of climate change and its effects on their welfare?
4. Which alternative sources of water do people in Engonyameni use to sustain their livelihoods?
5. What are people's suggestions in addressing water scarcity in Engonyameni?

CONSENT FORM IN ENGLISH

UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE
(HSSREC)

APPLICATION FOR ETHICS APPROVAL

For research with human participants

INFORMED CONSENT RESOURCE TEMPLATE

Researcher: Nomfundo Mshololo (216073226)

Department: School of Built and Development Studies

Contact details: 0839740158

E-mail: 216073226@stu.ukzn.ac.za

INFORMED CONSENT RESOURCE

Note to researchers: Notwithstanding the need for scientific and legal accuracy, every effort should be made to produce a consent document that is as linguistically clear and simple as possible, without omitting important details as outlined below. Certified translated versions will be required once the original version is approved.

Information Sheet and Consent to Participate in Research

Date: _____

Dear participant,

My name is Nomfundo Mshololo, a student in the School of Built and Environment Studies at Howard College University of KwaZulu-Natal, South Africa.

You are being invited to consider participating in a research on water scarcity and citizen welfare within the context of climate change in the case of the Engonyameni Village in KwaZulu-Natal.

The research aims at exploring how climate change has affected availability of water resources leading to water scarcity and how that has affected people's lives in the area of Enginyameni in KwaZulu-Natal, South Africa.

The study is will involve 12 participants from Engonyameni, invited specifically from Ezi Mpisini, eziNyathini and Yobe with each location inviting 4 participants. Furthermore, all interviews will be recorded to ensure easy use and the capturing of correct information as the participants speak.

All the interviews will be conducted at your convenience at times and venue that you will be comfortable with. Each interview is expected to last for 30 minutes. Furthermore, the research is not funded by any organisation, as such all expenses will be met by the researcher.

There is no risk or harm associated with your participation in this study and should you experience any discomfort during the course of interviewing, you have the right to refuse to respond to certain questions, to discontinue or to withdraw from the interview process.

I hope that your participation in this study will contribute to the knowledge about specific challenges people in KwaZulu-Natal are experiencing due to the scarcity of water. It is, therefore, expected that such information will contribute to an effective response from the municipality to address the situation accordingly.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number_____).

In the event of any problems or concerns/questions, you may contact the researcher at 0839740158 and the UKZN Humanities and Social Sciences Research Ethics Committee or the researcher's supervisor. The contact details are as follows:

HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001

Durban

4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557- Fax: 27 31 2604609

Email: HSSREC@ukzn.ac.za

Supervisor

Professor Oliver Mtapuri

School of Built Environment and Development Studies

University of KwaZulu-Natal, Howard College Campus,

Durban 4041,

Shepstone Building

South Africa.

Tel: 031 2601031

Email: Mtapurio@ukzn.ac.za

Your participation in this study is voluntary and you may choose to withdraw from the study at any point without attracting any penalty or loss of treatment.

Your participation will not attract any cost and similarly no incentives for participating in the study are provided. The interview will be kept strictly confidential. Your identity will be protected and anonymity will be maintained throughout the interview. Audio recordings and transcribed materials will be kept safe by the researcher for use in my dissertation without reference to your identity unless with your written consent. After the completion of the dissertation, audio recordings and transcripts will be kept with my supervisor and only destroyed after five years upon completion of the study and the awarding of the degree.

CONSENT

I _____ have been informed about the study entitled “Water scarcity and citizen welfare in a context of climate change in the case of the Engonyameni Village in KwaZulu Natal”.

I have read and understood the information sheet and I am aware that I can ask questions about the research and receive satisfactory answers,

I know that the participation is voluntary and that I can withdraw at any time without giving a reason.

I agree to take part in the interview and give my permission for the recording and quotes without my name being disclosed.

I understand that the data might be looked at by the researchers, supervisors or peers for reviewing without my identity being revealed.

If I have any further questions/concerns or queries related to the study, I understand that I may contact the researcher.

Nomfundo Mshololo

School of Built Environment and Development Studies

University of KwaZulu-Natal, Howard College Campus,

Durban 4041,

South Africa.

Tel: 0839740158

Email: 216073226@stu.ukzn.ac.za

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researcher, I may contact his supervisor.

Prof. Oliver Mtapuri

School of Built Environment and Development Studies

University of KwaZulu-Natal, Howard College Campus,

Durban 4041

Shepstone Building, South Africa.

Tel: (031) 260 1031

Email: mtapurio@ukzn.ac.za

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KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557 - Fax: 27 31 2604609

Email: HSSREC@ukzn.ac.za

I hereby provide consent to:

Audio-record my interview YES / NO

Signature of Participant:

Date:

Signature of Witness:

Date:

(Where applicable)

CONSENT FORM IN ISIZULU

UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC)

ISICELO SOKUGUNYAZWA UKWENZA UCWANINGO

LOKUSEBENZISANA NABANTU

ULWAZI NGEMVUMO

OKUZOSEBENZA NGEZIGABA

Bacwaningi: Kuyisidingo ukuthi konke kwenziwe ngobuchule noma ngokucophelela ngokomthetho, ukuthi konke okwenziwayo kube ulwazi olucacileyo ngokolimu olwaziwayo, futhi kungabi bikho ulwazi olubalulekile oluzokweqiwa kulokhu okungenzanzi. Ulwazi oluhunyushiwe luzodingeka emva kokuthi ulwazi lokuqala selugunyaziwe.

Ngezizathu ezithile ulwazi lungamukelwa ngokukhuluma kudingeke ukuthi kube nobufakazi noma ngezizathu ezithile Ulwazi ngemvumo yomuntu ngayedwa lunqatshwe noma lususwe ikomide(HSSREC).

Ulwazi oluqokethwe ngokuzibophezela ukuba yingxenye yocwaningo

Usuku:

Mhlali othandekayo:

Igama lami ngingu **Nomfundo Mshololo**, ngingumfundi waseNyuvesi yakwaZulu-Natali.

Uyamenywa ukuba ube ingxenye noma ukusebenzisana **Water scarcity and citizen welfare in a context of climate change in the case of Engonyameni village in KwaZulu Natal**

Lolucwaningo lizobuza abahlali abali shumi naMbili aphuma esigodini sase Ngonyameni, abahlali bakwaMaphumulo, Inwabi nakwaShozi, kulendawo ngizo buza imbuzo kubantu abane. Kubaluleki ukuba ngithathe yonke into eshiwo umhlali mase ngibhala njengoba injalo.

Ngizobuza abahlali buza imbuzo yonke uma bekhululekile, lembuzo izothatha imzuzu ema shumi amathathu. Kubalulekile ukuth abahlali bazi ukuth angeke bakhokhelwe ukwenza lolu cwaningo.

Kubalulekile ukwazi ukuthi uma ungazizwa kahle phakathi ko cwaningo, uvumelekile ukuth uyeke noma kungathiwa awuqedile ukubuzwa imibuzo.

Lolucwaningo selubhekwe abantu abaphezulu, abase Nyuvesi yakwaZulu-Natali Humanities ne Social Science Research Ethics Committee (nombolo:.....).

Uma kuba nenkinga inombolo yomfundo ithi: 0839740158 noma ungathinta iNyuvesi yakwa Zulu-Natali Humanities & Social Sciences Research Ethics Commitess noma uthinte u cwaningo umphathi omkhulu, ungamthinta la:

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My Supervisor

Professor Oliver Mtapuri

School of Built Environment and Development Studies

University of KwaZulu-Natal, Howard College Campus,

Durban 4041

Shepstone Building

South Africa.

Tel: 031 2601013

Email: Mtapurio@ukzn.ac.za

Ukusebenzisana nathi kulesisifundo awuphoqelekile, unalo ilungelo lokushintsha umqondo noma ngasiphi isikhathi uhoxe. Ngasesayidini lethu njengoba senza lolucwaningo asinawo umuhlombulo esizowunikezela kuwe kodwa singakunika uma sesiqedile ukwenza ucwaningo iphepha ukuze ulifunde noma ubeke umbono ngalo.

Umcwaningi akukho lapho ezothatha khona igama lakho futhi konke ozobe usitshela khona akukho lapho oyokubona khona ukuthi uwena. Konke ozokutshela umcwaningi kuzogcinwa kahle kukhiyelwe ekhabetheni. Esizobe sikugcine kwicomputha nakho kuvikelekile ngoba kuba nenombolo yemfihlo uma uyivula. Emuva kweminyaka emihlanu siyokushabalalisa lolulwazi osinike lona.

ISIVUMELWANO (gcwalisa njengoba kudingeka)

Mina.....(igama) ngitsheliwe mayelana no cwaningo: ucwaningo ukuqonda nokuphela kwamanzi nanokuthi aletha umphumelo onjani emphakathini wase Ngonyameni ngase Mlazi, KwaZulu.

Ngiyabonga ukuthi uvume ukuba yingxenye yalolu cwaningo. Imibuzo izoba inkulumo nje esuselwa emibuzweni ebhalwe phansi. Inhloso yemibuzo ukuthi kube nengxoxo phakathi kwethu,

Ngizocela ukhululeke ukuzwakalisa imibono yakho ngokuphelele. Imibuzo izothatha isikhathi esingama shumi amathathi. Ngicela imvumo yokuba ngiqophe inkulumo yethu. Engikutholayo kulolu daba esikhuluma ngalo ngizokusebenzisa ukubhala umbiko.

Ngaphambi kokuba siqale ngithanda ukugcizelela ukuthi ukuvuma kwakho ube ingxenye yocwaningo kukuwena. Esikukhulumayo kuphakathi kwethu, igama neminingwane yakho ngeke idalulwe.

Ayikho inkokhelo noma ingozi ekubeni ingxenye yalolu phenyo. Ungahoxa noma inini futhi uvumelekile ukungaphenduli enye yemibuzo uma ungakhululekile. Ungabuza noma imiphi imbuzo noma inini.

Ngicela usayine isivumelwano ngenzansi.

Mina (igama) ngiyakuqinikisekisa ukuthi ngiyifundile futhi ngayiqondisisa imibandela ethulwa nguNomfundo Mshololo mayelana nocwaningo

Iwakhe. Nginalo ithuba lokubuza imibuzo futhi ngiyagculiseka ngezimpendulo ezibekiwe. Nginalo ulwazi lokukhetha ukuba inkulumo iqoshwe.

Nginalo ulwazi ukuthi ngingahoxa noma inini

Ngियाqonda ukuthi awukho umnikelo engizowuthola kulolu cwaningo

Uma unemibuzo, thumelela imiyalezo noma izinkinga ku

Nomfundo Mshololo

ngaphansi kwesikole seBuilt Environment ne Development Studies

eNyuvesi yakwaZulu-Natali, Howard College Campus

Durban 4041,

South Africa.

Inombolo: 0830740158

Email: 216073226@stu.ukzn.ac.za

Lolu cwaningo lusingethwe nguProfessor Oliver Mtapuri ngaphansi kwesikole seBuilt Environment and Development Studies eNyuvesi yakwaZulu-Natali lapho ngifunda khona. Yimi ozobe enza ucwaningo, uma unemibuzo ungabuza:

Isikole seBuilt Environment and Development Studies, eNyuvesi yakwaZulu Natali, Howard College, eThekwini. Imininigwane yami ukuze ngithinteke ungathumela umyalezo wombani kuleli kheli: 216073226@stu.ukzn.ac.za.

Uma udinga ulwazi oludlulele ungathinta uProfessor Oliver Mtapuri kuleli kheli: Mtapurio@ukzn.ac.za. Inombolo yocingo: ((031) 2601013.

Noma ungathintana nehhovisi lakwa HSSREC Research Office:

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Okwengeziwe ngemvumo okudingekayo

Ngiyanikezela ngemvumo ukuthi

Ukusebenzisa isiqophamazwi / ingxoxo yedlanzana labantu AKUKHO/YEBO/CHA

Sayina ukuzibophezela

Usuku

Kusayina ufakazi uma ekhona

Usuku

Kusayina ochazayo uma ekhona

Usuku