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Investigating the Social Impact of Water Shortage on the Livelihoods of Rural Settlements: The Case Study of KwaNonzila in Mkhambathini Municipality

By

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Masters of Housing

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DECLARATION – PLAGIARISM

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DEDICATION

This dissertation is dedicated to my parents Buyisile and Bonginkosi Kheswa for their love and support throughout my academic life.

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LIST OF ACRONYMS

AIDS	: Acquired Immunodeficiency Syndrome
BHN	: Basic Human Needs
CMAs	: Catchment Management Agencies
DEA	: Department of Environmental Affairs
DWA	: Department of Water Affairs
DWAF	: Department of Water Affairs and Forestry
DWS	: Department of Water and Sanitation
FBW	: Free Basic Water
HIV	: Human Immunodeficiency Virus
IWRM	: Integrated Water Resource Management
ILO	: International Labour Organization
LM	: Local Municipality
MDG	: Millennium Development Goal
MM	: Mkhambathini Municipality
NEMA	: National Environmental Management Act
NWA	: National Water Act
RDP	: Reconstruction Development Programme
SIA	: Social Impact Assessment
SDG	: Sustainable Development Goals
UN	: United Nations
UNDP	: United Nations Development Programme.
UNW	: United Nations Water
WHO	: World Health Organization
WSA	: Water Service Authority
WSAs	: Water Source Areas

ABSTRACT

The provision of water is a matter of life and death to humans since water shortages may increase incidences of social injustice, as well as have adverse effects on people's standard of living. In South Africa, water is regarded as a constitutional right. Therefore, the government has to put measures in place to ensure that everyone has access to at least a basic level of water service.

The study aim was to assess the impact of water shortages on the livelihood of people living in a rural settlement. The hypothesis underpinning the study read as follows: "Water shortages in rural areas deprive the people of social justice and quality of life leading to poor livelihood strategies." The theoretical framework used for the study was the Basic Human Needs Approach and Systems Theory. These theories were used as lenses for the study.

The study was conducted in the rural settlement of KwaNonzila, in the Maqonqo area under the Mkhambathini Municipality in the Province of KwaZulu-Natal.

The study adopted a qualitative methodology comprising, questionnaires, an interview and observation. Thirty households were selected from a population of 255 households using random sampling. The head of each household or their spouse completed a semi-structured questionnaire. The respondents could be of either gender and had to be over the age of 18. Purposive sampling was used to select a respondent for an in-depth interview. In this regard a water and sanitation official was purposively selected for their expertise in the subject area. Observation was conducted by the researcher and was recorded in the form of photographs.

Findings revealed that the main cause of water shortages in KwaNonzila was due to the lack of infrastructure and the subsequent lack of supply of water. Given this, the community of KwaNonzila is deprived of social justice and a good standard of living. In accordance with the findings, the study recommended that the local municipality should increase the number of water tanks that supply the community with water. In

addition, Umgeni Water needs to upgrade the pipe that supplies the whole area of Maqonqo from one mega litre per day to 2,5 mega litres per day.

In conclusion, the best way to rectify the water shortage issue would be to have a multi-disciplinary approach that would address the current shortages and impact on the future as well. Therefore, local government and Umgeni Water should develop a solution that would not only be a short-term one but long-term as well.

Chapter One: Introduction to the Study

1.1 Introduction

The challenge of water shortages faced by developing countries contributes to the inability of people to secure safe water to meet their basic needs. According to the United Nations (2005), there is a huge number of children who continue to die every year due to preventable water-borne diseases and the scarcity of water.

Water shortage is a global phenomenon that has existed for many years. There are many causes of water shortages that are both natural and man-made. Natural causes include drought, climate change, surface runoff, earthquakes, evaporation and transpiration (Nkuna, 2012). Human causes include disparity in water supply, illegal tap connections, contamination of existing water sources, leaking water pipes, urbanization as well as population growth. However, even before water shortage became a phenomenon of international concern, certain parts of countries around the world, especially in Africa, have never received a water supply (United Nations, 2005). Globally, water is viewed as a basic need that should be provided to people. In the South African context, Section 27(1) of the Constitution states that every citizen has the right to sufficient water. Furthermore, it also states that the government has to place equitable legislative and other measures, within its resources, to achieve the realization of this important right (Constitution, 1996).

According to Mothetha, Nkuna and Mema (2014) the majority of South Africans that reside in rural areas are experiencing a problem in accessing a quality water supply because they cannot afford to pay for the municipal service. Conversely, the Department of Water Affairs (DWA) has assigned to the water service provider the mission of certifying that all the citizens of South Africa, including the poor households who cannot afford the water service, have access to it. People can have access to the basic level of the service, which is defined as 25L per person, per day at no cost (Mothetha et al, 2014).

The Department of Provincial and Local Government (DPLG) (2007:67) states that “municipalities must spend funds on the provision of infrastructure necessary to supply

25L of potable water per person per day supplied within 200 metres of a household and a minimum flow of 10L per minute (in the case of communal water points) or 6 000L of potable water supplied per formal connection per month (in the case of yard or house connections) or to upgrade and build new infrastructure up to a basic level of service in existing formal settlements.”

The concept of disparity in water supply simply means that certain parts of a country are receiving a water supply whereas others are not. In the South African context, it is usually the urban areas which receive a supply of water while people living in rural areas either seldom receive water or do not receive water at all. In most rural areas in South Africa, residents have faced a problem or challenge when it comes to accessing water (Nkuna, 2012). For example, they have to travel long distances in order to acquire sufficient and safe drinking water. In many cases, however, the water collected is from an unhealthy water source since there is no proper (official) service provider. In cases where there is an official service provider, the water is often inadequate in terms of quality (Mothetha et al, 2014).

In South Africa, there are a number of legal frameworks that have been put in place to support and give proper function to the delivery of water to all the citizens of the country (see Chapter Four). When looking at the social aspects of a community or a person, one has to look at various aspects of life. These aspects include health, knowledge and skills, safety and security, paid work, human rights, culture and identity, economic standard of living, social connectedness and the environment they live in.

The study examined the social impact of water shortages on the community of KwaNonzila. It is important to highlight what social means and how it links to water. The social aspect is taken from the four pillars of sustainable development, which are economic, environmental, social and institutional. While the study acknowledged the other pillars, the focus was placed on the social pillar of sustainable development.

1.2 Problem Statement

Water shortages are strictly linked to poverty, especially in rural areas and this is because rural settlements use water for a wide range of purposes such as domestic

use, home gardens, vegetation and livestock. Thus, water shortages affect both the rural household and the rural economy (United Nations, 2006).

Most people in rural settlements depend on subsistence farming in order to feed their families. When there is a water shortage, this is hard to achieve as they can no longer water and maintain the health of their home gardens, vegetation and livestock (United Nations, 2006). In the case of rural people who engage in commercial farming, the subsequent utilisation of water from unreliable sources can result in produce dangerous to the health of the consumer and can also result in the farmers getting into trouble with the law. Water shortages and associated problems thus make it hard for the farmers to continue supplying food to the people, and this forces them to close down their businesses thereby causing poverty for their households and the consumers. Furthermore, as pointed out above, most people depend on subsistence farming as a way of providing for their households. It becomes hard to maintain feeding their families when there are continual water shortages (Nkuna, 2012).

Thus, water plays an essential role when it comes to human settlements. It is about what people can do, what they can become and the freedom they have to exercise choices in their lives. Water is evident in every aspect of human development (Barker and Koppen, 1999). When people do not have access to clean water at home or when they lack access to water as a productive resource, their choices and freedom are inhibited by illness, poverty and vulnerability. Water gives life to everything, including human development and human freedom (United Nations, 2006).

Barker and Koppen (1999) states that the quantity of water is even more important than the quality in terms of its impact on human health. However, water scarcity leads to declining water quality and pollution which has a particularly negative effect on the rural poor. Many people in rural areas who live in developing countries are forced to drink water that is unfit for human consumption. They suffer from a range of skin and internal diseases and other health problems (Barker and Koppen, 1999). Water shortages force people living in the rural areas to carry heavy pots of water and to often travel long distances every day to meet household needs. Water shortages add to the adversity of farmers who lose their land because of lack of irrigation water. Shortages also, as mentioned, lead to increasing health problems due to water

pollution and to a rise in incidents of water-borne diseases. Water and sanitation go hand-in-hand and not having access to sanitation means that people are forced to defecate in fields, ditches and buckets. This can lead to severe public health problems (Nkuna, 2012).

In the context of pursuing local economic development, it is very hard to start and grow businesses in areas where there are shortages of water. For example, brick making in rural settlements is a common business that people engage in and water is in high demand to support such a business venture (Nkuna, 2012). The success of a brick making business relies on sustainable water sources and as a result some people involved in brick making end up setting up their businesses next to river streams, which can be very dangerous. Many rural settlements do not have tarred roads due to lack of access to water which is required for building such roads. This means that if a person owns a business in the community, the delivery of goods from the warehouse or suppliers is difficult and takes longer due to improper road infrastructure (Mothetha et al, 2014) and this might well result in the failure of the business.

It is evident from the above that water is a crucial resource and water shortages can have many negative ramifications for rural people.

1.3 Aim of the Study

The aim of the study was to assess the social impact of water shortages on the livelihoods of people living in the rural settlement of KwaNonzila.

1.4 Objectives of the Study

- 1.4.1 To assess how the settlement of KwaNonzila functions with the problem of water shortages.
- 1.4.2 To determine the causes of water shortages in the settlement of KwaNonzila.
- 1.4.3 To investigate the alternative water sources that can be applied in the settlement of KwaNonzila.
- 1.4.4 To assess the extent to which water shortages affect livelihoods in the settlement of KwaNonzila.

- 1.4.5 To identify the challenges faced by the role players in providing water to the settlement of KwaNonzila.

1.5 Main Research Question

What is the social impact that water shortages have on the livelihoods of the people of KwaNonzila settlement?

1.6 Subsidiary Questions

- 1.1.1 How does the settlement of KwaNonzila function with the problem of water shortages?
- 1.1.2 What are the causes of water shortages in the settlement of KwaNonzila?
- 1.1.3 What are the alternative water sources that can be applied in the settlement of KwaNonzila?
- 1.1.4 To what extent do water shortages affect livelihoods in the settlement of KwaNonzila?
- 1.1.5 What are the challenges that are faced by the role players in providing water to the settlement of KwaNonzila?

1.7 Hypothesis

Water shortages in rural areas deprive the people of social justice and quality of life leading to poor livelihood strategies.

1.8 Justification for the study

This research study investigates the social impact of water shortage on the livelihoods of rural settlements. The findings of the study, could assist in illustrating the effects of water shortage on the lives of rural settlements. In addition, show the importance of water for humans and their surrounds. It could also assist local government to formulate strategies to provide water services in rural settlements.

1.9 Dissertation Outline

The study is broken down into seven chapters with each focusing on a specific theme. The chapters, in summary, are as follows:

- **Chapter One: Introduction**, this introductory chapter outlines the research topic, problem statement, the study's objectives, and the focal research

question, and subsidiary questions, followed by the hypothesis. It also presents the justification for the study and its limitations.

- **Chapter Two: Conceptual and Theoretical Framework** comprises, as the heading indicates, a discussion of the conceptual and theoretical frameworks informing the study.
- **Chapter Three: Literature Review and Legislative Framework** consists of two sections: The first, the literature review, explores relevant literature on the topic of water shortages in rural communities both locally and internationally. Secondly it examines the legislation and policies in place in South Africa with regards to water supply and management.
- **Chapter Four: Research Methodology** consists of a discussion of the research methodology employed to address the research problem.
- **Chapter Five: Historical background of the study area and Data presentation, interpretation and analysis** provides an historical overview of the KwaNonzila settlement and by so doing reveals factors contributing to the current state of the settlement
The analyses of the data collected through questionnaires administered and the interview conducted. It presents and discusses the findings in the light of the relevant literature.
- **Chapter Six: Summary of Findings, Recommendations and Conclusion** is the final chapter and provides an overall summary of the key findings as revealed in Chapter Six and recommends possible ways in which a rural settlement such as KwaNonzila can overcome water shortages. The chapter ends with a conclusion in which a multi-disciplinary approach to the problem is called for.

1.10 Summary

In this introductory chapter the topic of the study was provided, namely, the social impact of water shortage on the livelihoods of rural settlements, a case study of KwaNonzila. The problem statement which provided insight as to why the study was of interest, was outlined. The aim of the study and the objectives and associated research questions to achieve the aim were listed. A hypothesis was provided and, lastly, an outline of the remainder of the study by chapter, was presented.

Chapter Two: Conceptual and Theoretical Framework

3.1 Introduction

This chapter presents the conceptual and theoretical framework employed for the study. The chapter is divided into two sections: The first section presents the conceptual framework in which important concepts used in the study are defined and linked. This will provide an understanding of the various phenomena under investigation in the study. These concepts are water shortage, rural settlement and social impact. Understanding these concepts is critical in terms of getting a better understanding of the outcomes the study sought to achieve. The second section of this chapter consists of the theoretical framework underpinning the study. The study was informed by two theories, namely, the Basic Human Needs (BHN) Approach and Systems Theory. Their relevance to the study will be unpacked by tracing their origin along with their underlying principles.

3.2 Conceptual Framework

As noted above, in order for one to get a full understanding of the study, it is very important to define the main concepts that were used.

3.2.1 Water Shortage

The United Nations (2006) states that water shortage can be defined as a condition whereby water sources become insufficient for the community. This could be due to factors such as climate change and population growth amongst others. This situation may lead to insufficient water for family consumption and the community at large.

Water is fundamental to life. It is a part of the physiological process of nutrition and waste removal from cells of every single living thing, including people (Vandas, Winter and Battaglin, 2002). Furthermore, it is one of the controlling components for biodiversity and the dissemination of earth's changed ecosystems, communities of creatures, plants and their interrelated physical and compound environment. In terrestrial ecosystems, organisms have adapted to large variations in water availability (Vandas, Winter and Battaglin, 2002).

Aquatic ecosystems, such as wetlands, streams and lakes are especially sensitive to changes in water quality and quantity (Alley, Reilly and Franke, 1999). In addition,

these ecosystems receive sediment, nutrients and toxic substances that are produced or used within their watershed, the land area that drains water to a stream, river, lake or ocean. Thus, an aquatic ecosystem is indicative of the conditions of the terrestrial habitat in its watershed. Wetland ecosystems provide habitat to a great variety of birds, plants and animals. These transitional areas between dry and wet habitats help reduce floods and decrease water pollution (United Nations Development Programme (UNDP), 2006).

Water is fundamental for most activities of human culture. Both monetary and social development and the support of human well-being are totally reliant upon prepared access to sufficient water supplies. All social orders require water for essential survival and for financial advancement (UNDP, 2006). However, as outlined above, it is also important to acknowledge the importance of water in nature and the ecosystem. Acknowledgement helps in awareness of the role water plays in nature, which in turn helps sustain the environment and the livelihoods of people who depend on nature to survive (Alley, Reilly and Franke, 1999).

According to the United Nations Water (UN-W) (2012) nature alone cannot guarantee water security for people, that is, access to the clean, safe water they need for health, livelihoods and production, and where risks from drought and flooding are manageable. Water security is based on the contributions of both nature and human ingenuity. In many parts of the world, the livelihoods of the poorest are directly linked to water resources. These livelihoods include farming, household supply, small scale industry and livestock care (UN-W, 2012).

According UN-W (2012) there are many benefits that humans receive from natural ecosystems for water purposes. These ecosystems include aquifers, soils and lakes. Furthermore, wetlands provide water storage, rivers provide conveyance, transportation and floodplains, and wetlands lower flood peaks in downstream cities (UN-W, 2012). In addition, coral reefs and barrier islands protect the coast against storms and inundation. Nature recycles and absorbs excess nutrients and water pollution. All of these services from nature contribute to water security (UN-W, 2012). Nature thus provides critical water infrastructure through these services (UN-W, 2012). This is natural infrastructure and complements, enhances or replaces conventionally

built infrastructure such as reservoirs, dams and canals. Kunset (2002) states that natural infrastructures provided by ecosystems are usually highly cost-effective and their restoration can provide attractive returns on investment in social and economic terms.

It is essential to note that water is a renewable resource. However, it is not always available when or where it is needed and it may not be of suitable quality for intended uses (Kunset, 2002). As far as the study was concerned, water shortage refers to the settlement or community of KwaNonzila, which does not get an adequate water supply. This leads to the people in the community experiencing a water shortage which can be attributed, amongst other factors, to poor policy implementation by stakeholders involved in providing water to the community.

3.2.2 Rural Settlement

When it comes to rural settlement, it is important to first define what a settlement is. According to Green and Argue (2012) a settlement refers to a distinct human community in its physical, socio-economic and environmental totality. Moreover, it requires the provisioning of services such as engineering and social services. Settlements can be ordered by size and other factors to define a settlement hierarchy, ranging from city regions to hamlets or dispersed rural settlements (Green and Argue, 2012).

A rural settlement refers to a group of people living together in a rural area (Landingin and Mutonhori, 2011). Furthermore, rural settlements are sparsely settled places away from the influence of urban areas and cities. People in rural areas live in villages, farms and isolated dwellings. Many rural areas have settlements characterized by agricultural activities (George, 2008). There are four types of rural settlements, namely, clustered, semi-clustered, hamleted and dispersed. Each are elaborated on below.

3.2.2.1 Clustered Settlement

According to Green and Argue (2012) a clustered rural settlement is a compact or closely built up area of houses. Furthermore, in this type of settlement the general living area is distinct and separated from the surrounding farms, barns and pastures.

Therefore, in such settlements, all the dwellings are concentrated in one central site (Green and Argue 2012).

3.2.2.2 Semi-clustered Settlement

Nag states (1990) that semi-clustered settlements may result from the tendency of clustering in a restricted area of a dispersed settlement. Moreover, such a pattern may also result from segregation or fragmentation of a large compact village. Hence, one or more sections of the village society choose or are forced to live a little away from the main cluster or village (Nag, 1990). In such cases, generally, the land-owning and dominant community occupies the central part of the main village, whereas people of the lower strata of society and menial workers settle on the outer sides of the village.

3.2.2.3 Hamleted Settlement

Hamleted settlements are types of settlements which are fragmented into several small units. The main settlement does not have much influence on the other units (Sarker, 2010). Hence, very often the original site is not easily distinguishable and these hamlets are often spread over the area with intervening fields. This segregation is often influenced by social and ethnic factors (Sarker, 2010).

3.2.2.4 Dispersed Settlement

According to Sarker (2010) a dispersed settlement is characterized by units of a small size, which may consist of a single house to a small group of houses varying from two to seven huts. Therefore, in this type of settlement, hamlets are scattered over a vast area and do not have any specific pattern (Sarker, 2010).

In South Africa, most rural settlements are ruled by traditional leaders known as chiefs. Furthermore, they are responsible for the planning and allocating of the land in the areas (Nag, 1990). For the purpose of the study, the definition of rural settlement refers to the community (or settlement) of KwaNonzila, which is located in a rural area in the District of uMgungundlovu. In addition, it is in the local municipality of Mkhambathini. In terms of the various types of settlements outlined above, KwaNonzila would be considered a semi-clustered settlement.

3.2.3 Social Impact

According to the Centre for Good Governance (2006) social impact is the consequences to human populations of any public or private actions that change the ways in which people live, work, play, relate to one another and organize to meet their needs. In addition, it refers to how people generally cope as members of society or community.

Social impact is determined via a social impact assessment (SIA). SIA is characterized as an identification, investigation and assessment of the social impact resulting from a particular event (Goldman, 2000). A social impact, in turn, is a noteworthy enhancement or deterioration in people's well-being, or a critical improvement change in an aspect of community concern. SIA is a technique that analyzes what impact activities may have on the social parts of the environment (Goldman, 2000). It includes portraying the current condition of such parts of the environment, and determining how they change if a given activity or option is executed. Furthermore, SIA creates methods for mitigating changes that are probably going to be viewed as negative from the perspective of the affected population. SIAs are identified with the more extensive procedures of social change and are vital in planning political and bureaucratic structures (Goldman, 2000).

Becker and Vanclay (2003) state that a convenient way of conceptualizing social impact is in terms of changes to one or more of the following:

- People's way of life, how they live, work, play and interact with one another on a day-to-day basis.
- Their culture, shared beliefs, customs, values and language.
- Their community, cohesion, stability, character, services and facilities.
- Their environment, the quality of air and water they use, the availability and quality of the food they eat, level of hazards, the adequacy of sanitation, their safety and access to, and control of, resources.
- Their political system, the extent to which they are able to participate in decisions that affect their lives and the level democratization that is taking place.

There is a little uncertainty that social impact analyses are not scientifically or politically neutral undertakings. They are, by definition, orientated towards providing a critical platform from which to engage development procedures (Becker and Vanclay, 2003). One of the major sources of SIA information is surveys (either questionnaire or interview-based). As noted in the previous chapter, the researcher used both these tools to gather data for the study.

For the purpose of the study, social impact was defined as the effect water shortages have on the social aspects of the people in the community of KwaNonzila. Such shortages affect the livelihoods of the people in the community in terms of how they live, earn a living, maintain their health and have sustainable lives. The term social impact thus referred to how water shortages affect the community.

3.3 Theoretical Framework

As noted above the study was informed by two theories, the Basic Human Needs (BHN) Approach and Systems Theory. Both are discussed below.

3.3.1 The Basic Human Needs Approach

The BHN Approach was introduced by the International Labour Organization's World Employment Conference in 1976 (Streeten, 1979). Paul Streeten's book (*First Things First*) with the sanction of the World Bank, gave a comprehensive proclamation of the fundamental BHN Approach (Jolly, 1976). Furthermore, the book depicted the yearning of those utilizing the approach "to halve world poverty by the year 2000" (Reader, 2006:67). The BHN Approach can be defined as "One of the major approaches to the measurement of absolute poverty in developing countries. It attempts to define absolute minimum resources necessary for long-term, physical well-being usually in terms of consumption of goods" (Jolly, 1976:25).

Streeten, Burki, Haq, Hicks and Stewart (1981) state that the BHN Approach proceeded by identifying a set of basic human needs, then designing political systems to meet those needs. Moreover, the approach focused on identifying and supplying resources that are universally needed such as water, food and housing (Reader, 2006). The BHN Approach seeks to identify what people need in order to survive and

have a sustainable life. It has based its emphasis more on what people consume in order to have a good standard of living. The BHN Approach moves development emphasis from a singular concern with rearranging the world economy to that of restructuring the domestic economy towards a new internal economic order. In addition, it aims at the eradication of poverty and social injustices (Streeten, 1979).

According to Streeten et al (1981) one of the interpretations that the BHN Approach fell under was that it was revolutionary. This was due to the fact that it called for the radical redistribution, not only of income and assets, but also of power and for the political mobilization of the poor themselves. The approach embraced the components of previous strategies and approaches that aimed at making the poor more productive (Streeten et al, 1981). These included rural development, alleviation of urban poverty, creation of employment through small-scale industries and redistribution with growth. The BHN Approach introduced a new element that shifted towards social services, households, their linkages to help and mobilize the poor and an emphasis on “so-called new-style projects in nutrition, health, and education” (Streeten et al, 1981, 96). This approach seeks to address absolute poverty not by creating job opportunities or giving people money but by providing resources and facilities for the people in order that they may receive basic services. A perfect example of this is providing educational facilities for poor children who cannot afford to pay school fees in schools that already exist (Crosswell, 1978).

The BHN Approach often aims to obtain additional resources to help a marginalized group obtain access to services. These basic needs include not only the essentials to physical survival but also access to services, employment and decision-making to provide a real basis for participation (Streeten, 1979). The two elements of the BHN Approach are: “Firstly, they include a certain minimum requirement of a family for private consumption: adequate food, shelter and clothing as well as certain household equipment and furniture. Secondly, they include essential resources provided by and for the community at large, such as safe drinking water, sanitation, public transport and health, education and cultural facilities” (Crosswell, 1978:45).

The BHN Approach tends to make more resources available domestically. This is done for three reasons: The first reason is that the composition of output needed to satisfy

basic needs is likely to be produced using more labour-intensive input (Streeten et al, 1981). An example of this would be countries with underemployed labour; this will raise not only employment but also production. The second reason is that it focuses on combatting malnutrition, disease and illiteracy as their eradication will not only sustain life and improve its quality but also improve the quality of the labour force. The final reason is that a BHN Approach that is based on participation will mobilize local resources in many ways (Streeten et al, 1981). The local community can support the programmes and local materials can be used for projects. In addition, a common commitment increases incentives for higher production.

According to Crosswell (1978) development programmes following the BHN Approach do not invest in economically productive activities. However, to help a society carry its own weight in the future, development programmes rather focus on allowing the society to consume just enough to rise above the poverty line and meet its basic needs. Streeten et al (1981) state that one merit of the basic needs concept is that it provides a powerful basis for organizing, analyzing and policy-making. Furthermore, it can mobilize political support and is capable of integrating thought and action in different fields.

Water is regarded as a basic need for human survival. The Constitution of South Africa clearly articulates this in Section 27 (1) (b) of Chapter 2 which states that everyone has the right, amongst other rights, to have access to sufficient food and water (Constitution,1996). Furthermore, the Constitution places an emphasis on the importance of water in the lives of human beings. In South Africa, it is the role of the national government to supply water to every community through local government.

In most developing countries, there are more water supplies in urban settlements compared to rural settlements. However, in rural settlements, people depend more on water as an element to achieve a sustainable livelihood. This is due to the fact that they depend on agricultural activities and/or their livestock in order to feed their families. In terms of agriculture, they use commercial and subsistence farming to feed their families and create a sustainable way of living for both the present and future generation.

3.3.1.1 Underlying Principles of the Basic Human Needs Approach

One of the underlying principles of the BHN Approach is meeting the basic human needs of the poorest people in the world. Furthermore, the approach targets marginalized people or communities in order to enable them to have access to basic services (Streeten et al, 1981). According to the principle of basic human needs, access to basic services and needs can be accomplished through benevolent or charitable activities (Ghai and Alftan, 1977). One of the ways this can be achieved is through providing resources within the communities of the targeted groups. Moreover, the BHN Approach is based on the consumption of goods or services, rather than empowering the marginalized group of people. Examples of these services include providing schools, clinics and infrastructure within the communities.

Another principle of the needs approach is meeting the rights of the people. This principle seeks to fulfill the rights of people that are marginalized. The idea of human rights and basic human needs are firmly associated (Smith and Van den Anker, 2005). However, while not all needs relate to rights and not all rights relate to needs, there is a synergy between human rights and the meeting of basic needs. Although the South African Constitution stipulates that everyone has a right to have access to water, many people, especially those in rural settlements, do not have access to clean water and sanitation (Constitution, 1996).

However, there is a contrast between the BHN Approach and the human rights approach. The BHN theory frequently aims to obtain additional resources to enable marginalized communities to get access to basic services (Streeten et al, 1981). On the other hand, the human rights approach calls for existing community resources to be shared equally, so that everybody receives similar services (Boesen and Martin, 2007). Moreover, helping individuals to declare their rights in this way frequently implies inclusion in political discussion. While a BHN Approach does not really perceive adamant or historical marginalization, a human rights approach points specifically at eliminating such marginalization.

Other principles of the BHN Approach are political and economic changes. When the BHN Approach is viewed as a political process, the context within which this is to be carried out becomes very important. According to Ghai and Alftan (1977:23)

“Satisfaction of material needs can never be accepted without regard to the system and means by which it is brought about.” The political and economic systems are as important as the state in realizing the basic needs objectives (Burki and Haq, 1981). This is because the country studies of the World Bank convinced the analysts that reallocation of resources towards alleviation of poverty and meeting basic needs involves considerable structural changes in the political and economic balance of power within the societies (Burki and Haq, 1981).

This principle of political change is regarded as revolutionary because “it calls for radical redistribution not only of income and assets but also of power and for political mobilization of the poor themselves” (Streeten, 1981:26). Sameter (1984) argues that third world governments would not adopt the BHN Approach. However, he alludes that they may do so in principle to please the people and the international community but not do so in practice.

It is comprehended by the researcher that the BHN Approach advocates for government intervention in meeting the poor's basic needs. In the study, the researcher used the approach as an unreliable method in assessing the relationship between the provision of potable water and sanitation in the settlement of KwaNonzila to promote sustainable livelihood strategies to the people in the community.

The manner in which the BHN Approach identifies with the study is in the provision of basic services. In the study it was hypothesized that the KwaNonzila community, with the provision of water to the settlement, would have the capacity to create sustainable livelihoods for themselves. The approach informed the study by underlining the need for government to supply water services to the poor in rural settlements in the form of the provision of basic services and the promotion of sustainable livelihood strategies. Natural factors that contribute to water shortage were also acknowledged and taken into consideration.

3.3.2 Systems Theory

Systems Theory was first introduced by Ludwig von Bertalanffy in his book *General System Theory* which was published in 1951. Its publication coincided with the theory

beginning to take on the form of a discipline. The theory gained immense popularity and immediate success in its early years of introduction to the world of science.

In order for one to fully understand the theory, the term system has to be defined. According to Mcloughlin (1969) a system is a “complex whole, a set of connected things or parts, an organised body of material or immaterial things and as a group of objects related or interacting so as to form a unity.” According to Gregory (1999), a system is any set of distinct parts that interact to form a complex whole. Thus, a system should be viewed as a whole, not a collection of separate parts. The theory seeks to solve problems that exist within organizations, groups and governmental structures which align with each other.

Gregory (1999) states that Systems Theory entails the interdependent relationship between the parts of an organization. Systems Theory contributes to investigating the various characteristics of physical, social and behavioural phenomena. The theory identifies the principles common to all systems, the most important of which are wholeness, hierarchy, self-regulation and adaptability (Jenkins, 1967). It is necessary to look at the inputs in the social system, the way in which these inputs are processed by the society, and the outputs that are produced. The system theory solves problems within firms and in local and national government (Jenkins, 1967).

Systems Theory shows the fundamental changes needed in the way that both individuals and organizations go about doing their work. Furthermore, it demands that problem-solving needs be carried out on a more interdisciplinary basis and that many firms and organizations need to be organized in a more integrated way than at present (Gregory, 1999).

Systems Theory takes the approach of looking at situations from a holistic perspective rather than in parts. Success has always depended on holistic rather than one-sided thinking. Jackson (2002) argues that Systems Theory can be seen as a reaction to the failure of natural science when confronted with complex, real-world problems set in social systems. Systems Theory supports using "holism" rather than reductionism in such situations (Reynolds and Holwell, 2010). Moreover, holism does not seek to

break down complex problem situations into their parts in order to study them and intervene in them. Rather, it respects the profound interconnectedness of the parts and concentrates on the relationships between them and how these often give rise to surprising outcomes. Contemporary Systems Theory also respects the different "appreciative systems" that individuals bring to bear in viewing the world and making value judgements about particular situations (Jackson, 2002). In order to contribute to a "holistic" appreciation of the problem situation at hand, different perspectives on its nature and possible resolution should be encouraged. Greater creativity will result and mutual understanding might be achieved about a way forward as appreciative systems become more shared (Jackson, 2002).

Systems Theory deals with grasping the properties of complete integrated systems and the relations of their elements. It represents a broad view, taking all aspects into account and concentrating on interactions between different parts of the problem (Everard, 2017). It is seen as a paradigm that recognizes that systems come in different scales – organisms, ecosystems, societies and organizations. According to Everard (2017) Systems Theory is concerned with understanding the properties of integrated systems, looking beyond component parts in isolation to consider their relationships and the functions of the whole. It is currently incorporated into a variety of fields including environmental management, governance and pedagogical.

In the application of Systems Theory in a realistic environment where there is a problem, the interdisciplinary holistic nature of the systems approach is emphasised, especially in the case where the number of affected parties' increases (Reynolds and Holwell, 2010). In the context of the study, there are policies and legislation that form a system that seeks to ensure that all citizens in South Africa have access to water. Systems Theory is concerned with resolving problems that communities face and focuses on the system at large instead of the problems in isolation. Hence, the issue of water shortages is a reflection of a system that has problems, and it this system that needs to be rectified in order to resolve this issue that has ripple effects on the livelihoods of rural communities. As mentioned, systems are required for problem-solving to be carried out from an interdisciplinary perspective – such as legislation to regulate the necessity of water for all and to ensure that both small and large systems are rectified.

3.3.2.1 Underlying Principles of Systems Theory

The key underlying principles of Systems Theory are holism and problem-solving. According to Bertalanffy (1969) nothing can be explained by isolating a component of a system. Furthermore, his thoughts on scientific reductionism could not accurately explain a whole system because that thought pattern broke everything up into pieces instead of studying things as a whole. In order to properly explain and gain a better understanding of something, the system and its holistic properties has to be analyzed to find the root of the problem (Bertalanffy, 1969). Systems Theory takes into consideration all possible sources of the problem and examines each individually and what role they play in the system.

Systems Theory suggests that when there is a problem with one component in the system, we cannot isolate that component but need to take a holistic approach and view the whole system to understand what the problem could be (Gregory, 1999). Problems are a sign of a malfunctioning process. When a system fails it is because either a feedback channel is not working or the adaptation cycle is being ignored; both of these are functions of communication (Jenkins, 1967).

Systems Theory not only explains systems of natural sciences, but it also helps bring clarity to other systems such as family relationships, organizations and even the sometimes complicated system of government. By examining a system as a whole, it is easier to understand how each part contributes to the overall mission. The greater the degree of wholeness in the system, the more efficient the system (Jenkins, 1967).

In the study, Systems Theory was used to view the provision of basic services in a holistic manner. The municipality should provide basic services, such as water in a packaged form. Furthermore, municipalities should use a top-down approach in order to know the needs of the people. This is part of problem solving in Systems Theory. It is the responsibility of all governmental structures to work as a whole to ensure that local municipalities have the resources needed to provide water services to their communities.

3.4 Summary

This chapter discussed the conceptual and theoretical frameworks employed in the study. The key concepts of water shortage, social impact and rural settlement were unpacked and discussed in the context of the study. The two theories that underpinned the study, namely, the BHN Approach and Systems Theory, have also been critically analyzed, discussed and linkages made to the study.

Chapter Three: Literature Review

4.1 Introduction

This chapter focuses on the review of related literature. It will initially discuss water as a basic need for human survival at both a national and international level. In doing so it will underscore the significance of water for human consumption, agricultural purposes and cleanliness as well as outline what might happen if natural disasters continue in rural settlements. Two precedent case studies, namely Gujarat and Taaiboschgroet, will be drawn on. The background of these case studies will be examined and the main issues that were experienced will be highlighted. Lastly, the legislative and policy framework at the national and local levels surrounding the provision of water will be put forward.

The purpose of the literature review is to demonstrate one's knowledge of the subject under study. It also points out the influential researchers and research groups within the subject area. Furthermore, it aims to highlight implicit and explicit debates, gaps, opportunities and critiques of the subject. Finally, it draws lessons from precedent case studies in all contexts – international, national and local.

4.2 Water as a Basic Need

Water is a fundamental basic need that people require to sustain their livelihood. It is nationally and internationally recognised as a basic need and according to the UN-Water Sustainable Development Goal 6 Synthesis Report (2018:10), “ensuring universal access to safe and affordable drinking water by 2030 requires we invest in adequate infrastructure, provide sanitation facilities and encourage hygiene at every local level ... universal access to clean water and sanitation”. This sustainable development goal is also aligned to the global goals that make up the 2030 Agenda for Sustainable Development, which is focused on achieving developmental goals, including ensuring universal access to safe and affordable drinking water.

According to Nealer (2009), water is an indispensable commodity and life would be impossible without it. Water is essential for the overall functioning of the human body, as well as animals and plants. It is noted that the maximum period people can survive without water is approximately three to four days (Nealer, 2009). This is the case since

water in the human body comprises fifty to seventy percent of an adult's weight. Water is not only required for human consumption but it is a chemically defined molecule that constitutes a core nutrient essential for people's health. Hence, Wenhold and Faber (2009:61) assert that "the human body has no provision for water shortages as it cannot be comprised without water". Therefore, it is without doubt that water is an indispensable commodity for human beings.

Water, as mentioned, is a basic necessity, which serves different purposes such as drinking, cleaning, diluting wastes, producing manufactured goods and producing food through subsistence means as well as generating energy (Gleick, 1996). The amount of water required for the mentioned activities depends on attributes such as lifestyle, culture, tradition, diet, technology and wealth. Water is consumed directly and utilised for other basic requirements such as sanitation as well as the production of food (Clarke, 2013). Approximately three-quarters of the water that humans consume can also be utilised in the production of food, especially subsidiary food production. However, in hot climatic conditions, humans consume more water in order to maintain a balance of body fluids since water in the body is lost due to sweating, respiration and excretion (Gleick, 1996). The shortage of water has severe consequences including famine, disease and even death. Hence, the UN-Water Sustainable Development Goal 6 Synthesis Report (2018: 24) states that "no resource is more basic than water. Water is essential for life, crucial for relieving poverty, hunger and disease and critical for economic development". This statement will be unpacked as the chapter continues.

Although there have been improvements in bulk infrastructure to provide water for people in all regions, the statistics of people that lack proper water for consumption and sanitation remain high. Households that create their own employment opportunities or sustain their own livelihood through produce, often experience hardships because of water shortage. Their crops that need water to germinate do not grow effectively; their cattle lack the necessary nutrients and therefore do not grow to their full potential, compromising a source of food for people. Hence, Gleick (1998) argues that water shortages eventually end up being a "people's problem" since all the implications of such shortages directly or indirectly affect people.

The increase in demographics and development efforts have also placed pressure on the requirement or necessity of water for people to sustain their livelihoods. This increase is a global concern that has also contributed to water shortages as well as the contamination of water (Clarke, 2013). This has resulted in people being deprived of their livelihoods and is more significant in rural areas where the infrastructure is not as fully developed as in urban areas.

It is noteworthy that several rural communities rely on natural drainage such as rivers for water but, unfortunately, with limited rainfall, this has resulted in restricted water in these bodies of water. This restriction has meant that rural dwellers have struggled to sustain their produce output as well as their cattle, thus affecting the overall household.

In as much as water is a basic human right and need, the fact that some people do not have access to clean water or experience water shortages contradicts the assertion contained in national legislation as well as international goals, that water is a basic human right for all.

As mentioned, water is the most crucial resource for sustaining human life. Water accessibility secures access to a variety of other resources, food being the most significant since it plays a similar role as water (Nealer, 2009). Currently, food resources are under severe threat due to water shortages and even though there have been advanced technological developments in the agricultural sector that have assisted in terms of accelerating growth of the sector, there have also been negative implications for the environment. According to Gleick (1996), over the years' reference has been made to increased agricultural production as one of the causes of environmental degradation and climate change. Thus, commercial farming has been viewed, for some time, as a contributing factor to water shortages, which is one of the symptoms of climate change. Although commercial farming has had significant outcomes and exceeded expectations over the years it has not, however, resulted in a significant decline in world hunger or malnutrition, issues which are mainly found in rural areas of developing countries.

4.3 Water Shortages on a Global Scale

According to the UNDP (2015), 70% of the world is covered with water. However, only 25% of available water is freshwater that is suitable for human consumption. Thus,

while statistics seem to suggest that even though there is an abundance of water resources or water bodies, such as oceans and rivers, it is vital to note that not all the available water is suitable for human consumption. Even though 70% of the earth is covered by water, most of that water is saline, and only 1% of freshwater is stored in easily accessible forms (Nealer, 2009). This is the case because most of the freshwater that covers the earth's surface is stored in glaciers or ground water, making it difficult to access for human consumption.

It is worth noting that due to climatic changes glaciers are melting and the freshwater they contain is being lost. This results in the freshwater flowing into saline water bodies through tributaries that connect both bodies of water. According to Turrall, Burke and Faurès (2011), over the years the water levels in saline water bodies have increased, whereas the demand for freshwater supply, due to growing demographics, has increased on a daily basis.

Taylor, Scanlon, Döll, Rodell, Van Beek, Wada, Longuevergne, Leblanc, Famiglietti, Edmunds and Konikow (2013:1) assert that "groundwater is the source of one third of all freshwater withdrawals, supplying an estimated 36%, 42% and 27% of the water used for domestic, agricultural and industrial purposes, respectively". Groundwater, as mentioned, is fundamental for different purposes, and is more significant in regions that depend on it as the main source for water. In such regions, natural groundwater discharges sustain base-flow to water bodies such as lakes, rivers and wetlands during periods of low or no rainfall (Taylor et al, 2013). However, over the years, there have been technological attempts to get more freshwater from the ground in order to increase freshwater supply; this has been done through hydraulic fracturing, whereby natural gases are used to extract freshwater. This has resulted in groundwater being contaminated, since the chemical composition of water and natural gases engage in a chemical reaction, and this results in a different molecule.

Gleick and Palaniappan (2010) assert that international attention on water should shift from available water sources when measuring water shortages, to focusing more on the flow of water. This is because annual precipitation data, for example, is a yardstick that concentrates on stock instead of flow. Furthermore, the data does not reveal the amount of water lost, or the accessibility for human consumption. The significance of

the above assertion is where the problem statement of the study lies – water shortages impact people’s lives (Gleick and Palaniappan, 2010). However, this is not documented effectively, since the focus is on figures regarding stock instead of flow and on essential findings such as how people access water for human consumption, and whether such access is sustainable or not.

Globally, the challenge of water shortages is usually predominant in developing countries. There is the issue of ensuring food security due to water scarcity and this is mainly in rural areas where the population depends on subsistence agricultural or livestock farming as a means of sustaining their livelihoods. Furthermore, Gleick (2002) asserts that waterborne diseases such as cholera pose a challenge for developing nations. As mentioned, not all available water is suitable for human consumption; thus, one cannot discuss water shortages or availability without considering the quality of available water. In other words, recorded water stocks do not provide insight on accessibility for human consumption or the quality of that water. Since recorded water stocks do not account for the quality of the available water, when measuring water shortages both quantity and quality are important attributes to bear in mind.

Economic aspects determine whether infrastructural investments can be made to ensure accessibility to water and that it is safe for human consumption (Nealer, 2009). Although water can be available in the physical sense, what could be a challenge for people or community members is that there may be a lack of water infrastructure including water treatment facilities that would make it possible for available water to be safe for human consumption. Where water is physically available but economically inaccessible is regarded as economic water shortage (Rijsberman, 2006). It is worth noting that precipitation data as well as the different indicators that concentrate on available water stock do not consider existing financial capacity in order to make the necessary economic investments for securing an adequate water supply (Rijsberman, 2006).

The current freshwater withdrawals are low on a global scale and, also on a global scale, water shortages do not seem to be a major problem. This is the case since looking at water shortages on a global scale overlooks the uneven distribution of

freshwater (Vörösmarty, Green, Salisbury and Lammers, 2000). Generally, it is noted that there is enough water on earth; however, there are some areas in the world that experience severe water stress. Hence, looking at the availability of freshwater on a global scale may be misleading since it fails to represent water shortages on a continental, regional or local scale (Vörösmarty et al, 2000; Oki and Kanae, 2006). Water is not only a spatial variable, but is also a temporary or seasonal variable in that a region may have abundant water but experience water shortages of a short duration. This variability is often not well represented in global studies on water shortages.

Although water availability may not be a major concern on a global scale, on a local scale gaining access to water is a challenge especially for rural populations in the developing world. According to Gleick (1993) developing countries are struggling to secure an adequate water supply because of the poor water infrastructure that they have. Ideally, environmental policies need to balance between developmental needs of emerging economies and the need to preserve and protect the environment, mainly water resources. The challenges that developed countries face include reducing the demand for water to sustainable levels, In contrast, challenges in developing countries include ensuring adequate access to water for economic and social development, nationally and locally, whilst implementing legislative measures that would guarantee that water usage for developmental purposes occurs in a sustainable manner (Rijsberman, 2006).

According to Oki and Kanae (2006), affluent societies in developed countries demonstrate privilege through unsustainable levels of water consumption. This is not the case in developing countries however, since economic challenges constrain efficient and reliable access to water. Hence, it is crucial that measures that ensure that water withdrawals do not increase to unsustainable levels and measures that prevent deterioration of water quality, be implemented. Ensuring this would require stricter water policies on a national level and better management of water on a local level (Vörösmarty et al, 2000).

4.4 Water Shortages in Rural Parts of the World

In the 21st century, 85% of the world's urban population had adequate access to a sufficient water supply as compared to only 47% of the rural population that had similar

access (Leonard, 2003). It is noted that within African countries there is a significant amount of people that reside in rural areas; and although there has been drastic rural-urban migration in pursuit of better opportunities, 75% of the African population still reside in rural areas and thus face the growing challenge of water shortages (Vörösmarty et al, 2000).

For instance, in certain regions of Kenya and Ethiopia water shortages have led to competition for water between rural communities (Leonard, 2003). Furthermore, water shortages have triggered water conflict since production systems in rural communities in developing countries are threatened by deteriorating environmental conditions. According to Leonard (2003), rural activities such as livestock farming and agriculture are threatened by desertification, and issues related to poor management of natural resources. This has increased water-related conflict in several areas, such as the conflict between Kenyan and Ethiopian tribes and serves as an example of how environmental challenges associated with water shortages are the most salient in Africa and are affecting rural communities on the continent.

The Usanga Plains in South-western Tanzania, according to Charnley (1997), became the desired destination for environmental migrants that were in search of different water sources as well as natural resources such as alternative grazing and arable land. These plains became desirable, especially for rural communities, since they had perennial and non-perennial wetland habitats. This resulted in several rural migrants deciding to reside in close proximity to the Usanga Plains for better accessibility to water. However, this has resulted in growing conflict between the long-term residents of the plains and the new rural migrants over accessibility and control of the resources in the region, particularly control over water (Charnley, 1997).

In rural Bangladesh the main source of drinking water is ponds. The changes in rainfall patterns as well as the increase in water salinity in these ponds has forced rural communities to migrate to urban areas resulting in a growing rural-urban migration (Kartiki, 2011). Urban migration, according to Reuveny (2007), is the sole response to declining water quality and increasing water shortages for people in the rural areas of Bangladesh that are faced with these challenges. A lack of access to water continues

to threaten food security for rural communities of Bangladesh who mainly depend on irrigated agriculture for their livelihood.

4.5 Water Shortages on a National Scale

South Africa is a semi-arid country that has approximately 9% of its annual rainfall ending up in rivers and 5% ending up in groundwater aquifers (Department of Environmental Affairs (DEA), 2011). The country experiences extended dry and wet conditions that create extreme temporal and spatial variability in water availability (Van Vuuren, 2009). According to the Department of Water Affairs and Forestry (DWAF) (2009), accessibility to water in South Africa is a severe issue, since it is estimated that one in ten South Africans do not have access to a basic water supply and three in ten do not have adequate sanitation. This is due to the country's annual rainfall of 495 mm, which is very low when compared to the global annual rainfall average of 1 033 mm. In addition, rainfall in South Africa is highly uneven, with 21% of the country receiving less than 200mm and 65% receiving less than 500mm of rainfall on an annual basis (Hedden and Cilliers, 2014). The most drastic issue that South Africa experiences with its reduced rainfall levels is the annual potential evaporation that is approximately four times greater than the average rainfall per year.

According to the DEA (2011) the increasing demand for water in South Africa is caused by the increasing demographics as well as ongoing industrial development, especially electricity generation. Hence, South Africa has to not only ensure accessibility to water for all, but also improve water management on a national, regional as well as local scale simultaneously (Van Vuuren, 2009). Water quality in the country is a major concern, especially since it is threatened by pollution that is contributed by mining activities, agricultural production, energy generation as well as urbanisation. Usher and Vermeulen (2006) assert that groundwater quality is different in different regions of the country and where the quality is compromised this is due to contamination through on-site sanitation and mining effluents. This has resulted in high levels of nitrate in the country's groundwater making 27% of abstracted groundwater unsafe for human consumption. The ideal nitrate level in water according to the World Health Organization (WHO) should not be greater than 10mg/l N-NO₃ whilst nitrate levels greater than 500mg/l can be found in some of the country's abstracted groundwater (Tredoux and Talma, 2006).

Van Vuuren (2009) suggests that South Africa's domestic water supply in rural regions needs to be prioritised by local government, and there is also a need for accountability, since the use of water in rural areas of the country is not well documented. Only recently has there been progress in improving bulk water infrastructure in rural areas and in making reference to how the water is utilized based on the quantity used (DWAF, 2009). Although there has been some progress in terms of infrastructural development for some municipalities and rural communities, this is not the case for most rural areas because they still depend on water bodies such as rivers, lakes and groundwater resources for water. Furthermore, the poor management of water resources that exist makes them vulnerable to droughts and pollution and puts rural communities at risk of waterborne diseases and water shortages.

4.6 Climate Change and Physical Water Shortages

According to McDonald et al (2010), the population is the primary determinant of water requirements, and the growth of the urban population tends to be increasing while that of the rural population seems to be declining. The increasing urban growth has had, and will have, a huge impact on the present and future supply of, and demand for, water. Managing urban water scarcity during periods of drought continues to provide many challenges to planners and policy makers (McDonald et al, 2010). Water resources are significantly impacted by climate variability associated with dry conditions (Schulze, 2011).

Rainfall and temperature greatly influence water demand in the urban centres during the summer months, and this influences long-term planning. An early warning system of progressive or successive dry seasons would be useful (Schulze, 2011). Climate change scenarios would also be useful for planning what impact changes in temperature and precipitation would have on water resources. Climate change is expected to bring about a temperature increase in the long-term, thus it has been concluded that efforts should be made to minimize future and existing dam surface areas to decrease evaporation losses (Schulze, 2011). If a change in rainfall patterns is to be expected, then constructing new pipelines that could carry larger volumes of water during high rainfall periods may need to be considered. However, these would be an expensive investment, and would require strong confidence in the prediction,

which currently planners do not have (Ziervogel, Johnston, Matthew and Mukheibir, 2010).

The greater part of the interior and western part of South Africa are arid or semi-arid (DWAF, 1996). Since rainfall displays strong seasonality, the natural availability of water across the country is variable. Climate change scenarios suggest that changes in seasonality and the intensity of rainfall will impact the runoff, groundwater recharge and the storage of water in the soil, dams, and reservoirs (Schulze, 2011).

According to Gleick (1998), physical water shortages refers to the reduction or decrease in water supply in a given area caused by various environmental conditions. These environmental conditions that inevitably lead to water shortages include water resource degradation, climate change as well as the conditions that result in droughts.

Bates (2009) states that climate change is the contributing cause of change in the distribution of water around the world. This is due to the fact that the availability of water is dependent on climatic conditions. The shortage of water for domestic purposes may further be linked to limited rainfall during different seasons. The high temperatures experienced in summer, for example, often increase the need for more water not only for humans but also for agricultural purposes (Piao et al 2010). The impact that climate change has on river flow conditions suggests that water bodies such as rivers tend to become non-perennial after a long duration without or with limited rainfall combined with intense heat. The high temperatures also contribute to drought-like conditions, creating more dry land as rainfall decreases (Bates, 2009).

Arid regions are more prone to water shortages due to the frequent occurrence of droughts. According to Wilhite, Svoboda and Hayes (2007) drought refers to extended periods of dry weather, characterised by low rainfall or no rainfall at all. Certain regions experience seasonal drought whereby the water table decreases with the limited rainfall that those regions get, resulting in several catchments with limited or no water. This may lead to water-related conflict (similar to the above-mentioned conflict experienced in Kenya and Ethiopia), as communities try to survive on the limited water resources.

4.7 Economic Water Shortages

Economic water shortages refer to the lack of investment in water infrastructure or insufficient human capacity to satisfy the demand for water in areas where the population cannot afford to use an adequate source of water (Sullivan et al, 2003). In some developing countries water may be physically available but economically scarce, as the inhabitants do not have the fiscal resources to access that water. In such cases, some countries provide limited amounts of water daily in order for communities to be able to survive. Countries that experience economic water shortages often suffer from poor water service delivery caused by dilapidated, damaged or inadequate water infrastructure (Sullivan et al, 2003).

4.8 Water Security

According to Rijsberman (2006), water security refers to having access to safe, sufficient and affordable water to satisfy basic human needs. Even though a region may not necessarily be experiencing physical or economic water shortage, there may be a case where individuals within that specific region are water insecure due to their inability to pay for water or any other constraints in accessing water. A water shortage is when community members in the same region experience water insecurity for a significant duration (Rijsberman, 2006).

Winpenny (1999) states that there are two “degrees” of water shortages, namely, an absolute water shortage which is the most severe form of water shortage that lasts for life-threatening durations and a seasonal water shortage which is temporary. A water shortage is distinct in terms of limited resources for community members to survive; however, when it is extended for a longer duration it is regarded as water scarcity. It is worth noting that distinguishing between water shortage and water scarcity is problematic since there is no set standard for what can be regarded as a longer duration or a significant period of time. Hence both these terms are open to interpretation and are often used interchangeably (Rijsberman, 2006).

4.9 The Socio-economic Impact of Water Shortages

The social impact of water shortages affects the livelihoods of people. Livelihoods and water are interlinked, especially in rural settlements. It is important to first understand what a livelihood is and how it links with water, in order to achieve sustainable

livelihoods. Livelihoods comprises the capabilities and assets that people need to make a living and maintain their well-being (UNDP, 2010). The concept “livelihood” was first proposed by the Brundtland Commission as a tool for analysing human activities for environmental sustainability (UNDP, 2010). Many people have different meanings when it comes to the concept of livelihood. People often associate the concept of livelihood with the means of earning money; however, livelihood is more than just income.

Frank Ellis (1998) states that "A livelihood encompasses an income, both cash and in kind, as well as the social institutions (kin, family, compound, village and so on), gender relations, and property rights required to support and to sustain a given standard of living. Social and kinship networks are important for facilitating and sustaining diverse income portfolios". Chamber and Conway (1991) state that a “livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base”.

According to the UNDP (2010), the Department for International Development (DFID), developed a sustainable livelihood framework (SLF). The framework is used as an analysis tool, which is beneficial for understanding the factors that affect a person’s livelihood and how those factors interrelate with each other. The framework views livelihoods as systems and provides a way to understand:

- The assets people draw upon.
 - The strategies they develop to make a living.
 - The context within which a livelihood is developed.
 - Factors that make a livelihood more or less vulnerable to shocks and stresses.
- (UNDP, 2010)

A livelihood encompasses five components, namely:

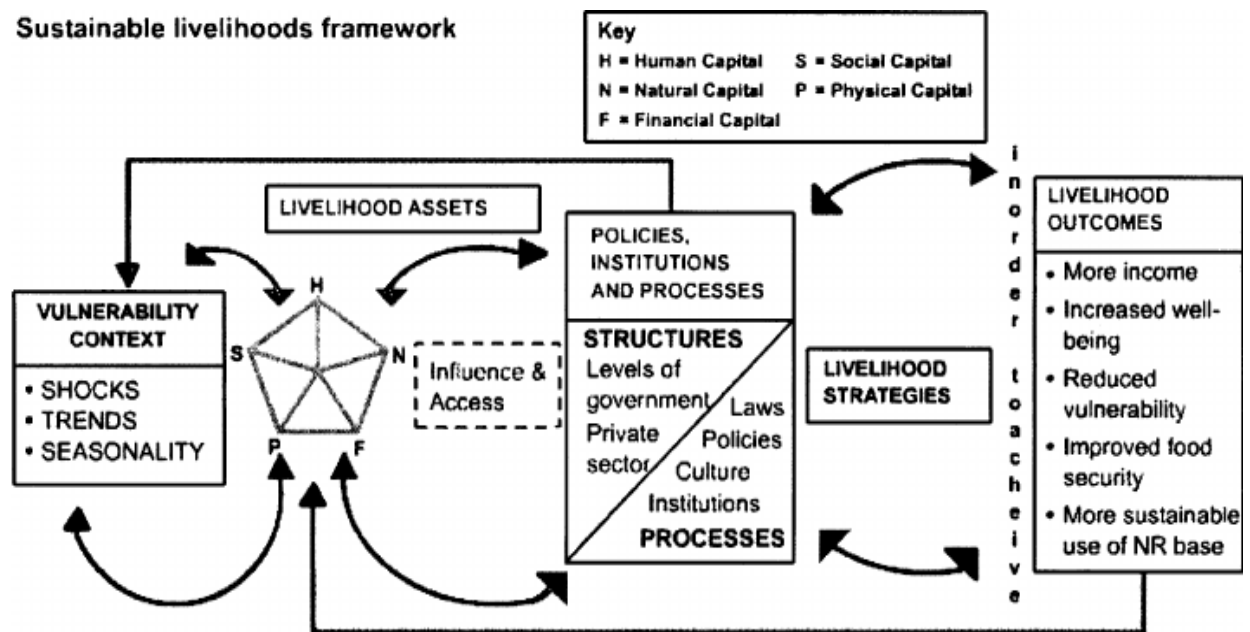
- Human capital (skills, knowledge, labour, and health).
- Social capital (family, friends, networks and institutions).
- Natural capital (land, water, wildlife, and hydrological cycle).

- Physical capital (infrastructure including shelter, access to water and electricity).
- Financial capital (UNDP, 2010).

According to LaFlamme (2010), a livelihood has six characteristics, the first one being assets. Assets look at what people have and places emphasis on the fact that these assets interact in different ways. Secondly, strategies, which refer to the mix of activities people engage in to secure outcomes. The choice of strategy will depend on context, available assets and people's capabilities. A strategy is determined by assets and by the obstacles that determine what people do with their assets. Thirdly, outcomes, which talk about what people get with what they have. In addition, the strategy determines the outcome. Fourthly, transforming structures and processes, which examine the rules that determine who can do what. This is done in terms of whether it is a top-down or bottom-up approach or whether it is cross-sectoral or cross-scale. Fifthly, the vulnerability context is uncontrollable events including shocks, seasonality and long-term trends which influence livelihoods. Moreover, it links risks and rules which affects the assets. Strong assets can resist the risks or can be used to influence the design of rules that enable risks to be managed with more certainty. Lastly, influence and access – rules must be accessible to change, but the ability to influence those rules depends on assets, such as relevant knowledge or political status (LaFlamme, 2010).

Figure 1, depicts a sustainable livelihood framework. It is based on the interactions of elements necessary for livelihoods, organised in a simple structure. Using the framework to design livelihoods helps ensure the important components that have been analysed above are included.

Figure 1: Diagram of a Sustainable Livelihood Framework



Source: Department for International Development (2008)

In terms of water and livelihoods, many people globally depend on water as their livelihood strategy, particularly in rural settlements. Water is not at all like other rare resources in that it supports all parts of human society, from nature to farming, to industry and it has no known substitutes (UNDP, 2006). People require clean water and sanitation to manage their health and keep their dignity. Furthermore, beyond the household, water also sustains ecological systems and provides an input into the production systems that maintain livelihoods.

Access to a dependable supply of water makes it feasible for people to broaden their livelihoods, increase productivity and lessen the dangers related to the dry season (UNDP, 2006). In addition, it enables producers to enter higher value-added areas of production, creates income and employment, and gives people the security to undertake investments.

According to United Nations Water (2015), access to water for productive uses such as agriculture and family businesses are vital to realize livelihood opportunities, generate income and contribute to economic productivity. Furthermore, investing in improved water management and services can help reduce poverty and sustain economic growth. Poverty-oriented water interventions can make a difference for

many poor people who receive direct benefits from improved water and sanitation services through better health, reduced health costs, increased productivity and time saving (United Nations Water, 2015).

Van Vuuren (2009) states that water is the most crucial resource for sustaining community members' livelihoods. Subsistence farming or production, as mentioned, sustains livelihoods, but it can be developed to the extent that producers are able to sell excess crops in order to generate income. However, due to water shortages, this poses a problem, especially in the context of unemployment as well as poverty. While small scale farming can assist in reducing poverty and unemployment, the problems that arise indirectly from such activity are often difficult to overcome. This is due to the fact that small-scale producers often do not have strategies that they can utilise to overcome challenges such as water shortages (UNDP, 2015).

The poorest of the poor in rural settlements in developing countries are often vulnerable to food insecurity due to water shortages (Ellis, 2000). The Food and Agriculture Organization of the United Nations (2012: 2) states that "agriculture is both a cause and victim of water shortages". This implies that it is mainly because of water shortages that agricultural production in poor countries is limited. Thus, food security in developing countries is a growing concern. However, at the same time environmental problems, such as water shortages, that are linked to climate change have been associated with technological upgrades made in the agricultural sector and the acceleration of agricultural production over the years.

Water shortages have negative implications especially for those that create local economic opportunities for themselves. For those involved in agricultural production initiatives or the manufacture of construction material such as bricks, the demand for water is high and crucial for their survival (Gleick and Palaniappan, 2010). Due to water shortages, such community livelihood initiatives often fail, exacerbating socio-economic challenges such as unemployment for those that benefit and earn a living from such initiatives (Ellis, 2000). Moreover, water shortages may result in predicaments for people generally, since they limit public health, industry as well as agriculture (Goldblatt, 2010). In addition, they damage economies by diminishing production in both the agricultural and industrial sectors. Ultimately the loss of

employment leads to poverty which has a negative impact on households. In addition, and as mentioned, consuming contaminated or unhealthy water due to water shortages leads to health and social problems (Goldblatt, 2010).

4.10 The Impact of Water Shortages on Women

Access to safe drinking water is a basic human right and essential for achieving gender equality. In many settlements, especially rural ones, women are responsible for collecting water for household use (Aureli and Brelet, 2004). Women customarily play a major role in managing and maintaining the communal water supply. In most African communities, women are responsible for the regulation and control of the social use and safe maintenance of water resources (Interagency Task Force on Gender and Water, 2004).

Women and young girls carry a double burden of disadvantage since they are the ones who sacrifice their time and their education to collect water (UNDP, 2006). Furthermore, for young girls, the lack of basic water and sanitation services translates into lost opportunities for education and associated opportunities for empowerment. While water and sanitation deficits threaten all children, it is young girls and women who shoulder a disproportionate share of the costs borne by the household. The time burden of collecting and carrying water is one explanation for the very large gender gap in school attendance in many countries (UNDP, 2006).

According to the Interagency Task Force on Gender and Water (2004) having water points close to the households decreases the distance women and girls need to walk, thus enabling time for different activities including training, childcare, growing food and earning income. The carrying of water over long distances is a risk to women's well-being, particularly during development and pregnancy periods (World Health Organization, 2005). Furthermore, during everyday water gathering, women confront the danger of drowning and sexual assaults from men.

Disease, domestic chores, and lack of separate school latrines for girls and boys keep school attendance figures down and impair the absent pupils' future chances of escaping from their families' poverty (World Health Organization, 2005). Improved

drinking water and sanitation services and better hygiene behaviour, especially by mothers, are crucial in cutting child mortality (World Health Organization, 2005).

The researcher notes that in rural settlements water is a sustainable livelihood resource for many people to survive and provide for their families. It is also worth noting that it is women and girls in rural settlements who are mostly affected when there is no formal water supply in households or communities. They are the ones who take the responsibility for ensuring that water is fetched and that there is enough for the whole household. Furthermore, young girls' academic lives are affected and they are left behind in terms of attendance at school and work opportunities.

4.11 Health Complications Due to Water Issues

In most developing countries, development efforts in all categories are being undermined by the rapid spread of HIV and AIDS (United Nations Programme on HIV and AIDS, 2007). In addition, the problem is so serious in parts of Africa that the life expectancy of a person born between 1995 and 2000 is as low as 49 years when, without the effects of HIV and AIDS, it would be 62 years (UNDP, 2006). The World Health Organization (WHO) (2005) asserts that it is imperative for people living with the HIV and AIDS pandemic to have a safe and an adequate supply of drinking water that can assist them with personal care. Furthermore, without an adequate supply of clean water, the risk of opportunistic infection resulting from inadequate personal hygiene is higher, particularly for those in advanced stages of the disease. HIV/AIDS increases a person's vulnerability to diseases related to water, sanitation and hygiene (United Nations Programme on HIV and AIDS, 2007).

According to the WHO (2005) "Death and disability from HIV/AIDS can have a dramatic impact on a community's capacity to cope with the hardships caused by a lack of improved water and sanitation services". The WHO (2005) goes on to say that with the high number of people suffering with HIV/AIDS in communities, the need for an adequate amount of safe water is even greater than elsewhere. Insufficient water and sanitation services are a serious health complication for those that have the virus or AIDS, since they require sufficient resources to survive with the disease. Insufficient services also pose a danger for those that do not have HIV/AIDS as they would be at a higher risk of contracting it, especially if they are exposed to it (Inter-Agency Standing

Committee Task Force on HIV, 2010). The WHO (2005) points to the tendency of people being cared for in their own home. However, in the absence of the requisite water and sanitation services to support invalid care, people's health and welfare are increasingly at risk. In the light of this, the WHO (2005) has appealed for the water and sanitation sector to intervene more actively in terms of both understanding and addressing the issues involved.

When there is a water shortage in a community people resort to unreliable water sources, which can be dangerous to their livelihood. This can lead to water-related diseases. A water-related disease can be defined as "any significant adverse effects on human health such as death, disability, illness and disorders caused directly or indirectly by the condition or changes in the quantity or quality of any waters" (WHO, 2011:46). Below are some of the water-related diseases.

The first is diarrhoea which is defined by the WHO (2011) as the passing of loose or liquid stools more frequently than is normal for the individual. It is considered a condition in which faeces are discharged from the bowels regularly and in a liquid form (Clasen et al, 2006). Diarrhoea is a symptom of infection caused by a host of bacterial, viral and parasitic organisms, most of which can be spread by contaminated water (World Health Organization, 2011). It is more common when there is a shortage of clean water for drinking, cooking and cleaning and basic hygiene is important for prevention. Diarrhoea is also associated with other infections such as malaria (World Health Organization, 2011).

Secondly, cholera is defined as an acute infection of the intestine, which begins suddenly with painless watery diarrhoea, nausea and vomiting (WHO, 2011). Faecal pollution of drinking water is the most noteworthy cause of cholera outbursts in many parts of developing countries (Clasen and Bastable, 2003). Cholera remains predominant in areas with poor hygiene and sanitation, which are close to surface water and which have a high population density and a high absolute humidity (WHO, 2011).

Thirdly, typhoid fever is an acute illness caused by the *Salmonella enterica* serotype bacteria (WHO, 2011). It can also be caused by *Salmonella paratyphi*, a related

bacterium that frequently causes a less severe illness. The bacteria are deposited in water or food by a human carrier and spread to other people in the area (Center for Disease Control and Prevention, 2008). Symptoms of infection can be mild or severe and include sustained high fever, malaise, anorexia, headache, constipation, diarrhoea, rose-coloured spots on the chest area and enlarged spleen and liver (Guillot and Loret, 2010).

The fourth disease is shigella – an acute bacterial disease characterized by bloody diarrhoea (Exner, 1996). Waterborne outbursts of the disease occur more regularly due to faecal-contaminated drinking-water (WHO, 2011). Epidemics of waterborne shigellosis generally appear in the context of wells contaminated with faecal matter and sewage discharge close to water intakes and bathing areas in communities (WHO, 2006). Presently, the disease is not known to be often spread by waterborne transmission but, as noted above, waterborne outbreaks are happening more frequently due to faecally contaminated drinking water (WHO, 2011).

Lastly, campylobacter is a worldwide zoonotic, which means it a disease that is passed to humans through animals or animal products. Diarrhoea often found in the presence of mucus and blood, abdominal cramps, fever and vomiting are characteristics of acute campylobacteriosis. In some cases, reactive arthritis can occur (WHO, 2011). The disease can be directly transmitted via the faecal-oral route or indirectly via contaminated foodstuff and drinking water (WHO, 2004). Campylobacter is often detectable in surface waters while drinking water is regarded as a frequent source of infection.

Water shortages may also lead to malnutrition which may be even more detrimental for those that have pandemic and endemic diseases. Furthermore, diseases such as diarrhoea, as well as contributing effects of it such as gastrointestinal motility, may result from shortages of water. Hence, the UN-W (2007) argues that the improved quality of water is a panacea for several bacterial or viral infections.

The researcher acknowledges that HIV/AIDS is an epidemic in developing countries in Africa. People affected by the HIV virus, can live a long and productive life, if they take care of themselves. Safe drinking water is important in making sure that people

affected by the virus are not exposed to other diseases found in unclean water. It must be borne in mind that water is also used to take medication and the human body requires water daily.

The aforementioned water-related diseases are the result of a poor supply of water and sanitation services and occur mostly in rural settlements. As a result, people are forced to use unreliable water sources and risk being infected by disease.

4.12 Case Study of Taaiboschgroet, South Africa

Taaiboschgroet village is located in Limpopo and has a groundwater scheme (GWS), which is situated in the North-western region of the Blouberg Local Municipality. The groundwater levels in Limpopo are monitored in order to prevent natural disasters such as droughts (National State of Water Resources Quarterly Report, 2014).

Apart from Taaiboschgroet, the GWS supplies other rural settlements with water, and these include the settlements of Simpson, Grootpan, Sais, Slaaphoek, Donkerhoek, Voorhout, Royston, Junior loop, Berseba, Wegdraai, Ga-Raphokola, Gideon, Thlonasedimong, Eldorado, Fonteine Du Champ, Esaurinca, Louisenthal, The Grange, Longden, De Vrede, Kromhoek, Pax, Johannesburg, Lovely, Burgerregt, Edwindsdale, The Glen and Glenferness. Furthermore, two mountain weirs supply water for this scheme.

The Blouberg Local Municipality (in which Taaiboschgroet is located) is one of the five local municipalities within the Capricorn District Municipality in Limpopo Province. This municipality covers an area of approximately 5 054 km² with 18 wards and approximately 139 settlements. It was established in the 21st century through the amalgamation of the Northern District Council with the Bochum or My Darling Traditional Local Council (Development of a Reconciliation Strategy – For All Towns in the Northern Region, 2011). Prior to the amalgamation, the bantustan government denied communities basic bulk infrastructure and related development. This resulted in the current situation of an inadequate water infrastructure to supply people in the municipality with water. Hence the reliance on groundwater supplies.

The Blouberg Local Municipality has low levels of development and, unfortunately, this has resulted in the municipality having the country's lowest income level (Development of Reconciliation Strategy – For All Towns in the Northern Region, 2011).

In terms of demographics, the low levels of development have resulted in out-migration of the economically active group, and this has left a large percentage of the population below 21 years of age (Taaiboschgroet DWA, 2011). This has created the economic challenges of unemployment, a high dependency ratio as well as poverty. In Taaiboschgroet village the demographics that were assessed in the case study indicated a negative growth potential, with predictions of the population decreasing to 49 744 by 2030 (Taaiboschgroet DWA, 2011). However, there have been positive activities done by community members to improve the economy and alleviate poverty. These include agro-processing of fruits, low-scale commercial farming as well as the running of an abattoir with offshoot industries such as beef packing, a hide tannery and a deboning factory. The economic focus that the village has is an agrarian one. The GWS has thus enabled people within Taaiboschgroet to engage in entrepreneurial activities such as agriculture in order to sustain their livelihoods.

Water in the Blouberg Local Municipality is supplied by the main water source, namely, the Taaibosch Fault that runs from east to west along the central part of the Taaiboschgroet water scheme, as well as the two weirs situated in the Blouberg Mountain. The water is then piped to individual settlements through an interconnecting reticulation system. In terms of basic water service delivery within the clustered area, it is estimated that 1.799 million m³/a is currently required, and this demand is greater than the current supply of 1.699 million m³/a. Due to the limited resources, increasing the water supply is not an easy undertaking especially with the water crisis that is affecting certain regions in South Africa. It is predicted that the demand for water will increase to 2.280 million m³/a by 2030 due to the potential increase in level of services provided as well as activities that require an intensive water supply (Development of a Reconciliation Strategy – For All towns in the Northern Region, 2011).

Given the above, the current supply of water (1.699 million m³/a) is not sufficient to meet the current needs or future demands of the area. Hence, the water shortages experienced in Taaiboschgroet village are related to the increased demand for water.

4.12.1 Lessons Learnt

Various lessons can be drawn from the Taaiboschgroet case study of water shortages and their implications for the livelihoods of people, and these are outlined below.

The water shortages that affected the Taaiboschgroet village impacted negatively on the livelihoods of people especially their entrepreneurial initiatives to make money such as small-scale commercial farming, gardening as well as brick manufacturing (Sebola, 2000). These initiatives put great pressure on the water supply, as water was the main component utilised and thus needed for the initiatives to prosper. Unfortunately, due to water shortages the initiatives collapsed. Not only had these initiatives created employment opportunities but had produced vital resources such as food to decrease food insecurity, and manufactured bricks for building (Sebola, 2000). The outcome of this collapse was unemployment for those that were involved – they were now unable to support their families as well as livelihoods.

Local economic development projects were also affected by the water shortages. One such project was the conversion of subsistence farming into small-scale commercial farming. This entailed backyard vegetable gardens that families had in order to support themselves and where the excess is sold to generate revenue. Water shortages affected the germination phase, meaning that plants would not necessarily grow at the rates they would normally do with the regular provision of water. There was also the possibility that they would not grow at all. Water shortages thus negatively impacted on the quest to reduce food insecurity in the village and created similar situations for communities or settlements at large (Sebola, 2000).

According to Challenge 20/20 (ND: 7; cited in Sebola, 2000), “the predicament of water scarcity limits public health, industry and agriculture.” This statement highlights that people utilise water for various things and this, in turn, increases the demand for water but also leads to water shortages. Daily activities by households, agriculture and industries, especially those that use streams and rivers for the deposition of waste, demand water. Water shortages, as well as anthropocentrically induced activities such as deposition of waste in rivers, lead to the poor socio-economic status of communities through unemployment, poor agricultural yields and decreased industrial production. Thus, water shortages also contribute to affecting economies by destroying production

in both the agricultural and industrial sectors (Sebola, 2000). Unfortunately, the negative impacts of water shortages contribute to communities falling into poverty which, in turn, has a negative impact on society at large.

4.13 Case Study of Gujarat, India

An international case study is also used to understand water shortages from a global perspective. The case study used is the state of Gujarat in India which experiences severe water shortages.

According to Ünver, Gupta and Kibaroglu (2012), Gujarat faces water challenges since it has only 2.28% of India's water resources but 6.39% of the country's geographical area. This is further constrained by the inequality in intra-state distribution within India. Unfortunately, over the years Gujarat has been experiencing a decline in the average annual rainfall of 80cm with a high coefficient of variance over time and space, and this has resulted in natural disasters within the region.

While India has approximately 185 rivers, it is noted that only eight of these rivers are perennial and all of them are located in the southern part, whereas Gujarat is located in the west of India. Approximately 80% of India's surface water resources are confined in the central and southern regions of Gujarat, whereas the remaining regions of India have 20% of the surface water resources. Although water resources are concentrated in one region, it is noteworthy that within this very region natural disasters such as droughts are experienced. In 2001 the region experienced water shortages that threatened the well-being of humans and the cattle population. According to Ünver, Gupta and Kibaroglu (2012), the Indian government had to intervene by supplying temporary strategies to make water accessible for community members. This was done through road tankers and in some instances through special water trains which supplied drinking water to communities to enable them to continue with their day-to-day activities.

The quest for water in order to sustain livelihoods even resulted in “water riots” in Gujarat and this was caused by the water shortages in the region as well as poor water resources management. Water shortages in Gujarat resulted in the region relying upon groundwater schemes to supply community members with water. Unfortunately, there

were complications such as the water quality. This meant that water from the groundwater schemes was not suitable for consumption since it had excessive fluoride, nitrate and salinity. This imbalance of chemicals in the water affected the well-being of community members and this was noted by the number of fluorides affected households, which increased from 2 826 in 1992 to 4 187 in 2003. According to Ünver, Gupta and Kibaroglu (2012), fluoride concentration in villages within India ranged from 1.5 mg/litre to a staggering high of 18.90 mg/litre. In Gujarat, fluoride caused extensive health problems; in some instances, dental fluorosis caused permanent pigmentation of teeth amongst children and bone deformities amongst adults. Other health-related problems caused by the increase in the concentration of fluoride included anaemia, loss of appetite, thyroid malfunction, nausea and, to a certain extent, brain impairment in children and, in expectant mothers, stillbirths or the need for abortions.

Water shortages also led to intra-state migration from the natural disaster-prone regions in western and south-western Gujarat to the central and southern regions of India, where water shortages were less drastic. Migration often meant the dislocation of people both socio-economically and culturally. It also often meant that livestock would be migrated as well. Unfortunately, the migration imbalances because of increasing water shortages resulted in the population decline in Gujarat being accentuated (Ünver Gupta and Kibaroglu, 2012).

The utilisation of the drinking water supply that was based on groundwater schemes was disadvantageous since groundwater from deep tube wells required high capacity pumping machines which in turn required electricity. This contributed to water pollution and also to an increase in the carbon footprint of water supply.

4.13.1 Lessons Learnt

Water shortages can have severe repercussions as occurred in Gujarat where the health and well-being of community members were at stake due to the groundwater being unfit for human consumption. Not only are water shortages prone to affecting people and their well-being on a daily basis, but contaminated water has a significant possibility of doing harm, especially in regions that have limited healthcare.

Water shortages and the possibilities of health problems causes people to migrate to areas without such shortages in pursuit of livelihood opportunities and this results in an imbalance in regions. More of the population moving to regions with fewer water shortages also means that those regions would experience severe demands being placed on their water supplies.

The Gujarat case study also revealed the socio-economic implications of people not being able to work when their health is compromised. People's production potential decreases, meaning that the income that they could have made to support their livelihood and their families potentially decreases as well.

4.14 Legislative Framework

In order to fulfil the obligations set out in the Constitution (which is also mentioned in this section), policies and legislation have been put in place by the South African government. The most important pieces of legislation concerning the water sector in South Africa are outlined and discussed below.

4.14.1 Constitution of the Republic of South Africa (Act No. 108 of 1996)

Chapter 2 of the Constitution of South Africa encompasses the Bill of Rights, which is considered the foundation of democracy in the country. Moreover, it enshrines the rights of all citizens of the country and affirms the democratic values of human dignity, equality and freedom. It articulates that the state must respect, promote and fulfil the rights in the Bill of Rights (Constitution, 1996).

Section 27 (1) (b) of Chapter 2 clearly articulates that everyone has the right amongst other rights, to have access to sufficient food and water (Constitution, 1996). Section 152 further states that it is the responsibility of local government to ensure the provision of services to communities in a sustainable manner; to promote social and economic development; and to encourage the involvement of communities and community organizations in the matters of local government (Constitution, 1996). Section 154 (1) of the Constitution directs the national and provincial governments to support and strengthen the capacity of municipalities to perform their functions (Constitution, 1996).

The Constitution thus lays the foundation for the right to access sufficient water and provides for the municipal delivery of water. There has been significant effort to redress the imbalances of previous discrimination in this sector and, at the same time, serve a growing urban population. However, rural settlements continue to pose significant challenges in terms of the delivery of services, including that of water. According to Colvin, Muruven, Lindley, Gordon and Schachtschneider (2016), between the censuses of 2001 and 2011 major milestones were achieved in the eradication of water and sanitation backlogs. In terms of basic water supply, South Africa had, by 2005, halved the backlog that existed thus achieving the Millennium Development Goals (MDGs) 10 years ahead of the 2015 target date. Furthermore, in terms of sanitation provision, there has been a 40% improvement since 1994, which is also well within the timeframe of the MDGs. Furthermore, between the years 2007 and 2010 more than 1 000 bucket-toilet systems in formalised areas were eradicated after R1.2 billion was allocated to a special bucket eradication programme (Colvin et al, 2016). This was seen as a major milestone as communities' lives were significantly improved with better sanitation facilities and services.

4.14.2 Water Services Act (No. 108 of 1997)

The aim of the Water Services Act (WSA) is to support municipalities in their role as water service providers in line with Section 27 of the Bill of Rights which states that everyone has the right to have access to sufficient food and water, and the state must take reasonable legislative and other measures to achieve the progressive realization of these rights (Tissington, 2011).

The WSA established the basic framework within which water and sanitation services would be provided in the future. Furthermore, it recognized the role of local government as the water service authority (DWAf, 1997). The Act provides for four different water services institutions. These are water services authorities, water services providers, water boards and water services committees (DWAf, 1997).

The WSA recognizes the importance of having access to sufficient water insofar that such access is not harmful to the environment, health and well-being. Section 3 (1) of the act clearly states that everyone has the right to access basic water supply and basic sanitation (DWAf, 1997). Furthermore, Subsection (2) (3) states that water

services institutions must take reasonable measures, within their power, to ensure that this right is met and is fulfilled. In addition, it also articulates that every water services authority must work within its water services development plan, in order to realise this right (DWAF, 1997).

Section 4(1) (a) of the WSA indicates that water services must be provided in a manner set out by the water services provider and the conditions for doing so must be accessible to the public. The act states that "every water services authority has a duty to all consumers" to provide water which is free from contamination. These water services authorities include national, provincial and local government. However, the local government is to provide water to the communities within its own jurisdiction (DWAF, 1997).

South Africa has approximately 4,718 dams registered with the Dam Safety Office, including those owned by the Department of Water and Sanitation (DWS) and those owned privately (Colvin et al, 2016). The DWS owns approximately 305 dams with a total capacity of 29.2 billion m³. This accounts for 70% of the total dam capacity in the country. The largest DWS owned dam in South Africa is the Gariep Dam on the Orange River between the Eastern Cape and Free State, with a capacity of approximately 5 500 million m³ (Colvin et al, 2016). More than 25% of DWS-owned dams are located in the Eastern Cape and 15% in Mpumalanga. Farm dams are not well monitored but it is estimated that there are between 150 000 and 400 000 throughout the country. There are 13 Water Boards, two Catchment Management Agencies (CMAs), the Water Research Commission, 167 Water User Associations and the TransCaledon Tunnel Authority all of whom report to the Minister of Water and Sanitation (Colvin et al, 2016).

Through the WSA, much has been achieved in terms of distinguishing roles and responsibilities and also how water should be delivered by water institutions. The building of dams plays a huge role in the supply of water to the people. However, some of these man-made dams have not been properly built and maintained. This has led to the dams deteriorating and breaking, causing leakages. However, rebuilding the dams will cost more money when compared to them being properly built and maintained from the beginning.

4.14.3 National Water Act (No. 36 of 1998)

According to the DWAF (2013), the purpose of the National Water Act (NWA) is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled. The NWA is mandated by Section 24 of the Bill of Rights in the Constitution of South Africa. It states that everyone has the right to an environment that is not harmful to their health or well-being, and to have the environment protected for the benefit of present and future generations through reasonable legislative and other measures (Constitution, 1996). The NWA is based on the concept of integrated water resource management (IWRM) on a catchment basis and the National Water Resource Strategy. The latter must promote the management of catchments within a water management area in a holistic and integrated manner (Goldin, 2010).

Goldin (2010) states that the guiding principles of the NWA are designed to promote social and economic development through the use of water and recognize the need to establish suitable water management institutions in order to achieve this purpose.

Chapter 4 of the act concerns the use of water. It clearly stipulates that the national government has the overall responsibility for, and authority over, water resources management, including the equitable allocation and beneficial use of water in the public interest (DWAF, 2013). According to the DWAF (2013) the national government, acting through the minister has the power to regulate the use, flow and control of all water in South Africa. The minister is ultimately responsible for ensuring that water is allocated equitably and used beneficially in the public interest while promoting environmental values.

The Water Source Areas (WSAs) are where South Africa gets its water from and there are 21 such areas. According to Colvin et al (2016) only 16% of South Africa's WSAs are formally protected as nature reserves or parks. Furthermore, the highest protection is found in the Western Cape. WSAs in the Eastern Cape have very low or no protection (Colvin et al, 2016). The overlap of coal deposits and WSAs is less than 1%, but it is nevertheless significant in WSAs such as the Enkangala Drakensberg and the Mfolozi Headwaters, where 30% of these water source areas overlap with coalfields (DWAF, 2013). An added concern is that more than 50% of Mpumalanga is under either a prospecting or mining licence for coal. This could result in widespread acid mine drainage pollution (DWAF, 2013). These areas need to be secured and well-

managed for South Africa's long-term water security and this should be of national concern.

Functioning Catchment Management Agencies (CMAs) are critical for the management of scarce water resources in South Africa, as integrated water resources management is best carried out at a local, catchment scale (Colvin et al, 2016). Furthermore, CMAs are envisaged as the operational arm to implement water policy and legislation in South Africa. There are currently two operational CMAs in South Africa, with the remainder at varying levels of establishment. Although there has been significant frustration regarding the slow development of CMAs across South Africa, the staggering of CMA establishment has created the opportunity to fine-tune the system (Colvin et al, 2016). The interlinking of catchments gives effect to one of the main principles of the NWA of 1998, namely, the designation of water as a national resource. The act makes provision for the progressive establishment of the CMAs which delegate water resources management to regional or catchment level agencies and make provision for involving local communities in decision-making (Colvin et al, 2016).

4.14.4 White Paper on Water Supply and Sanitation Policy (1994)

This policy was based on the Reconstruction and Development Programme (RDP) in order to fulfil its objectives (DWAF, 1994). The RDP was designed to eradicate poverty in South Africa in an integrated and principled manner through housing. The lack of basic services such as water supply and sanitation were seen as a key symptom of poverty and underdevelopment. The provision of such services had to be part of a coherent development strategy if it was to be successful. The creative management and use of water were considered vital in ensuring that the RDP's objectives of eradicating poverty and promoting sustainable economic and social development were realized (DWAF, 1994). The White Paper on Water Supply and Sanitation Policy placed emphasis on the importance of speedy delivery of basic services. Basic water was defined as:

- A standpipe supplying 25 litres per capita per day;
- within 200m of the household;
- at a minimum flow of 10 litres per minute supplied on a regular basis;

- once minimum quantity is available, water should meet minimum quality standards;
- should be potable (taste, odour and appearance) (DWAF, 1994)

The White Paper outlined the institutional framework for water and sanitation provision, which was subsequently legislated in the Water Services Act in 1997 (Beck, 2016). The policy outlined in the 1994 White Paper stressed that sanitation services should be self-financing at a local and regional level (DWAF, 1994) and that exceptions would be made where poor communities were unable to afford basic services. In these situations, government may subsidise the cost of construction of basic minimum services, but not their operating, maintenance or replacement costs. Such basic service grants were to be provided, as far as possible, directly to local authorities (DWAF, 1994).

In 1994, at the time of South Africa's transition to a multi-racial democracy, the distribution of water-related services to the country's 39 million inhabitants was skewed to serve the white minority. Around 15.9 million South Africans, many in rural areas, did not have access to safe water supplies, while only 59% had access to basic levels of water service – usually a communal tap (DWAF, 1994).

4.14.5 National Environmental Management Act (No.107 of 1998)

The National Environmental Management Act (NEMA) seeks to provide for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment (Mackay, 2003). Furthermore, it seeks to establish institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state and to provide for matters connected therewith.

Section 2 (4) of the NEMA consolidates principles relating to sustainable development. The principles incorporate, amongst other stipulations, that the disturbance of 31 ecosystems and loss of biological diversity be minimized, that waste is avoided, risks circumvented (as much as current knowledge allows) and a cautious approach adopted (Tissington, 2011). According to the principles, the use and exploitation of

non-renewable natural resources should be both responsible and equitable (Rossouw and Wiseman, 2004). Moreover, the consequences of the depletion of the resources should be taken into account and in the case of the use and exploitation of renewable resources and ecosystems, their integrity should not be put at risk. Decisions regarding the environment should be taken in an open and transparent manner (Tissington, 2011). In addition, there should be intergovernmental co-ordination and harmonisation of policies, principles and actions. Actual and potential conflicts of interest between organs of state should be resolved through conflict resolution mechanisms (Tissington, 2011).

The principles above apply to all spheres of government, whose actions may significantly affect the environment. The principles serve as a 32-point general framework within which environmental management and implementation plans should be formulated, and they also serve as guidelines that should be used when decisions are taken that may have an impact on the environment. The principles should also guide the interpretation, administration and implementation of NEMA or any other law that is concerned with the protection or management of the environment (Benson and Garmestani, (2011).

Colvin et al (2016) state that the majority of South Africa's wetland and river ecosystem types are threatened. The authors consider this to be of enormous concern given that wetlands make up only 2.4% of the country's surface area, and that they play a crucial role in delivering ecosystem services, such as water purification, flood regulation and drought mitigation. Furthermore, less than a third of the country's river, wetland and estuary ecosystem types can be considered moderately to well-protected (Colvin et al, 2016). The authors go on to point out that although inclusion in a protected area does not guarantee conservation, rivers inside protected areas are in a better condition compared to those outside, despite some being degraded by upstream human activity before entering the protected area (Colvin et al, 2016).

4.14.6 Free Basic Water Policy (2000)

The primary aim of the Free Basic Water (FBW) Policy is to alleviate poverty by ensuring that no one is denied access to a basic water supply (DWAF, 2003). The FBW programme was initiated by DWAF in December 2000 which brought out a

policy/strategy document. The reason for embarking on the programme was precipitated by the realisation that many local authorities were unable to provide basic water free of charge to those who were unable to pay, despite being required to do so in terms of the WSA and the Constitution.

According to Hall et al (2006), the FBW Policy recommends that 6 000 litres of clean water are provided free per household per month. However, the local authority determines how much water it can provide for free per household every month (Blanc and Ghesquieres, 2006). The 6 000 litres are per household, which is calculated as 5 litres per person per day (based on a household of 8 people), and considered a level sufficient to promote healthy living (Hall et al, 2006). The FBW Policy is a national one but it is the responsibility of local government to provide for its implementation at the local and community level (Hall et al, 2006).

The basic provision of water as set out under the FBW Policy is considered to be the minimum requirement and not adequate to ensure a “full, healthy and productive life” (DWAF, 2003). This minimum requirement forms the base of the water ladder, and is followed by an intermediate service level step of access to water in the yard, and finally, the full-service level step of piped water within the home (DWAF, 2003).

There are arguments surrounding the implementation of the FBW Policy. Many scholars and writers believing that the policy will only benefit those who are not the target market of this policy. According to Calfucoy et al (2009) the free water policy has had several challenges. Firstly, many of the poorest households lack access to any formal water services whatsoever, not to mention free basic water. Thus, they will not be able to benefit from the policy until water services are extended to them. This explains why free basic water is easier to implement for consumers who are already receiving and paying for a metered supply of water. Secondly, the financial models for providing free basic water, while still maintaining financial sustainability at municipality level, will need to be carefully designed and tailored for local conditions. Effective targeting mechanisms will be needed which minimise the exclusion of poor people from the benefits of the policy, but which are administratively cost-effective to apply. Thirdly, the free basic water policy must be integrated with any future basic sanitation

policy, since if waterborne sanitation is installed this will have an effect on the amount of water used per household (Calfucoy et al, 2009).

The FBW Policy was revised in 2007, acknowledging ongoing affordability and capacity challenges across different municipalities (DWAF, 2007). The revised policy does not change the amount of free basic water, but it states a commitment by the government to support an increase to 50 litres per day, left to the discretion of local municipalities, again to act within their resources (DWAF, 2007). The main focus of the revised FBW Policy is “ensuring that there is increased access to water infrastructure by the poor while maintaining access through sustainable operational arrangements that should include appropriate subsidy targeting mechanisms to minimize ‘leakage’ of subsidies intended for the poor to wealthy consumers” (DWAF, 2007:45).

4.15 Summary

This chapter explored both international and South African literature with regards to the different scenarios and contexts of water shortages and the impact of such shortages on people and communities. The broad literature on water shortages and the livelihoods concept has been reviewed in order to provide a better understanding of the background to, and the nature of, the study. The policies and legislation underpinning the supply of water in South Africa were outlined and discussed.

The review pointed out that without a proper supply of water, people resort to unreliable supplies of water which are not only dangerous but can lead to death. The legislation and policy, if properly implemented in the local context, can enable people, especially in rural settlements, to create sustainable livelihoods for themselves. Hence, with the provision of a potable supply of water from the municipality, people can gradually uplift themselves out of poverty and better their standard of living.

Chapter Four: Research Methodology

2.1 Introduction

In the study the researcher adopted a mainly qualitative research approach in order to gain an understanding of individuals' and stakeholders' views and assessments of their own lived experience in the area. In addition, the qualitative research paradigm enabled the researcher to interact with the participants in their natural setting in an effort to make sense of phenomena in terms of the meaning people give to them.

2.2 Qualitative Research

Qualitative research is a strategy for the systematic collection, organization and interpretation of textual information. Furthermore, the data obtained via a qualitative approach is considered subjective data in that it cannot be coded into numbers; the emphasis is on words and feelings (Golafshani, 2003). It focuses on generating meaning and understanding through description. In addition, qualitative research explores the meaning of peoples' experience, culture or a particular issue or phenomenon. Qualitative research usually involves fieldwork, during which the researcher goes to the participants in order to observe their behaviour in its natural setting (Golafshani, 2003).

There were various advantages of using qualitative research as a research tool for the study. Firstly, it helped to generate detailed data which, in turn, assisted in determining the perspectives of the participants. Secondly, qualitative research provided a holistic perspective of the phenomenon under scrutiny. Thirdly, it had the capacity to allow the researcher to interface with the participants in an agreeable dialect and on their own particular terms. Lastly, qualitative research provided the researcher with a flexible way to perform data collection and interpret the collected information (Kothari, 2004).

2.3 Secondary Sources of Data

Secondary data is data which has been collected by someone else and has passed through the analysis process. Secondary data means data that is presently available (Kothari, 2004). When a researcher uses secondary data, he or she has to identify the various sources from where it can be obtained. In this case, the researcher is certainly

not confronted with the problems that are usually associated with the collection of original data. Secondary data may be either published data or unpublished data. The study used secondary sources of data such as peer-reviewed papers, books, archives, journals, sound recordings, reports and newspapers found in both hardcopy and online. This form of data provided assistance in supporting or not supporting the results obtained from the primary data sources (Kothari, 2004).

2.4 Primary Sources of Data

Primary data is data which is collected for the first time and therefore regarded as original information (Gray, 2004). Primary data collection methods that were employed in the study were a semi-structured questionnaire, an interview (using a schedule comprising open questions) and on-site observation (Kothari, 2004). Each of the methods used are further discussed below.

2.4.1 Interview

According to Kvale (1996) a qualitative research interview seeks to determine the meaning of central themes in the life-world of the participant. An interview is a dialogue between two or more people based on a particular topic (Kvale, 1996). The main task of interviewing is to understand the meaning of what the interviewees (participants) say. The researcher used an interview to gather information from a key informant. The interview schedule (see Annexure 2) comprised 14 open questions thus allowing for, and encouraging, in-depth responses. The key informant that was interviewed for the study was the senior technician for water and sanitation in the uMgungundlovu District and, importantly, was the person responsible for the provision of water in KwaNonzila. The senior technician was interviewed to determine why there was an inadequate supply of water to the community of KwaNonzila which led to the water shortages being experienced.

2.4.2 Questionnaires

As noted above, a questionnaire was one of the methods used for data collection in the study. Oppenheimer (1992) states that questionnaires are adopted when collecting and recording data about a particular issue of concern. Questionnaires usually contain a set or list of questions, giving straight-forward guidance and room for responses (Oppenheimer, 1992). The questions which were asked were linked with the research

objectives thus showing precisely how the findings would be used. Both open and closed questions were used in order for the researcher to obtain more detailed information from the respondents. The type of questionnaire administered, therefore, was a semi-structured one. The justification for using such a questionnaire is that the closed questions are quicker and “easier” to answer (thereby placing less stress on the respondents) and the responses easier to analyse (Kothari, 2004). Moreover, while open questions do not limit a respondent to a specific response and allow respondents to answer in their own words, they are recognised as being more difficult and time-consuming to answer and analysis of the responses is equally more difficult and time-consuming.

2.4.3 On-site Observation

Observation involves the observer/researcher as a member of the setting in which they are collecting data (Bryant, 2009). By conducting observation, the researcher is better able to understand and capture the context within which people interact. It also gives the researcher a clearer picture of the surroundings in which a phenomenon takes place. The observations in the study were captured by the researcher taking pictures while in the field.

The following is a checklist of items that were observed by the researcher while in the field (or study area of KwaNonzila):

- ✓ Areas where people in KwaNonzila get water (sources of water)
- ✓ Existing local businesses in KwaNonzila
- ✓ Schools in, or close to, KwaNonzila
- ✓ Heath facilities in, or close to, KwaNonzila.

2.4.4 Mapping

Mapping is a vital technique that allows the presentation of information in a condensed and readily understandable format (Rubin and Babbie, 2007). Maps of the study area were obtained from the Mkhambathini Municipality and used to fulfil a number of the study’s requirements such as demarcating the boundaries of the study area, showing the sources of water, and the distances between the households and the water sources.

2.5 Sampling Methods

Sampling is a manner of determining who the participants of a study are going to be (Kothari, 2004). In terms of the present study, this process involved identifying a portion of the population of KwaNonzila who would comprise the sample and from whom the information would be obtained. Random sampling was used to select the participants (Kothari, 2004). This was done on the assumption that the sample obtained would be representative of the population from which it was drawn. In random sampling, participants in the population are selected via a random process. Using a random number generator (in this instance a table) leads to each person (or unit) in the population having an equal probability of being selected for the sample. Random sampling was selected for the study for the following reasons: Firstly, it saved time and money in that it would have taken a long time to interview the whole population of KwaNonzila and doing so would have cost a huge amount of money. Secondly, by making the sampling random there was no bias taking place in selecting the sample. Lastly, it was simple and efficient.

KwaNonzila falls under the area of Maqonqo and the statistics show that there are 255 households in Maqonqo. To ensure validity 30 households were randomly selected and a person in each household was interviewed. The criteria for being interviewed was that respondents had to be household heads or spouses of either gender and be 18 years or older.

In addition to random sampling, a purposive sampling technique was also used for the study. Kothari (2004) defines purposive sampling as the deliberate or planned choice of a witness or informant because of their qualities. In terms of this definition (and as mentioned above), the senior technician for water and sanitation in the municipality was purposively selected because of his involvement in water supply to the settlement of KwaNonzila. The researcher had determined what should be known and set out to identify individuals who were willing and able to provide the data by virtue of their knowledge or experience. It was on this basis that the senior technician was selected.

2.6 Data Analysis

According to (Kothari, 2004) data analysis is a process of inspecting, cleaning, transforming and modelling data with the goal of highlighting useful information,

suggesting conclusions, and supporting decision-making. This is done so that the data found can be clear, understood and presented as information. In the study the qualitative data obtained from the interview and the open questions in the questionnaire were analysed using thematic data analysis in which themes are identified in the data collected. Analysis of the quantitative data obtained from the closed questions in the questionnaire was straightforward and comprised frequency counts of the responses.

2.7 Resolution of Anticipated Problems/Limitations

In planning for the study, the researcher had foreseen possible problems or limitations impacting on the study and subsequent validity of the findings. In the first instance the researcher anticipated people not willing to participate. To deal with this potential limitation the researcher informed the selected participants (from the community of KwaNonzila) that the study would be beneficial to the community in terms of combatting the water shortages and thus assist in alleviating the problems they were facing. This was to be done through the recommendations that emerged from the study. All participants selected agreed to participate in the study.

A second anticipated limitation was time, that is, to determine and agree on an appropriate time whereby the researcher could meet with the selected respondents and administer the questionnaires. To deal with this potential limitation, the researcher planned beforehand. Importantly, back-up plans had been put in place should the first plan not succeed.

Lastly, financial resources to cover the cost of the fieldwork (travel, accommodation and subsistence costs) were identified as a limitation particularly given the fact that a number of trips to the settlement were envisaged to be necessary. To overcome this anticipated limitation, the important and needed financial support was asked for and received from family, friends and colleagues.

2.8 Summary

In this chapter the research methodology for the study was detailed. The study adopted a mainly qualitative approach, whereby both secondary and primary sources of data were used. Primary data was derived from questionnaires, an interview and

observation. The sampling methods and data analysis were explained and lastly, the anticipated problems or limitations were discussed as well as the manner in which they were resolved.

Chapter Five: Historical Background of the Study Area and Data presentation, interpretation and analysis

5.1 Introduction

This chapter provides the historical background and context of the case study area and its geographical location within the Mkhambathini Municipality. The selected case study was the rural settlement of KwaNonzila. It was considered important to explore the complex historical background of the case study area as such an exploration reveals factors contributing to the current state of the settlement.

This chapter also presents and discusses the research findings. Data collected from a municipal official involved in water supply, the community of KwaNonzila and through observation by the researcher was collected and analysed using thematic analysis. This section is vital, since it presents and interprets the research findings with the specific end goals of arriving at conclusions. Furthermore, putting forward recommendations with regard to the social impact of water shortages on the livelihoods of the community of KwaNonzila.

5.2 Mkhambathini Municipality

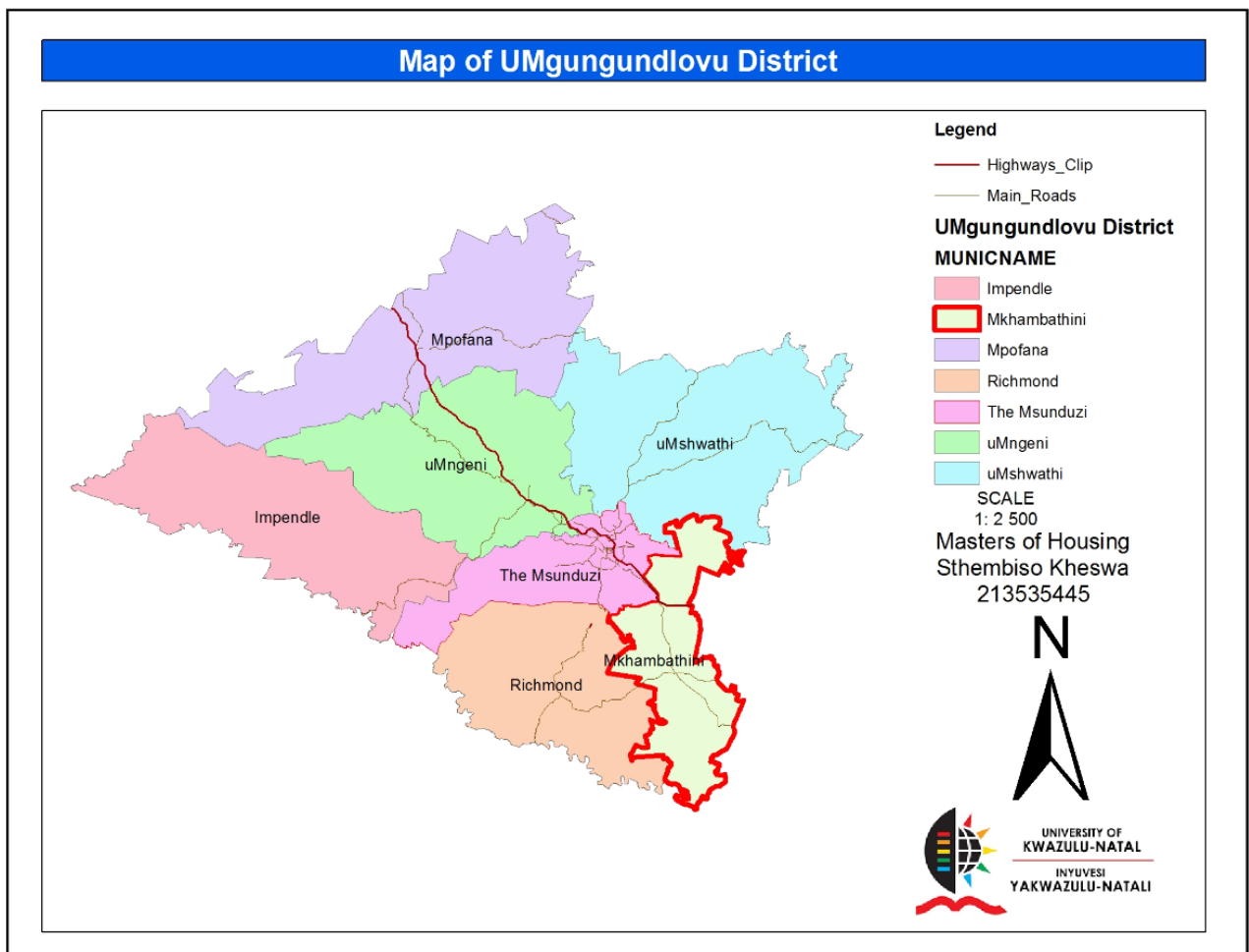
KwaNonzila is located in the Mkhambathini Municipality in KwaZulu-Natal. Mkhambathini is a Zulu word and is derived from eMkhambathini meaning “a place of acacia trees” (Mkhambathini Local Municipality, 2018/19: 12). The Mkhambathini Local Municipality is one of seven local authorities within the uMgungundlovu District Municipality, which is situated in the south-west of KwaZulu-Natal. The Mkhambathini Municipality consists of seven wards, with a large part of the municipality being rural in nature and underdeveloped (Mkhambathini Local Municipality, 2018/19). The towns within the municipal boundaries include Camperdown, Eston and Mid Illovo. The Mkhambathini Municipality covers an area of approximately 917 km² and is the second smallest municipality within the uMgungundlovu District Municipality (Mkhambathini Local Municipality, 2018/19).

Mkhambathini is 24.1 km from Pietermaritzburg (the capital city of KwaZulu-Natal), 23.6 km from the Oribi Airport and 81.4 km from King Shaka International Airport (Mkhambathini Local Municipality, 2012). The Mkhambathini Municipality is located

along the south-eastern boundary of uMgungundlovu District Municipality and adjoins Richmond and Msunduzi local Municipalities to the west, Mshwathi Local Municipality to the north and eThekweni Metropolitan area to the east. The N3 National Road passes through the Mkhambathini Municipality linking it to Durban in the east, Pietermaritzburg in the west and the Gauteng Highveld in the north (Mkhambathini Local Municipality, 2012).

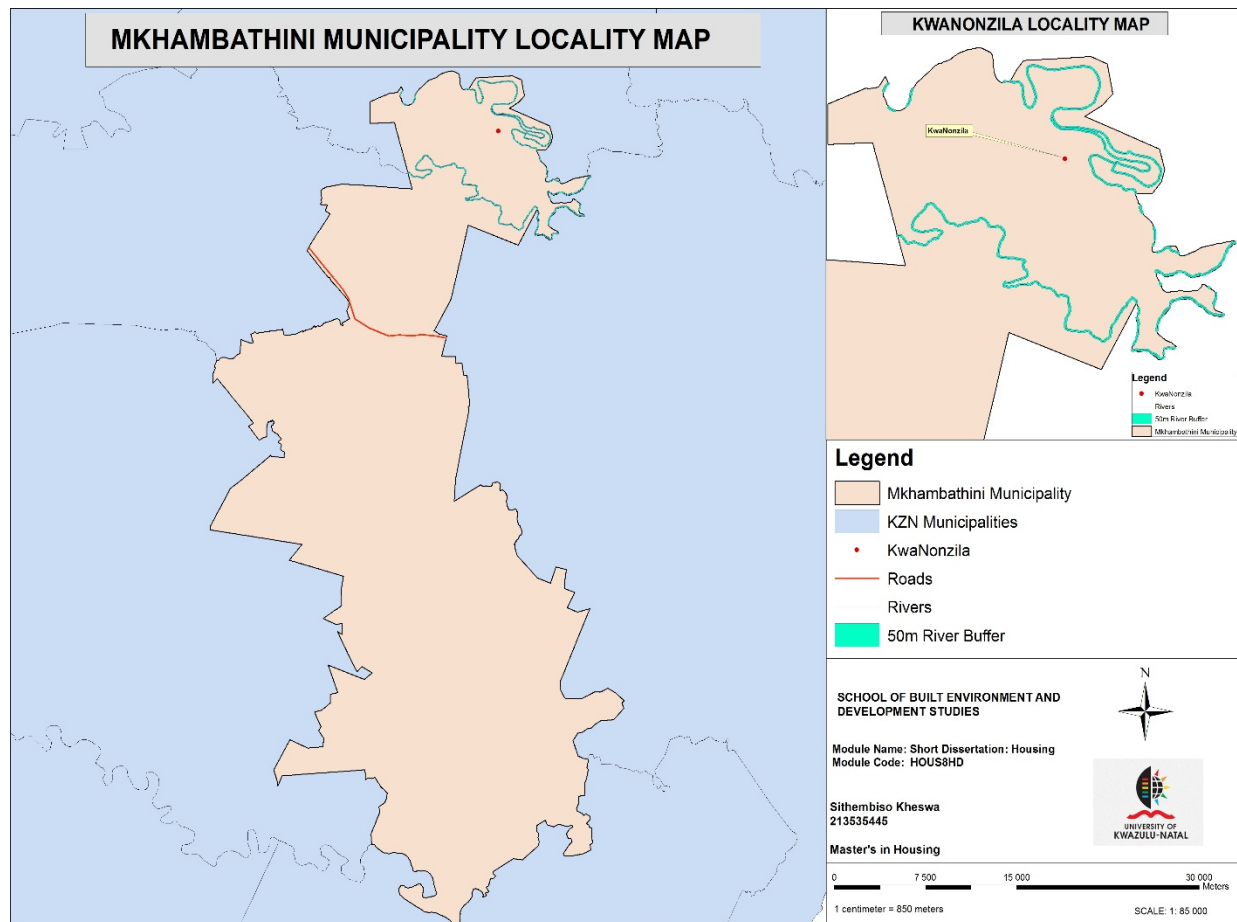
The Mkhambathini Municipality has four traditional authorities namely, Mbambangalo, MaNyavu, Macala-Gwala and Embo-Thimuni (Lehohla, 2012). The municipality is predominantly rural in character and the majority of people reside within traditional authority areas, which are characterised by a high level of poverty. People in these areas cannot afford to build and maintain proper houses, due to high levels of unemployment. Moreover, traditional authority areas were previously excluded from the housing subsidy scheme (Lehohla, 2012).

Map 1: Mkhambathini Municipality Location in the uMgungundlovu District



Source: Author (2018)

Map 2: Geographical Location of Study Area (KwaNonzila)



Source: Author (2018)

5.3 KwaNonzila Demographics

According to Stats SA (2016) KwaNonzila has a population of 2 088. In terms of gender, the population comprises 54% females and 46% males. In KwaNonzila, 54% of the households in the community are headed by females (Stats SA, 2016). During the site visits by the researcher, it was mentioned by community members that many of the males leave KwaNonzila and go to the cities (urban areas) seeking work opportunities.

Since KwaNonzila is located in KwaZulu-Natal, 98,5% of the population speak isiZulu. IsiNdebele and Setswana are the home languages of 0,4% of the population while other languages account for the remaining one percent (Stats SA, 2016).

5.4 Socio-economic and Amenities Information

KwaNonzila falls under a traditional council area known as Manyavu and is situated in Ward 2 of the Mkhambathini Municipality. Few amenities are found within the area and many parts of KwaNonzila are green areas.

There are no health facilities in KwaNonzila. However, there is one clinic in a neighbouring area. The clinic is a small one and is always full and busy. This means that people cannot get medical attention timeously. This leads to them being forced to go to urban areas for medical attention, which is costly in terms of transport. The shortage of medical supplies is another problem in the clinic and the clinic was not designed to cater for a large population of people.

Map 3: IMaguzu Clinic, Located Within a Neighbouring Area of KwaNonzila



Source: Google Maps (2018)

According to the Mkhambathini Local Municipality (2018/19) there are five primary schools, namely, Nonzila, Phangidawo, Mphayeni, Sansikane and Table Mountain in Ward 2. Nonzila Primary School is the school closest to KwaNonzila. There are three high schools, namely, Inhlanhlayabebhuzi, Banqobile and Ngangezwe in the ward. A major concern within the ward is that the youth does not have access to tertiary education. It is believed that is one of the reasons why people in the area work in low paying jobs or cannot find work at all. This leads to poverty within the community.

In terms of economics, Nagle Dam Msinsi (a resort and game reserve) is located within KwaNonzila. It has provided some job opportunities for people within KwaNonzila and neighbouring areas. There are a few tuck-shops in KwaNonzila owned by people in the community and which sell commodities such as bread and cool drinks. Brick making is one of the business ventures that the people in the community partake in.

Map 4: Location of Nagle Dam in KwaNonzila



Source: Google Maps (2018)

5.5 Livelihood strategies

Through the observation lens of the researcher, the most common livelihood strategy used by the community of KwaNonzila is subsistence farming. Subsistence farming is considered an easier way for the households in the community to provide for their families. It is cheaper and more convenient for people who are living in a poverty-stricken rural settlement to engage in. In many households within the area, herding cattle as livestock is another livelihood strategy.

5.6 Housing Typologies in KwaNonzila

There are different types of houses found in KwaNonzila. Most houses found in the area are traditional detached houses. Many of these are not in good condition, with cracks being the main problem. The poor condition of the houses is reflected in the Nonzila Primary School where part of the school building collapsed. As in many rural settlements, hut houses are also found in KwaNonzila. These hut houses are usually made of mud, wood, cow dung and zinc tiles. There are a few RDP houses that were built by the government. These RDP houses are the only ones in the community that are able to accommodate JoJo tanks for water storage.

The following section of the chapter, covers the data presentation, interpretation and analysis. The research findings were obtained from the questionnaires administered to 30 households in KwaNonzila, an interview with a senior technician in water and sanitation at the uMgungundlovu District Municipality and personal observation by the researcher. The technician was the person responsible for water services in Mkhambathini Municipality and, more specifically, in KwaNonzila. The findings were used to provide an answer to the main research question (that is, what is the impact that water shortage has on the livelihoods of the people of KwaNonzila settlement?).

5.7 Data Collected from Households in KwaNonzila

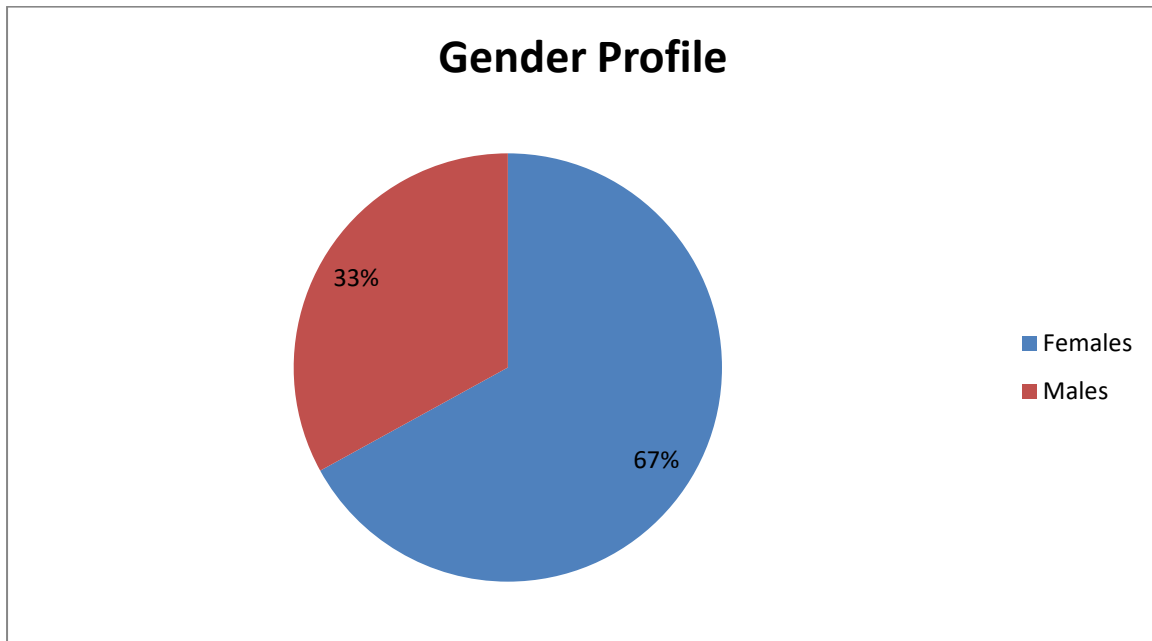
This section presents the data obtained from the questionnaires administered to the 30 respondents who participated in the study.

5.7.1 Demographic Characteristics of the Respondents

The respondents that participated in the study were mainly female since they accounted for 67% of the respondents whereas the male counterparts accounted for

33%. This could be due to the fact that, as pointed out, there are more females in rural areas as most males migrate to pursue economic opportunities in urban areas. This male female ratio is reflected (albeit to a much lesser extent) in national statistics with females comprising approximately 51% of the population and males approximately 49%. Figure 2 below reflects the gender profile of the respondents.

Figure 2: Gender Profile of Respondents



Source: Field survey (2018)

5.7.2 Employment Status of Respondents

Table 1 below indicates the employment status of the 30 respondents. Respondents had to indicate whether they were employed full-time, part-time, casually employed, self-employed or unemployed. As reflected in the table, the largest percentage (33%) of respondents were unemployed with 10 respondents indicating this. Seven respondents were casual employees, 5 part-time, 4 self-employed and a further 4 (13%) had full-time employment.

Table 1: Employment Status of Respondents

Employment Status	Intervals	Percentage
Full-time	4	13
Part-time	5	17
Unemployed	10	33
Casual	7	24
Self-employed	4	13
Total	30	100

Source: Field survey (2018)

The findings above highlight that a third of the respondents in the case study area are unemployed and this verifies the contention that rural settlements are characterised by high unemployment rates.

5.7.3 Economic Profile of KwaNonzila

Due to the high levels of unemployment in KwaNonzila, several community members become entrepreneurs in order to sustain their livelihoods. One of the notable businesses that they engaged was brick manufacturing, which requires water. However, due to water shortages, this business was often affected since bricks cannot be manufactured without water.

5.7.4 Educational Profile of KwaNonzila

KwaNonzila Primary School (see Figure 3 below) is the only school in the community. The school receives water from two water tanks which provides students with water. One of the respondents asserted that the school runs out of water and this results in the school taking half-days since water, as a basic resource, was unavailable. In some instances, the school had to send children back home before midday. This was due to the fact that water requested to fill the tanks was not delivered to the school at the scheduled times, and this meant that children were deprived of water. This had a ripple effect on the education – the children had difficulties concentrating since they were dehydrated.

In worst-case scenarios the children would leave school and go to neighbouring households to fetch some water to stay hydrated. In several households it is the children's (mainly girls) responsibility to fetch water, prior to, and in some cases after school in order to do their daily chores. This to a certain extent affects the time that they have for their schoolwork, since fetching water depends on where the body of water is located and the distance to it. Those that fetch water prior to going to school often do so to assist their family, but this affects their punctuality since they have to fetch water, leave it at home, and then go to school. This, clearly, will have a negative impact on their learning.

In terms of hygiene, the conditions in the classrooms are not good. In KwaNonzila Primary School in particular, the classrooms accommodate many children over their carrying capacity. The over-crowded classrooms mean that person-to-person contact

is very common and happens on a daily basis. Malnutrition and other underlying health problems are common in the school. The school (as well as others in surrounding areas) lacks sanitation and hand-washing facilities. Girls and boys are likely to be affected in different ways by inadequate water, sanitation and hygiene conditions in the schools especially in the high schools in the area. Girls, particularly in high school, are more affected than boys because the lack of sanitary facilities means that they cannot attend school during menstruation.

These findings are aligned with the literature in Chapter three which documented how females carry the burden in rural areas where there are water shortages. As pointed out by the UNDP (2006,32) “Women and young girls carry a double burden of a disadvantage since they are the ones who sacrifice their time and their education to collect water”.

Figure 3: KwaNonzila Primary School



Source: Author (2018)

The findings provided in this section are in agreement with the hypothesis of the study, namely, that water shortage in rural areas deprives the people of social justice and quality of life leading to poor livelihood strategies. In this instance, children are being deprived of getting a proper education due to water shortages. This leaves them academically behind children who attend schools in the urban areas. As a result, the

children in KwaNonzila are at a disadvantage which will affect them in the long run. For example, they miss out on opportunities of receiving bursaries and scholarships due to poor marks from not receiving a full and proper education. This perpetuates the cycle of poverty in the families and in the community as a whole. Several of the youth in KwaNonzila dropout in high school or should they complete high school, do not progress further academically.

5.8 Effects of Water Shortages on Livelihoods

One of the questions asked respondents what the social challenges they faced in the family due to water shortages were. Based on the responses a theme was developed, namely, the impact of water shortages on people's livelihoods. The developed theme was aligned with one of the objectives of the study: To assess the extent to which water shortage affects livelihoods in the settlement of KwaNonzila.

5.8.1 Households

In Chapter three, Chambers and Conway (1991) asserted that a "livelihood comprises of the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base".

Water shortages have posed a challenge for people in KwaNonzila since they cannot easily recover from the stress and shocks of such shortages, as highlighted above when school children have to leave school because of the lack of water. Several respondents stated that they have difficulties running their households because of water shortages, since basic chores and preparing food require water. This affects their households since they can only do so much without water. Searching for water and collecting it requires resources and energy, which becomes problematic.

One of the respondents referred to a disabled elderly person living in one of the households. When there are water shortages it is difficult for the disabled individual to get water since they live alone. The respondent also emphasised that fetching water is both a time-consuming and strenuous process even for those who are not disabled.

It is understandably more severe for the disabled individual that lives alone, since they have to fend for themselves.

5.8.2 Dependence on Agriculture

One of the questions asked was whether families depended on agriculture for subsistence or commercial farming, and a majority (63,4%) of the respondents asserted that they engage in subsistence farming to support their livelihoods. One of the respondents stated that they engage in commercial farming whereas 10 respondents stated that they do not depend on either subsistence or commercial farming. The findings are depicted in Table 2 below.

Table 2: Dependence on Agriculture

Dependence	Interval	Percentage
Subsistence Farming	19	63,4
Commercial Farming	1	3,3
No form of Farming	10	33,3
Total	30	100

Source: Field survey (2018)

As noted above a majority of households depend on subsistence farming in order to feed their families. However, a significant challenge that they face is that of water shortages as without water either the seeds will not germinate or the crops will die. Furthermore, households cannot use just any water irrigation system since water that is from an unreliable source could be harmful for the crops and the families that consume them. One of the respondents pointed to the problem stating that:

“We can’t irrigate the crops properly due to water shortages”.

The impact of water shortages affects productivity which ultimately affects the well-being of families. They cannot irrigate their crops due to the fact that there is either limited or no water in the area of KwaNonzila.

However, there were several respondents who asserted that:

“No, I fetch water from the river but it is tiring because it is far”.

This assertion indicates that even though the community members experience water shortages the river has water. However, one may argue that it is limited and needs to be purified. Furthermore, the distance to the river was another challenge mentioned making it difficult to collect sufficient water to irrigate.

Age was also pointed to as a challenge. One of the older respondents asserted that: *“I’m old, I cannot fetch water from the river or water tanks and I can’t see properly”*.

The old people in rural areas often require assistance to access water, since their health and well-being are not good. As the older respondent above mentioned, their eyesight is poor and the distances involved in accessing water (from either the tanks or river) make it difficult if not impossible to do. Without the necessary assistance from neighbours or family members to access water they could suffer from severe health implications such as dehydration.

It was noted in Chapter two, that the BHN Approach talks about “identifying and supplying resources that are universally needed such as water, food and housing” (Reader, 2006). The BHN Approach seeks to identify what people need in order to survive and have a sustainable life. The findings on the effects of water shortages, show that households in KwaNonzila are struggling to live a sustainable lifestyle. The findings suggest that most people in the settlement depend on subsistence farming in order to feed their families. In this regard, water is a crucial commodity for ensuring that crops manifest into edible food.

In Chapter two it is stated that “access to water for productive uses such as agriculture and family businesses are vital to realize livelihood opportunities, generate income and contribute to economic productivity’ (United Nations Water, 2015,44). This statement underscores the importance of farming for the families who are dependent on it. It can create sustainable livelihoods for families and can also create opportunities for the upcoming generation to break the cycle of poverty which exists within families and the community.

5.9 Coping with Water Shortages

The respondents were also asked about how they function with the problem of water shortages. This question was aligned with the first objective which sought to assess how the settlement of KwaNonzila functions with the problem of water shortage. In analysing the responses, a theme emerged that was aligned to the objective.

It is evident that the community members of KwaNonzila have adopted some of their own strategies in order to access water. Unfortunately, most of their strategies are

unsustainable, unsafe and unreliable; hence the municipality has developed strategies to assist. However, the strategies that the municipality has developed are temporary and are not effective in terms of satisfying the needs of the whole community. The strategies adopted to address the issue of water shortages are outlined and discussed below.

5.9.1 Connecting Pipes to Wells

The community members of KwaNonzila have developed creative ways to access water, such as connecting pipes to safely-made wells in the mountains. The water is sourced from rain and underground and each household in the community has their own pipe. The pipes are interconnected and this is done to ensure that every household receives water from the wells. However, it is regarded as a frustrating process as some community members, once they have received water, forget to connect the pipes for the next household. This means that other households are affected by the actions (or rather lack of action) of the individual that has received water. The process is thus regarded as unsustainable and problematic – if the pipes are not connected and the relevant households are not available to connect them, the community members find themselves without water.

In some instances, community members have to contact the relevant households in order for them to connect the pipes. However, if those households are unavailable the members have to travel in order to connect the pipes themselves and so be able to access water. In the event of heavy rains or flash floods the wells can get damaged, which poses a challenge for community members, especially since it is expensive to maintain and fix infrastructure. Despite this, community members do go to the mountains to rebuild or fix the wells, because their need for water is an urgent one.

One of the respondents pointed out that:

“The water from the wells sometimes is dirty and they don’t taste good”.

This is a further challenge since community members require more resources to purify the dirty water. One respondent, however, stated that it is better to have dirty water that could be utilised for irrigation than to be without water at all. The picture in Figure 4 below shows pipes that are connected to one of the wells that exist in KwaNonzila.

Figure 4: Pipes Connected to Well



Source: Author (2018)

The picture highlights that the interconnected pipes are not a sustainable strategy since they can be easily disconnected and easily damaged. As noted, the pipes are connected to wells in the mountains to source water which is used for the household and/or agricultural purposes.

In Chapter three, water-related diseases acquired from drinking unclean water were outlined. These diseases include diarrhoea, cholera, typhoid fever, shigella and campylobacter. Drinking water from the wells is unsafe and can lead to one of the aforementioned water-related diseases.

5.9.2 Water Tanks

Another strategy that was adopted by the local municipality was to provide water to the community of KwaNonzila by using water tanks. Bulk water delivery trucks deliver water to the community once a week. JoJo tanks in the community are used to store the water delivered by the trucks. (Refer to Figure 5 below.) Such a strategy is not without its problems. In this regard one of the respondents pointed out that:

“The water in the tanks quickly runs out and is not enough for the whole community”.

This statement indicates that the strategy adopted by the local municipality is not a sustainable long-term solution, since the water that is delivered once a week is not enough to support the whole community. When the bulk water delivery truck comes to deliver water, most households send children to go fetch water from the water tanks

using buckets to carry the water and the tanks are soon empty. There are only four JoJo water tanks for the entire community of KwaNonzila and even though these are filled each week one may argue that the local municipality should look into increasing the number of JoJo tanks to increase the water supply for the week.

Figure 5: Water Truck Filling a JoJo Tank



Source: Author (2018)

5.9.3 Water from Rivers

Fetching water from a river in rural settlements like KwaNonzila has been a long-term strategy for accessing water. The respondents agreed that most households go to the river to fetch water for their needs and chores. In most households' women are responsible for fetching water from the river. As mentioned, old people are often challenged since they are unable to carry water from the river back to their homes, which is the reason why they send children to do so. In many cases, instead of collecting water from the river to do their chores such as laundry, the community members do their laundry in the river. This means that they further pollute the water body since they add chemicals which react with water. Water from the river, therefore, is not clean. Apart from the washing, this is also due to the fact that people from the community dispose their waste in the river, highlighting poor waste management. Furthermore, livestock such as cows and cattle, consume water from the river and, in some instances, defecate in the river. Figure 6 below illustrates that KwaNonzila has

a small river that is expected to provide the community members with water. In winter, when the river dries up, the community experiences severe water shortages.

Figure 6: River in KwaNonzila Used for Domestic Purposes Such as Laundry and Drinking



Source: Author (2018)

According to the literature reviewed in Chapter three, women are the ones responsible for collecting water. The women in KwaNonzila are not an exception and they too are responsible for collecting water illustrating the gender inequality which exists.

5.9.4 Rain Water

In KwaNonzila there are a limited number of government subsidised houses that were planned with water shortages in mind since each house has a small JoJo water tank next to it. The JoJo tanks play a significant role in water provision since, as has been emphasised, access to water is a continual challenge for the community and that is the reason why the subsidised houses were planned as they were. Houses that were constructed by community members without assistance from government as well as old subsidised houses were not supplied with JoJo tanks and it is these houses that have to depend on the bulk water supply via the communal water tanks for access to

water. Those households that have JoJo water tanks are able to store rain water whenever it rains as well as store water that is collected from wells or the river.

These findings are aligned with the hypothesis of the study. Due to water shortages in KwaNonzila, people have to depend on unsafe and unreliable water sources (poor livelihood strategies). Consuming water from the river and the wells is not safe and the bulk water supply is inadequate. In terms of safety, a person's head was actually found in one of the wells (see below). After this incident, a skin rash epidemic occurred in the community and whether this was a result of the contamination of the well is not known. However, people in KwaNonzila are not living a life as full as that of other people – they are deprived of social justice.

5.10 Health Complications due to Water Issues

One of the questions that was asked, was whether there was any incidence of water-borne diseases in the community that were caused by utilising unreliable water sources. Interestingly, despite the skin rash epidemic above, the respondents asserted that there were none. One may argue that the human head found in one of the wells that people use to access water was a serious health hazard that could have had serious outcomes for the community (more serious than the skin rash). The respondents might have said there were no health-related challenges due to water shortages because none of them got sick or had heard of those that did get sick because of consuming water from the well contaminated by the human head. Furthermore, they may have viewed the skin rash epidemic as not serious enough to mention. Nonetheless, the head in the well was a grave health risk for all those that consumed water from that well.

5.11 Causes of Water Shortages

One of the objectives of the study was to determine the causes of water shortages in the settlement. The findings in terms of this objective are presented and discussed below.

In line with the objective, a crucial question asked of respondents was “What are the causes of water shortage in the community?” According to the respondents there was

one dominant cause of the water shortages, namely, the lack of infrastructure in the community. One of the respondents bluntly asserted that:

“The local municipality does not supply us with water and infrastructure”.

The assertion of the respondent is aligned with the fact that local government has only recently started considering the water shortage issue since the recent subsidised houses have, as mentioned, small JoJo water tanks to assist the households. However, since the community is not provided with a sufficient supply of water via the bulk water strategy (as described above) it has to depend on the river and wells located on the mountains to supply the shortfall and this supply, also as mentioned above, is very problematic. Essentially, as asserted by the respondent, there is a lack of infrastructure to provide water in the community including JoJo water tanks to supply those living in the old government subsidised houses and in the houses constructed by community members.

Another respondent raised a valid point, stating that besides infrastructure, the causes of water shortages was due to the:

“Abuse of water in water tanks by community members”.

The reason why the respondent raised this point was because community members were not restricted to the amount of water, they could collect from the water tanks; hence those who collected water immediately when the bulk water delivery truck supplied the JoJo tanks often wasted it. More water was collected than necessary and those doing so simply did not consider the next person. As a result, the supplied water quickly ran out and, because of this, could not sustain the community of KwaNonzila for the entire week.

Directly linked to the inadequate quantity of water supplied was the following comment by one of the respondents:

“The bulk water delivery trucks do not come often enough”.

This could be related to the fact that there are insufficient water tanks and the fact that water is only delivered once a week. Indeed, it was pointed out by one of the respondents that the supply of water for the community was inconsistent. Thus, despite the JoJo water tanks being, in the main, responsible for the supply of water to the community of KwaNonzila there are not enough and they are only filled once a week. In addition, the schedule for doing so is often irregular. This situation, together

with the other issues relating to the wells and the river mentioned above, leads to water shortages in the community.

Given the above, it is evident that the most noted cause of water shortages in KwaNonzila is the lack of water-related infrastructure. There is a lack implementation of both communal and dwelling taps and local government has not provided the bulk infrastructure necessary to supply water for each household. Furthermore, households that were provided with water from taps no longer receive water since the taps have run dry.

5.12 Issues Raised by the Water and Sanitation Official

To fully understand what components and procedures go into the provision of water supply, the researcher conducted an interview with the senior technician of uMgungundlovu responsible for water supply in KwaNonzila. The interview was considered all important in getting more precise data regarding the water situation in KwaNonzila, the challenges the municipality face with the supply of water and future plans to solve the problem of water shortages. It is important to note that the uMgungundlovu District is responsible for the supply of water to the Mkhambathini Municipality. Furthermore, the uMgungundlovu District receives its water supply from Umgeni Water.

In line with one of the objectives of the study, the researcher asked what the challenges faced by the community of KwaNonzila with regards to water supply were. In response, the technician referred to the general water challenges faced by Maqonqo, the area under which KwaNonzila falls. According to the technician, the challenges faced by the whole area of Maqonqo are water supply and water reticulation.

In terms of supply, Umgeni Water supplies the area with water through their pump stations. Water is pumped into the intermediate reservoir which caters for the area. The tank main is 150 mm and was designed to cater for the communities in the past. However, the increase in the number of households has led to the demand for water being greater than the supply.

The technician stated that:

“The challenge is the supply of water but we are expecting Umgeni Water to upgrade their pipe, once they have the funding. We get 1 mega litre per day from Umgeni Water, of which this area needs, 2, 5 mega litres per day. So, they are only able to give us one. Immediately once they upgrade this pipe, that’s when they will be able to give us 2, 5 mega litres.”

The second challenge mentioned by the technician was that of water reticulation. According to him:

“Reticulation, there are many illegal water connections in the area, which is not easy to deal with. It takes a long time to fix, because you don’t know where the illegal connection is but the people are connecting for themselves in order to have access to water.”

The technician did point out that there was a way of mitigating the challenge of water reticulation. To do so, the water is “switched off” at approximately 7 o’clock at night and this allows the reservoir to fill. The reservoir is closed at the outlet and by morning is full once more at which time (around 6 o’ clock) it is reopened for use. When asked if there was any noticeable success in this strategy to mitigate the challenge, the technician replied in the affirmative:

“Yes, it helps because we don’t lose water at night, all the water leaves during the day so everyone can have access to it.”

According to the technician, uMgungundlovu has engaged with Umgeni Water and they are planning to upgrade the pipe that supplies them with water. He further stated that *“Even if we have a good scheme put in place but if we don’t have water supply, nothing will work.”*

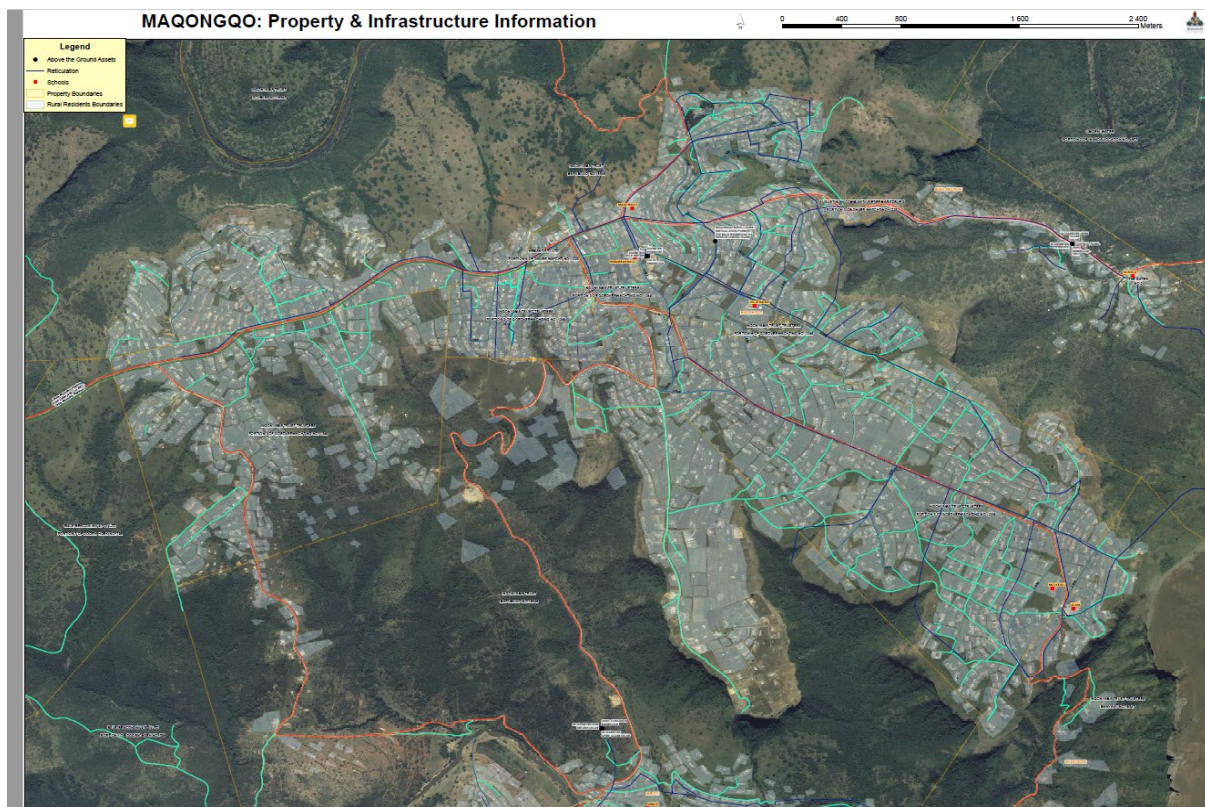
In closing the interview, the senior technician remarked that there was a water project taking place in KwaNonzila. It was adopted in 2017 and aims to ensure that people receive clean water that is consumable and on a sustainable basis.

One of the theories used as a lens for this research study was Systems Theory. As noted in Chapter Three, “The theory seeks to solve problems that exist within organizations, groups and governmental structures, which align with each other”. From the interview with the senior technician it was established that water supply was the

main challenge in KwaNonzila. This was due to the fact that the pipe supplying water was too small to cater for the whole area of Maqonqo. Umgeni Water, which is a government entity, is part of the local government structure. The local government is responsible for the supply of water services in local municipalities. Since uMgungundlovu is responsible for the supply of water in the Mkhambathini Municipality, the problem of the pipe should be solved between Umgeni Water and the uMgungundlovu District Municipality. Both entities are part of governmental structures and should, in line with Systems Theory above, work as one in order to solve the water problem.

The maps below (Maps 5 and 6) illustrate the water networks, property and infrastructure information of Maqonqo.

Map 5: Maqonqo: Property and Infrastructure Information



Source: uMgungundlovu District (2018)

Map 6: Water Supply Infrastructure in KwaNonzila



Source: uMgungundlovu District (2018)

5.13 Summary

This chapter provided an overview of the case study area of KwaNonzila. The researcher started by giving a background to the municipality (both local and district) that govern KwaNonzila to indicate where the settlement gets its services, including water provision. The demographics of KwaNonzila were outlined and this was followed by socio-economic and amenities information. The chapter ended with a description of the livelihood strategies within the community and the types of houses in which the people of KwaNonzila live.

The chapter also comprised of the presentation and discussion of the findings. Data was collected via questionnaires from a sample of community members of KwaNonzila as well as an interview with the senior technician for water and sanitation in the uMgungundlovu District Municipality. A third method by which data was collected was observation by the researcher. In analysing the data, various themes were developed which were aligned with the objectives underpinning the study.

Findings regarding how the community members deal with water shortages and the ripple effects that they experience were presented and discussed. The respondents were of the opinion that the main reason for water shortages was due to a lack of

infrastructure. The technician, however, stated that the reason for water shortages in KwaNonzila was, in the main, due to the demand surpassing the supply. It is also important to note that the findings were aligned with the hypothesis of the study.

Chapter Six: Summary of Findings, Recommendations and Conclusion

6.1 Introduction

This chapter provides a summary of the findings, recommendations on the research problem at hand and ends with a conclusion to the study. The recommendations are based on the issues raised by the municipal official and respondents, as well as the theoretical framework. The research question and sub-questions are placed within the themes which emerged from the analysis of the data and these further inform the recommendations made. The questions served as a guide to assess whether the objectives of the study had been answered.

6.2 Summary of Findings

The conceptualisation of the study was formed from its hypothesis, namely, that water shortage in rural settlements deprives the people of social justice and quality of life leading to poor livelihood strategies. In order to accomplish the study's aim, a qualitative method was employed. In addition, the researcher also adopted a theoretical framework directing the study. A questionnaire was administered to a sample of residents in the settlement of KwaNonzila. In addition, an interview was conducted with the senior technician responsible for supplying water in KwaNonzila and observation of the area was carried out by the researcher himself.

The information collected from the respondents was analysed and three main themes emerged from the data. These are as follows:

6.2.1 Coping with Water Shortages

On the point of how the community of KwaNonzila functions with water shortages, the study found that the community has adopted its own strategies in order to access water. These strategies include connecting pipes to wells and fetching water from the river. These strategies are unsustainable, unsafe and unreliable. An example of this was the human head found in one of the wells and the subsequent outbreak of a skin rash epidemic in the community.

The local municipality under which KwaNonzila falls has adopted strategies to assist the community. These strategies include providing communal water tanks and smaller JoJo tanks to houses built by the municipality. These strategies are also unsustainable because the water provided in the communal tanks is insufficient in catering for the whole community; while the JoJo tanks are only provided for the few houses which were built by the municipality. These findings are aligned with the hypothesis of the study, namely, that the people of KwaNonzila are deprived of social justice and quality of life which has led to poor livelihood strategies.

6.2.2 Causes of Water Shortages

As far as the causes of water shortages in KwaNonzila are concerned, the study found that the two main causes were lack of infrastructure and the abuse, by the community, of the water stored in the communal tanks. In terms of lack of infrastructure, while some of the households in KwaNonzila have had pipes and taps installed, not a drop of water has come from these taps. The researcher was informed that a new project is currently taking place in KwaNonzila with the installation of water meters and new pipes. However, according to the respondents, this is not the first or second time that such a project has taken place in the community and receiving water from the pipes to the taps has yet to occur.

With regards to the abuse of water, the study found that community members were not restricted in the amount of water they could collect from the communal water tanks. As pointed out, there are only four water tanks servicing the KwaNonzila community and they cannot cater for the whole community. That is why community members rush to the water tanks as soon as they are refilled and collect as much water as they can for their households. This quickly leads to depletion of the tanks and, as a result, other households are left with no water at all.

6.2.3 Effects of Water Shortages on Livelihoods

With regards to the effects of water shortages on the livelihoods of the community of KwaNonzila, the study found that it is difficult to run a household in a community that faces water shortages; preparing food, doing the washing and cleaning all require water. This negatively affects the households since they can only do so much without

water and proper sanitation. Furthermore, searching for water and collecting it requires resources (such as time and energy) which can be problematic.

Many households in the community of KwaNonzila use subsistence farming as a way of supporting their families. According to the findings 63,4% of the respondents use such farming as a way of feeding their families. However, the challenges that they face include seeds not germinating or their crops failing to thrive due to a lack of water. Furthermore, they cannot simply use water irrigation systems since the source of that water could be unreliable and thus potentially harmful for their crops and their families that consume them.

Schools in the community are also affected by water shortages. This mainly affects the children and they are deprived of receiving a proper education. The schools sometimes run out of water, and this leads to children being sent home early thus missing educational instruction that had been time-tabled for the day. Apart from the possibility of dehydration from not having safe drinking water, sanitation and washing facilities are also affected. Girls in high school are particularly impacted by water shortages. Rural learners are, therefore, at a disadvantage when compared to their counterparts in urban areas or cities.

In summary, the findings indicate that water shortages in the community of KwaNonzila deprive the people of social justice and quality of life leading to poor livelihood strategies. To reiterate: The main problems facing the community is the lack of water-related infrastructure and an insufficient (and at times, inconsistent) supply of water.

6.3 Recommendations

Water shortages have been a very sensitive issue in the rural settlement of KwaNonzila. It is evident that this challenge has been a persistent one without any significant change to the status quo. The community of KwaNonzila is faced with the serious problem of a limited water supply. In the light of the findings, this section, therefore, recommends some actions to be considered in order to address the water shortage issue that is prevalent in KwaNonzila (but not in other areas of Maqonqo).

6.3.1 Addition of Water Tanks

It was noted that there were four JoJo water tanks in the settlement of KwaNonzila that were filled with water by the bulk water delivery truck once a week and which supplied the community with water. However, this is inadequate as pointed out by a respondent who asserted that *“The water in the tanks quickly runs out and is not enough for the whole community”*. It is recommended that the local municipality increases the number of water tanks that supply the community with water. Furthermore, while the RDP houses in the community were provided with JoJo tanks at the time of being constructed, consideration must also be given to supplying the other non-RDP houses in the community with similar tanks. This would be a good solution as, according to Steduto, Hoogeveen, Wimpenny and Burke (2017), at household and community levels, small decentralized water harvesting and storage systems have increased the availability of water and boosted agricultural production.

6.3.2 Change the Water Supply Pipes

During the interview with the senior technician for water and sanitation it was noted that Umgeni Water supplies KwaNonzila with water through their pump stations. While the main tank which was designated to supply the community in the past was able to provide sufficient water, increased population and the consequent increased demand for water has meant that the current supply of water is insufficient to cater for the community. As the technician pointed out *“We get 1 mega litre per day from Umgeni Water, of which this area needs 2, 5 mega litre per day”*. To rectify this issue, it is recommended that the water pipes that supply the settlement of KwaNonzila be changed in order to cope with the needed increased flow of water. In doing so, not only current demand must be addressed but future demand must also be kept in mind.

6.3.3 Ensure Equality in Distribution of Water in Maqonqo

The United Nations Water (2007) states that for poor people, water shortage is not only about droughts or rivers running dry. However, it is also about guaranteeing the fair and safe access they need to sustain their lives and secure their livelihoods. The water shortage issues as outlined are predominant in KwaNonzila, whereas in Maqonqo (of which KwaNonzila is a part) there are areas that do not experience these issues. There are thus disparities in the manner in which water is provided and in the manner in which the different community members access the water. Given this, local

government should commit to ensuring that there is equal distribution of water even though there may be water shortages. Also to be considered is the fact that KwaNonzila has always suffered from water shortages whereas other surrounding areas have not. Local government should investigate why this situation exists and, on the basis of the findings, take the necessary remedial action.

6.3.4 Provision of Water Infrastructure

According to the DWS (2018) South Africa is facing water shortages caused by insufficient water infrastructure investment and maintenance. The findings of the study give credence to this assertion as several respondents pointed to the lack of water infrastructure being a major reason why the community of KwaNonzila was experiencing water shortages. Given this, it is recommended by the researcher that local government, through the Integrated Development Plan of the Mkhambathini Municipality, prioritizes the lack of water infrastructure as one of the cross-cutting issues faced by the municipality.

6.4 Conclusion

In conclusion, the study has critically investigated the social impact of water shortage on the livelihoods of the households in the settlement of KwaNonzila. The study has explored the factors that contribute to the water shortages in KwaNonzila by investigating the experiences and perspectives of 30 heads of households in the settlement. In addition, an interview with a senior water and sanitation technician was helpful in terms of determining the reasons why the community of KwaNonzila was not receiving an adequate water supply. It was noted that the area has dealt with the issue of water shortages for an extended period without any solutions being offered.

The study found that water shortages do indeed impact on the livelihoods of the rural community of KwaNonzila, and one can therefore argue that the aim of the study was achieved. For example, it was through the study that the issue of the elderly not accessing water easily was noted; that children fetching water had implications for them in terms of doing homework and punctuality and thus their education generally; and the fact that the water supply in KwaNonzila was, in short, insufficient. The literature review provided an overview of water shortages and their impact and assisted in terms of noting the disparities amongst different countries that experience

such shortages. Hence, it was important to highlight why water is a basic human need (as was done in the study) before highlighting water shortages on a global and national scale.

The study concludes by stating that the best way to rectify the water shortage issue would be to have a multidisciplinary approach that would address the current situation and ensure that the future is catered for as well. Therefore, it is crucial that local government and Umgeni Water should develop a solution that is not only short-term but long-term as well.

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ANNEXURE 1

Questionnaire for the community of KwaNonzila

Personal Questions

1. Please tick.

MALE	<input type="checkbox"/>
FEMALE	<input type="checkbox"/>

2. How long have you lived in KwaNonzila?

.....
.....

3. Employment status. (Please tick)

Full-time	<input type="checkbox"/>
Part-time	<input type="checkbox"/>
Unemployed	<input type="checkbox"/>
Casual	<input type="checkbox"/>
Self-employed	<input type="checkbox"/>

4. If unemployed, how does the family survive?

.....
.....

5. Does the Family depend on agriculture for subsistence or commercial farming?

.....
.....

6. Do you have a challenge of water shortage in this area?

.....
.....

7. If yes, does water shortage affect your productivity in terms of work and agricultural activities?

.....

Questions on water related challenges

8. What are the causes of water shortage in the community?

.....

9. What are the social challenges you face in the family due to water shortage?

.....

10. How does the community function with the problem of water shortage?

.....

11. Do you think the youth is affected academically by water shortage in the community?

.....

12. What kind of water sources are found in the community? (Please tick)

Rivers	
Spring water	
Taps	
Wells (Isiphethu)	
Water Tankers	

Other	
-------	--

If other, mention it

.....

13. Which of these water sources are used for drinking/consumption purposes?

.....

14. Are they safe to use? (Please tick).

YES	
NO	

Support your answer

.....

15. What are the main challenges with regards to accessing water? (Please tick)

Water is not safe	
Insufficient water	
Poor infrastructure of water services (broken pipes)	

16. Where do social facilities such as schools and clinics get water from?

Water Tankers	
Rivers	
JoJo's	
Other	

If water Tankers, how many times do they get the supply per month/week?

.....

.....

Water borne diseases

17. Has there been records of water-borne diseases in the community?

YES	
NO	

If YES, is it still a challenge even today?

.....

.....

Relationship between the
community of KwaNonzila and the
Municipality

20. To whom does the community report water problems? (Please tick)

Traditional leaders	
Councilor	
Local Municipality	

21. What measures have been put in place by the local municipality in order to alleviate water shortage in the community?

.....

.....

22. How do you think the problem of water can be solved in our area?

.....

.....

ANNEXURE 2

Semi-structured in-depth research questions

1. What are the water-supply challenges that the community of KwaNonzila is facing?

.....
.....

2. What solutions have you implemented to mitigate the water-supply challenges?

.....
.....

3. Has there been any notable success in these solutions?

.....
.....

4. What role has the community played, in order to help themselves with the water shortages that it is facing?

.....
.....

5. How do you assist those who run community gardens with water?

.....
.....

6. How do you assist those who do farming?

.....
.....

7. Since water shortage is still a problem, how is the municipality planning to resolve this problem going forward?

.....
.....

8. Has the water-shortage challenge been documented within municipal plans, such as the Integrated Development Plan?

.....
.....

9. How will the municipal plans ensure that this water-shortage challenge is addressed to ensure sustainable development?

.....
.....

10. Have there been any water projects implemented in KwaNonzila?

.....
.....

11. What notable success or downfalls did these water projects have in KwaNonzila?

.....
.....

12. When was the current water project adopted?

.....
.....

13. How is the current water project taking place in KwaNonzila different from the previous water projects that have taken place in the community?

.....
.....

14. What is the overall aim for this current water project in KwaNonzila?

.....
.....