

**WATER SCARCITY AND WATER DEFICIT IN THE LEPELLE-NKUMPI LOCAL
MUNICIPALITY: LIMPOPO PROVINCE**

by

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DECLARATION

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Water scarcity and water deficit in the Lepelle-Nkumpi Local Municipality: Limpopo Province

I declare that the above dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.



17/08/2023

Signature

Date

DEDICATION

This research is dedicated to my late family members, my mother Ramaesela Welheminah, my niece Moshe and my sisters Matipane and Dipolelo Maleasenya.

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Xikongomelokulu xa dyondzo leyi a ku ri ku lavisisa mpimo wa ku pfumaleka na ku kayivela ka mati eka Masipala wa Muganga wa Lepelle- Nkumpi, lowu welaka eka Masipala wa Xifundza xa Capricorn eka Xifundzakulu xa Limpopo. Masipala wa Muganga wa Lepelle-Nkumpi wu ya emahlweni wu hlangana na ku pfumaleka na ku kayivela ka mati loko vanhu va ya va karhi va ndlandlamuka endhawini. Hi xikongomelo xa dyondzo leyi, maendlelo yo hlamusela hi vuenti ya tirhisiwile ku hlengeleta mahungu lama fambelanaka na xiphiso xa ndzavisiso. Tiinthavhiyu na mpuxeto wa tidokhumente swi endliwile ku hlengeleta mahungu lama faneleke. Leswi kumiweke swa dyondzo swi humeserile erivaleni leswaku sisiteme leyi hoxekeke ya mphakelo wa mati leyi vangaweke hi ku pfuta ka tiphayiphi na tiphayiphi leti bulukeke swi nghanisile xiave eka ku pfumaleka na ku kayivela ka mati endhawini. Mabindzu na mindyagu swi khumbekile swinene hi ku tsemiwa ka mphakelo wa mati, leswi vangeke ku lahleka ka mianakanyo ya bindzu, naswona mindyangu a yi fanele yi xava mati.. Hambiswiritano, swi vonaka onge masipala wu le ku endleni ka matshalatshala yo antswisa nhlayiso, na ku lunghisa, sisiteme ya mphakelo wa mati, hambileswi ntirho lowu endliweke eka nkarhi wa sweswi wu vonakaka wu nga ringanelanga ku ololoxa mintlhontho hinkwayo ya nkayivelo wa mati. Hi ku ya hi leswi kumiweke, ku bumabumeriwile leswaku masipala wu anakanya ku borha tindhawu totala ta mati endhawini ku ololoxa ku kayivela ka mati..

Maritoyankoka: nkululo, mati, nkayivelo wa mati, mpfumaleko wa mati, mphakelo wa mati

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Maikemišetšo a magolo a nyakišišo ye e be e le go nyakišiša bogolo bja tlhokego ya meetse le tlhaelelo ka Mmasepaleng wa Selegae wa Lepelle-Nkumpi, wo o welago ka gare ga Mmasepala wa Selete sa Capricorn ka Profenseng ya Limpopo. Mmasepala wa Selegae wa Lepelle-Nkumpi o itemogela tlhokego ya meetse le tlhaelelo ka go oketšega mola setšhaba se oketšega lefelong leo. Bakeng sa morero wa nyakišišo ye, go šomišitšwe mokgwa wa boleng go kgoboketša tshedimošo yeo e lebanego le bothata bja nyakišišo. Dipoledišano le tshekatsheko ya ditokomane di dirilwe go kgoboketša tshedimošo ya maleba. Diphihleleo tša nyakišišo ye di utollotše gore tshepedišo ye e fošagetšego ya togaganyo ya meetse yeo e hlolwago ke diphaephe tše di dutlago le diphaephe tše di phatlogilego e bile le seabe go tlhokego ya meetse le tlhaelelo lefelong leo. Dikgwebo le malapa gantši di be di angwa ke go kgaolwa ga kabo ya meetse, e lego seo se ilego sa feleletša ka go lahlegelwa ke dibaka tša kgwebo, gomme malapa a ile a swanelwa ke go reka meetse. Le ge go le bjalo, go bonala gore mmasepala o dira maitekelo a go kaonafatša tlhokomelo ya, le go lokiša, tshepedišo ya togaganyo ya meetse, le ge e le gore mošomo wo o dirwago mabapi le se ga o bonagale o lekana go rarolla ditlhohlo ka moka tša tlhokego ya meetse. Ka mabaka a diphihlelelo tše, go šišinywa gore mmasepala o nagane ka go bora melete ye mentši ya meetse lefelong go šogana le tlhokego ya meetse.

Mantšu a bohlokwa: tlhwekišo, meetse, tlhokego ya meetse, tlhaelelo ya meetse, kabo ya meetse

ABSTRACT

The primary aim of this study was to investigate the magnitude of the water shortage and deficit in the Lepelle-Nkumpi Local Municipality, which falls within the Capricorn District Municipality in Limpopo Province. The Lepelle-Nkumpi Local Municipality is increasingly experiencing water scarcity and deficit while the population expands in the area. For the purpose of this study, a qualitative methodology was used to collect information pertaining to the research problem. Interviews and a review of documents were undertaken to collect relevant information. The findings of the study revealed that a faulty water reticulation system caused by leaking pipes and burst pipes has contributed to the water scarcity and deficit in the area. Businesses and households were frequently affected by water supply cut-offs, which resulted in a loss of business opportunities, and households had to purchase water. Nevertheless, it appears that the municipality is making an effort to improve the maintenance of, and repairs to, the water reticulation system, although the work being done in this regard does not seem adequate to address all the water scarcity challenges. On the basis of these findings, it is recommended that the municipality consider drilling multiple water boreholes in the area to address water shortages.

Keywords: sanitation, water, water deficit, water scarcity, water supply

ACRONYMS

CSIR	Council for Scientific and Industrial Research
DPW	Department of Public Works
DRC	Democratic Republic of Congo
DWAF	Department of Water Affairs and Forestry
IFR	Instream Flow Requirement
IDP	Integrated Development Plans
NGO	Non-Governmental Organisation
PVRO	Photovoltaic Reverse Osmosis
RDP	Research, Design and Planning
SDG	Sustainable Development Goals
UNISA	University of South Africa
WHO	World Health Organisation
WPI	Water Poverty Index

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CHAPTER 1: INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 INTRODUCTION

The main purpose of this study is to investigate the magnitude of the water shortage and deficit in the Lepelle-Nkumpi Local Municipality under the Capricorn District Municipality in the Limpopo Province. Water is a basic need that must be provided to all citizens and this obligation rests primarily on government authorities, according to the Constitution of the Republic of South Africa. In fact, the issue of water shortages is not the only challenge that appears to be facing the citizens in remote rural areas because water deficits seem to present another challenge. The research proposal is structured as follows: the background and rationale are presented in order to provide an overview of the problem. The problem statement is provided, together with the aims and objectives of the study.

A literature review was carried out in order to ascertain what is known, compared to what is not known about the water shortage problem. The study period will be limited and will be undertaken within the Lepelle-Nkumpi Local Municipality from 2016 until 2019. The research design, methodology and conceptualisation are also presented. The ethical considerations and the outline of the chapters are provided. The summary, possible limitations of the study and provisional bibliography are also provided.

1.2 BACKGROUND AND RATIONALE FOR THE STUDY

Water provision is predominantly carried out by government authorities through public institutions, in most countries. The primary responsibility for water service provision is carried out by the local government. In terms of section 84 (1) (b) of the Municipality Structure Act 117 of 1998, the district and local municipalities carry out the responsibility for water service provision, (Republic of South Africa, 1998: 34). This responsibility is not only limited to water supply but also extends to ensuring the availability of water sources. Government functioning such as taxes as well as external donors are often financed functions because the communities are not paying for the services. Tariffs are minimal

for piped connections, as most water institutions are not run on a profit basis (Dovi, 2007:7-11).

According to the Constitution of the Republic of South Africa, 1996, people must have access to a certain quantity of water per day and the water must be free of contamination. In this sense, the Lepelle-Nkumpi Local Municipality has a responsibility to supply water to the communities under its jurisdiction, which is the focus of this study. The water shortage and water deficit, referred to in this study, is crucial for basic households needs such as washing, cooking, drinking and sewage systems. Individual households and small businesses depend solely on the Lepelle-Nkumpi Local Municipality for basic services such as water supply. Section 27 (b) of the Constitution of the Republic of South Africa, 1996 (Republic of South Africa, 1996: 11), states that water is a basic need that must be provided to all citizens, and that this is an obligation of government. According to the Constitution of Republic of South Africa, 1996, water must be free from contamination and pollution, and people must have access to clean and good quality water. The Constitution of Republic of South Africa, 1996, gives effect to the White Paper on Transforming Public Service Delivery of 1997. This White Paper states that service delivery is obligatory at all levels of government including local municipalities.

The Republic of South Africa did not have equity in terms of water supply. As a consequence, this led to the introduction of the White Paper on Water Supply and Sanitation in 1994. By the end of the nineteenth century, there was still a serious inequality with regard to water supply in South Africa. Basic water provision in line with the government Reconstruction and Development Programme was to cover every citizen, irrespective of colour (Muller, 2008: 67-87).

In terms of the White Paper on Water Supply and Sanitation Policy (Republic of South Africa, 1994:1-15) the free basic water supply is defined as twenty-five litres per person per day. In other words, this is considered to be the minimum amount of water required for direct consumption, including the preparation of food, as well as daily personal hygiene. The cartage should be the minimum of two hundred metres and the distance may be reduced in steep terrain. The availability of water from the outlet should not be

less than ten litres per minute. According to Tully (2005: 35-63), people need to be equally treated when supplied with water, irrespective of colour, race, religion and age. This shows that water supply is concerned with the ability to acquire, use water or have access to adequate and safe drinking water. The World Health Organisation (1995:1403-1409) advises that people should not have to travel more than one kilometre from home within thirty minutes to collect water. In South Africa, the Constitution of Republic of South Africa, 1996, Water Services Act 108 of 1997 and the National Water Act 36 of 1998 seek to promote the constitutional right of access to water. In this regard, the National Water Act provides for strong tools to protect imbalances taken from the past Apartheid government, because its primary aim is to make sure that basic water services and sanitation are achieved in full.

1.3 PROBLEM STATEMENT, PURPOSE AND QUESTIONS

1.3.1 Problem statement

South Africa is categorised as a water stressed country, which is forecasted to experience physical water scarcity by the year 2025 with an annual freshwater availability of less than 1000m³ per capita, (Otieno & Ochieng, 2004:120-124). Despite the provision of the Constitution of Republic of South Africa, 1996, the Water Services Act and the National Water Act, concerning the individual rights to have access to clean water in South Africa, it appears that most residents in rural communities continue to experience water shortages and water deficits. In this regard, the Lepelle-Nkumpi Local Municipality is not an exception since most individual households do not receive a regular supply of water. In support of these views, Mngadi (2020: online) stated that the South African government has not done much to invest in water and sanitation facilities for communities in remote rural areas. Most of the people from rural areas are not working and may find it difficult to purchase water on a daily basis. This challenge appears to be escalating at an alarming rate as the number of individual households in the villages seem to be increasing rapidly. The water shortage and water deficit have the potential to negatively affect the livelihood of the people and the development of the Lepelle-Nkumpi Local Municipality.

1.3.2 Research purpose

The purpose of this study is to investigate the magnitude or scope of water scarcity and water deficit in the Lepelle-Nkumpi Local Municipality in the Limpopo Province.

1.3.3 Research questions

It is important to answer the following research questions, in order to achieve the main purpose of this research:

- What are the reasons for water scarcity and water deficit in the Lepelle-Nkumpi Local Municipality?
- How does water scarcity and water deficit affect households and small businesses in the Lepelle-Nkumpi Local Municipality?
- What measures does Lepelle-Nkumpi Local Municipality put in place to manage water scarcity and water deficit?

1.4 RESEARCH OBJECTIVES

The study has the following objectives:

- To assess the reasons for water scarcity and water deficit in the Lepelle-Nkumpi Local Municipality
- To examine how water scarcity and water deficit affects households and businesses in the Lepelle-Nkumpi Local Municipality
- To identify and explain measures that the Lepelle-Nkumpi Local Municipality has put in place to manage water scarcity and water deficit.

1.5 DERMACATION OF THE RESEARCH AREA

A dimension is a structure that categories data in order to enable end users to answer business questions. In order to realise a clear focus, the following dimensions will be considered:

1.5.1 Geographical dimension

To address the water shortage, the geographical dimension of the research was chosen as a focus area. Lepelle-Nkumpi Local Municipality is chosen as an area to concentrate on because it is accessible to the researcher. It is one of the four local municipalities (Blouberg, Molemole and Polokwane) that falls under the Capricorn District Municipality. Its seat is at Lebowakgomo. They are next to one another which made it simpler for the researcher to get good research data.

1.5.2 Hierarchical dimension

To determine which of the criteria used are the most significant in relation to defining the difference, the researcher referred the hierarchical dimension to categorisation, abstraction and generalisation, in order to develop an understanding of the hierarchical meaning of relations (Boshomane, 2011:7).

In hierarchical dimensions, dimensions also include attribute relationships between hierarchy levels and their dependent dimension attributes. The study will be undertaken at the Lepelle-Nkumpi Local Municipality and the researcher will interview residents, headmen, municipality employees and managers. The primary reason for selecting these people is to assist the researcher to have valid research findings because water shortages affect them all.

1.5.3 Time dimension

The study will cover a four-year period from 2016 to 2019. The time dimension can be explained well when the researcher has a time frame for the completion of the research study. The four-year time frame will make it possible for the researcher to manage the research project within a reasonable time, considering resource constraints.

1.6 DEFINITION OF TERMS AND CONCEPTS

Below are the definitions of the concepts to be used throughout the entire research study:

1.6.1 Community

The Local Government Municipality System Act (Act 32 of 2000) defines community as a body of persons comprising the residents of the municipality, the ratepayers of the municipality, any civic organisations and non-governmental, private sector or labour bodies which are involved in local affairs within the municipality, among other purposes (Republic of South Africa, 2000: 9). Selznick (1992). A web of effective relationships that is qualitatively different from those constituting other kinds of human groups is implied by the community. Lombard (1992:37-38) also explains community as containing geographical, functional or geographical functional elements. Community also involves a commitment to a shared culture, including shared values, norms and meanings.

1.6.2 Water

Water is a liquid found on earth which is known as H₂O that has no odour or taste. Seventy percent of the earth is made up of water. Ninety-seven percent of the earth's water is found in oceans and seas, while two percent is found on the ice caps. Seventy-seven percent of the human body is made of water and ninety percent of human blood is water. Life will be impossible without water as it is an essential product (Nealer, 2009:74). Water is the sustaining source of life and hence access to safe and potable water is a priority in service delivery and is also guaranteed in the Bill of Rights entrenched in the Constitution.

1.6.3 Water deficit

Water deficit is characterised by water losses that exceed the absorption rate and in this way it acts directly in the plant-water relations, depending on the intense and exposure period, (Fernandez, Mcinnes & Cothren, 1996: 1224-1233). Water deficit is the most single important factor limiting crop yields worldwide. Also, it affects plant growth and productivity, (Begg & Turner 1976: 161). Water deficit induces a shift of the expression level of a set of sugar-responsive genes that is indicative of increased, rather than

decreased availability, (Hummel, Pantin, Sulpice, Piques, Rolland, Dauzat, Christophe, Pervent, Bouteille, Stitt & Gibon, 2010: 357-372).

1.6.4 Water scarcity/shortage

Water scarcity is usually referred to as the mismatch between the demand for and supply of freshwater resources, given a predetermined time horizon and spatial scale. Water scarcity is an abstract concept to many and a stark reality to others. It is the result of myriad environmental, political, economic and social forces, (Kharakhonova, 2016: 21). According to the Global Risks Report, 2019, water scarcity is the lack of freshwater resources to meet the standard water demand.

Water scarcity can also be caused by droughts, lack of rainfall or population. Water scarcity refers to the imbalance between water availability and the need for water over a specific time period and in a certain region. Water scarcity is limited compared to demand, because water sources are valuable, (Wolfe & Brook 2007:100). Water scarcity is made up of three levels, namely: First order scarcity stems from actual or perceived inadequacy of supply, given levels of demand that are presumed to be largely if not entirely outside policy control. Second order deals with scarcity of water due to a lack of adaptive capacity. Third order presents scarcity from a political or cultural point of view.

1.6.5 Water supply

The U.S National Library of Medicine defines water supply as the provision of water by public utilities, commercial organisations, community endeavours or by individuals, usually by means of water systems of pumps and pipes. Irrigation is covered separately. Water supply is the most important factor determining distribution, species composition and growth of forests, (Kozlowski, 1992: 1-38).

Water supply is a supply of water, specifically, water collected, as in reservoirs and conveyed, usually by pipes, for use in a city, villages, mill, and the like, according to the Webster dictionary meaning. Water supply refers to the improved water provided, according to its uses in order to meet specific defined quality standards. The concept of

drinking water is generally assigned to the water provided for human uses, including for drinking, cooking and washing, (Irmiler & Liu, 2013: 28-34).

1.7 LIMITATIONS AND DELIMITATIONS

The current research is limited to studying water shortages in households in Lepelle-Nkumpi Local Municipality. The study will cover a period of approximately four years. The study does not focus on the causes and impact of water shortage on households only because the topic was covered by Machete (2011). Furthermore, this study does not investigate the implementation of water restriction measures set in place to counteract the water shortages, since a study undertaken by Baatjies (2014) has dealt with these issues.

1.8 SEQUENCE OF CHAPTERS

The chapter outline structure is as follows:

Chapter 1: Introduction and Background of The Study

Chapter 1 provides a generic overview of the study. The chapter starts by presenting the background and rationale for the study, in order to lay a solid foundation for the problem statement. The research purpose, research questions and research objectives are clearly stated. This chapter concludes by explaining the limitations and delimitations of the envisaged study.

Chapter 2: The Legislative and Regulatory Framework on Water in South Africa

Chapter 2 discusses the legislation as well as the regulations in connection to water in South Africa. At the same time, the chapter assesses the areas of concern in relation to current legislation and regulations.

Chapter 3: Water Scarcity and Water Deficit: A Literature Review

This chapter is threefold, based on a review of the literature on water scarcity and water deficits. Firstly, the chapter focuses on the causes of water scarcity and water deficit in South Africa. Secondly, it focuses on the impact of water scarcity and water deficits. Lastly, the review focuses on measures that the government can put in place in order to enhance the management of water scarcity and water deficit.

Chapter 4: Research Design and Methodology

This chapter presents the research paradigm, design and methodology. Specifically, it focuses on the qualitative research design and methodology that was adopted, since it was found to be suitable for the purpose of the study. The sampling procedures, data collection techniques, and data analysis will conform to the qualitative approach.

Chapter 5: Presentation of Findings and Discussion on Water Scarcity and Water Deficit in The Lepelle-Nkumpi Local Municipality

Chapter 5 present the findings with specific focus on the assessment of the reasons for water scarcity and water deficit in the Lepelle-Nkumpi Local Municipality. Secondly, the chapter examines how the water scarcity and water deficit affect individual households and businesses in the Lepelle-Nkumpi Local Municipality. The chapter concludes by identifying and explaining the measures that Lepelle-Nkumpi Local Municipality has put in place to manage water scarcity and water deficits.

Chapter 6: Summary of Major Findings, Conclusion and Recommendations

This chapter starts by present a summary of major findings, followed by conclusions. Equally important is that the chapter concludes by outlining some practical recommendations for implementation by the municipality. At the same time, recommendations in terms of areas for further research are captured.

1.9 SUMMARY

This chapter presents the background and rationale for the study. The main objective of the study is stated unambiguously as follows: to assess the reasons for water scarcity and water deficit in the Lepelle-Nkumpi Local Municipality. The study provided the research questions which the study will answer. The demarcation of the research area with its various dimensions was presented. Importantly, the chapter also presented definitions of various terms and concepts. Limitations and delimitations were also discussed in this chapter, as well as the sequence of the chapters.

CHAPTER 2: THE LEGISLATIVE AND REGULATORY FRAMEWORK ON WATER IN SOUTH AFRICA

2.1. INTRODUCTION

The previous chapter introduced the background and rationale for the study, the problem statement, the purpose of the study and questions about it, the research objectives and the demarcation of the research area. This chapter presents a detailed discussion of the legislation and legal frameworks that govern water provision in South Africa. The legal frameworks include the Constitution of the Republic of South Africa, 1996, the Water Service Act (Act 108 of 1997), the National Water Act (Act 36 of 1998), the White Paper on Water Supply, sanitation policy and water quality, which is a vital dimension of water security, the right to water, the Department of Water and Sanitation, water pollution, Rand Water, and national norms and standards for domestic water and sanitation services. According to the National Environmental Management Act (Act 107 of 1998), regulations regarding the safety of dams in terms of section 123 (1) of the National Water Act, 1998, and small wastewater treatment works and Department of Public Works design guidelines.

2.2. THE CONSTITUTION OF REPUBLIC OF SOUTH AFRICA ACT, 1996

The Constitution of South Africa, 1996, chapter two comprises the Bill of Rights which is the cornerstone of democracy in South Africa. Section 27 (2) of the Constitution of Republic of South Africa, 1996, states that, the state must respect, promote and fulfil the rights of people as listed in the Bill of Rights (Republic of South Africa, 1996:11). The Bill of Rights confers an obligation onto the government to protect, prevent, fulfil and promote the rights of citizens. According to section 9 (1), (2), (3), (4) of the Constitution of Republic of South Africa, 1996, no person shall be unfairly discriminated against on the grounds of; for example, gender, sex, ethnic group or origin, language, and everyone is equal before the law (Republic of South Africa, 1996:5-6). Access to a safe and adequate water supply is basic to life and is recognised as a fundamental human right. Section 27 (1) (b)

says that everyone has the right to have access to sufficient food and water (Republic of South Africa, 1996:11). The right to have access to water is a justifiable human right and it protects the rights of individuals, particularly those who were previously disadvantaged. Section 27 (b) of the Constitution of the Republic of South Africa, 1996, states that water is a basic need that must be provided to all citizens, and that this is the obligation of government. According to the Constitution of Republic of South Africa, 1996, water must be free from contamination and pollution, and people must have access to clean and good quality water.

The Constitution of Republic of South Africa, 1996, provides for the right of access to sufficient water. The Consideration of Republic of South Africa, 1996, must be given to international law, in interpreting the right of access to sufficient water. The Constitution of Republic of South Africa, 1996, states that international law must be taken into consideration in interpreting the rights contained in the Bill of Rights. Access to water implies that water should be both physically and economically accessible. Physical access means that water should be found within a specific distance and must be easily accessible by children, elderly persons and persons with disability.

Even for areas that are not serviced, there should be adequate infrastructure and effective maintenance of facilities and equipment. Financial costs associated with accessing water are referred to as economic access. The right of access to sufficient water in section 27 (2) should be understood to mean that the state is not obliged to provide water for free but is under an obligation to create mechanisms that enable people to have access to sufficient water. Sufficient water refers to the quantity and quality required to satisfy domestic basic needs. The minimum amount of water required to meet basic needs is referred to as quantity, whereas quality refers to the minimum standard acceptable to consumers in terms of health-related characteristics. The quantity of safe water required is twenty to forty litres per person per day, according to the World Health Organisation (WHO), whereas the Department of Water Affairs and Forestry (DWAF) in South Africa has set the minimum quantity at twenty-five litres per person per day. This is considered to be the minimum requirement for direct consumption, physical hygiene and food preparation, but is not enough for a full, healthy and productive life.

The state is the custodian of the national water resources. The Constitution of Republic of South Africa, 1996, divides the government into three spheres: national, provincial and local government. The management of water resources to the national government is allocated by the Constitution of Republic of South Africa, 1996, while local government, meaning the municipalities are responsible for the management of water and sanitation services. The South African state has the duty to ensure the protection of rights of individuals to have access to water, such as unlawful disconnection and justifiable limitation of this right by third parties, in relation to the right to have access to the water in rural communities.

The state is obligated and empowered to protect and promote the rule of law, including the obligation to ensure that protection is not limited to ensuring that there is no abuse of human rights or interference. In order to meet its obligation to protect citizens when entering into a contract with private sectors to provide services that may impact upon the enjoyment of human rights, the government should exercise adequate oversight.

As entrenched in the Bill of Rights, the obligation to promote the rule of law in terms of water provision, entails that the state must promote and advance fundamental rights. The local government, especially municipalities with help from national and provincial governments, in rural communities, has a constitutional obligation to ensure that people residing in those communities have access to sufficient drinking water.

2.3. THE WATER SERVICE ACT, No. 108, 1997

The Water Service Act. No. 108, of 1997 provides for the rights of access to basic water and sanitation. In terms of section 3 (1) of the Water Service Act, 1997, it states that water must be provided in line with the terms and conditions set-up by the water services provider (Republic of South Africa, 1997:15). The Water Services Act No. 108, of 1997, states that every water services authority has a duty to all consumers to provide water which is free from contamination. The Water Service Act No. 108 of 1997, section 3 (1) provides that a person has a right of access to basic water supply and basic sanitation. According to Regulation 3, promulgated by the Minister of Water Affairs and Forestry

under sections 9 (1) and 73 (1) of the Water Services Act 1997, the prescribed standard for basic water supply is a minimum quantity of potable water of twenty-five litres per person, per day or six kilolitres per household per month, at a minimum flow rate of not less than ten litres per minute (Republic of South Africa, 1997:40-45).

The Water Service Act is the instrument that regulates the accessibility of water by domestic users. It secures the right of access to basic water supply as well as the basic sanitation that is necessary to ensure sufficient water and an environment that is not harmful to health and wellbeing, thereby codifying section 27, paragraph 1 (b), of the Constitution section 3 (2) – (3) and 11 (1), WSA. The Act stipulates that water service authorities have a duty to all consumers or potential consumers in their area of jurisdiction to progressively ensure efficient, affordable, economical and sustainable access to water services. Sections 12, 15 and 18 of the Water Service Act, also provides for certain provisions on transparency, such as stipulating that every water service authority must prepare and report on the implementation of a water service development plan. Section 9 (1) (a), regulations under the Act require that water service authorities must include a suitable programme to ensure the quality of potable water provided by it to consumers in its development plan.

No person, without the approval of a water service authority, may use water services from a source other than a water services provider nominated by the water service authority that has jurisdiction in a particular area. A person who was using water services at the commencement of this Act, from a source other than what was nominated by the relevant water services authority, may continue to do so, for a period of sixty days after the relevant water services authority has requested the person to apply for approval. A water services authority whose approval is required may not withhold the approval for any reason and subject to reasonable conditions, may give the approval. The minister from time to time may prescribe compulsory national standards relating to water service provision, the quality of water taken, and the effective and sustainable use of water resources for water services. With the concurrence of the Minister of Finance, the Minister may prescribe norms and standards in respect of tariffs for water services from time to time. Every water services authority in its area of jurisdiction has a duty to all consumers or potential

consumers to continuously make sure that there is efficient, affordable, economical and sustainable access to water services.

A water service authority may not, without a valid reason, fail or deny giving access to water services to a potential consumer or consumer in its area of jurisdiction. A water services authority or a private sector water services provider may only enter into a contract after it has approached all known public sector water services providers which are willing and able to perform the relevant functions. To do so no person may after being called upon to stop using water, by the minister, a province or any water services authority, continue the wasteful use of water and unlawfully and intentionally or negligently interfere with any water services work. The following organisations continue to exist and are deemed to be water boards established in terms of this Act:

- Any water board established in terms of the Water Act, 1956 (Act No. 54 of 1956).
- The Rand Water Board established under the Rand Water Board Incorporation Ordinance, 1903 (Ordinance No. 32 of 1903 (Transvaal)), as consolidated in the Rand Water Board Statutes (private) Act, 1950 (Act No. 17 of 1950), and
- The North-West Water Supply Authority established by the North-West Water Supply Authority Act, 1988 (Act No. 39 of 1988 (Bophuthatswana)).

2.4. NATIONAL WATER ACT, No. 36 of 1998

This Act was promulgated to regulate the implementation of this basic human right. The National Water Act was enacted during the transition to the post-Apartheid era and is broadly recognised in policy circles as one of the most inclusive water laws in the world. The National Water Act is simply a water law approved by Parliament in 1998, which applies to the whole of South Africa. The National Water Act is based on three principles, namely, simultaneous provision, equity and efficiency. The National Water Act is aimed at doing away with the Apartheid idea of privileged access to water service delivery. If the current patterns of water use continue unchanged, South Africa will face escalating problems and will experience prolonged water deficits for the next twenty-five to thirty

years. The country has a very high level of conventional water resources and, in order to meet projected water demands, new approaches are urgently needed to stretch the limited water supplies (Smakhtin, Ashton, Batchelor, Meyer, Murray, Barta, Bauer, Naidoo, Olivier & Terblanche, 2001: 314-334). Sustainability means promoting social and economic development while ensuring that the environment is protected both now and in the future. Equity means that every individual must have access to water and to the benefits of using water. Efficiency entails that water should not be wasted but must be used to the best possible social and economic advantage.

The overarching objectives of the Act are to ensure the beneficial use of water in the public interest (Republic of South Africa, 1998:8-9). The National Water Act, which was adopted in 1998, is the principle legal instrument relating to water resources. It transformed the South African water legal framework by setting out a comprehensive agenda for water resource management. The National Water Act has four principles, namely,

- The Act rests on the principle of the unity of the hydrological cycle.
- The nation's water resources are managed through a public trust, which is created to replace private ownership.
- The National Water Act based the comprehensive protection of all water resources on the need to protect basic human and ecological needs.
- The National Water Act de-links water rights and land ownership.

Under the 1998 National Water Act, private ownership of water is not possible. There are only rights or water usage authorisations. The custodian of nation water resources is national government, and it has the authority and responsibility for management of the water resources allocation for any of the eleven-water use categories. In accordance with its constitutional mandate, the national government, acting through the minister, must ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all persons (Republic of South Africa, 1998:9). Water policy in 1997 stated that water for human needs will be provided

free of charge, but the infrastructure costs for delivery of the water will be charged. A policy for providing free basic water has been implemented since it was realised that people especially from rural areas are struggling to pay for water. The passing of the Environmental Conservation Act (Act 73 of 1989) and the adoption by the DWAF of the Integrated Environmental Management process (DEA 1992) required that Instream Flow Requirement (IFR) should be determined according to environmental impact assessments and mitigation studies for all water development projects.

Water resources management and development functions were carried out by the national government (DWAF) until 1994, through a centralised, bureaucratic system. The minister, through the Water Act provisions can establish advisory committees, which can then provide local input to decision making, as well as local knowledge and expertise. International water management institutions can be established by the minister to implement international agreements regarding shared river basins. Mechanisms have been provided in terms of the 1998 Act, for overseeing and auditing of the new water management institutions. Within the next twenty-five years South Africa will face a serious water shortage and effective water demand and management forms an integrated part of the solution. In South Africa, municipalities are challenged by limited funding opportunities and a lack of capacity, and are responsible for the majority of water supply functions (Du Plessis, 2014:77-88). The principle behind the pricing policy for water (DWAF, 1997), is that people should now pay for water at a rate which reflects its value and scarcity. The total charge on water will be made up of three components, namely, a charge to cover the costs of managing the raw water resources, a charge for development and use of government waterworks, and a charge to promote equitable and efficient allocation of water (Republic of South Africa, 1998:44-47). There is a need for water and water used to be priced at a level that reflects the true value of water to society, as was indicated by the water policy in 1997.

2.5. THE WHITE PAPER ON WATER SUPPLY AND SANITATION POLICY (1994)

This White Paper was introduced by then Minister of Water Affairs and Forestry in the Republic of South Africa, Professor Kader Asmal, MP. This White Paper was introduced due to the fact that water and sanitation were central to the RDP process. Therefore, everyone is entitled to a free basic water supply, (Republic of South Africa, 1994: 3-4). In terms of the White Paper on Water Supply and Sanitation Policy of 1994, the free basic water supply is defined as twenty-five litres per person per day. The user of the water services must pay for their provision.

The local water committees support the local democracy, (Republic of South Africa, 1994:24). To achieve the goals of this White Paper, a joint venture of government, private sector, NGOs and the communities is encouraged, (The White Paper on Water Supply and Sanitation Policy, 1994:10). In developing countries, the need for water and sanitation is huge. Some 2.9 billion people will have to receive improved water supplies and 4.2 billion will need improved sanitation to meet the water and sanitation target for all by the end of 2025 (Mara, 2003:452-456).

The concept of developmental local government overseeing the central responsibility of municipalities to work together with local communities requires them to find sustainable mechanisms to meet the needs of the community and to improve the quality of life of community members as specified in the White Paper. The White Paper suggests that municipalities who represent local government should ensure that there is citizen participation in policy initiation and formulation and in the monitoring and evaluation of decision making and the implementation of same requires developing mechanisms. The White Paper's objective is to set out the policy for the new department with specific regard to water supply and sanitation services. The White Paper's purpose includes providing some historical background with regard to the supply of water and the development of sanitation in South Africa, as well as to explain the approach to water development that has guided policy formulation, and to ensure that certain basic policy principles are advocated for basic service delivery which will provide the standard and guidelines and also set out a policy for financing of services.

Equity is the fundamental issue that needs to be addressed in the water sector. The policies that are directing health, education, housing and land ownership are examples of the inequalities that prevail in all spheres of our society. To end the inequity in access to basic water supply and sanitation services, is the goal of the new Department of Water Affairs. The department must ensure that bulk supplies of water are available to those who can afford to exploit them. Public funds are available for water supply development. The farmers benefited from that because they can install pumps to take water from the rivers to irrigate their fields. Due to the lack of both funds and organisation, poor communities have not been able to take advantage of their right to primary water supplies. Because of inadequate maintenance and ineffective management, many new water systems failed. In South Africa 9.7 million (20 percent) of people do not have access to adequate water supplies and sixteen million (33 percent) lack proper sanitation services (Kahinda, Taigbenu & Boroto, 2007:1050-1057). For communities to take responsibility for their own service provision was a lesson learnt from the harsh past experiences. Communities need to be empowered. The people's sense of entitlement to government services and their attitude toward government policy regarding water supply and sanitation is the key element in influencing households' willingness to pay for an improved water supply. Water supply and sanitation policy needs to observe the following principles:

- Local structures, decision making, and control must be given authority.
- Human rights are basic services.
- Taking account of population and level of development into account, the limited national resources available to support the provision of basic services should be equally distributed between regions.
- In all development of activities, it is necessary to ensure that the environment is considered and protected.

The DWAF policy ensures that all communities in the country have access to basic services and to the support they need to achieve them. The Department of Water and

Forestry must assume the responsibility to fill in the gaps in the interim, by supporting the work of other agencies.

In the water sector, the role of central government can be divided into two distinct areas, namely; management of nation water resources in the public interest and access to adequate water and sanitation service for all citizens. In developing countries, improved water supply, sanitation and hygiene should be combined in order to obtain better health for the poor people in particular, as well as other categories. The international communities recently made a commitment to demand that greater emphasis should be placed on improved sanitation and hygiene and to impact more favourably on health (Clark & Gundry, 2004:157-169). Through the promotion of effective local government, provincial governments will be better equipped to share their responsibility for assuring service provision. To ensure survival in the initial stages of a disaster, water and sanitation are the most critical issues. To prevent death from dehydration, to reduce the risk of water related disease and to provide for consumption, cooking and personal and domestic hygiene requirements, an adequate amount of safe water is important (Ersel, 2015:27-33). To engage in the type of development required, private sector professionals will have to continue to adapt their skills and their orientation.

The greater part of what Non-Governmental Organisations (NGOs) had to struggle with was lobbying and fighting against state officialdom for rights on behalf of oppressed people. A commitment to work together has been declared between the Department of Water and Forestry and NGOs. The communities the NGOs works for, are given roles to further improvement in rights for citizens. The international co-operation and assistance that is required in order to meet development objectives is welcomed by the Department of Water and Forestry. Such co-operation is achieved by sharing of experience and knowledge, aid and development finance and assistance from foreign engineering firms and suppliers of equipment.

Policy and practices regarding sanitation provision are undeveloped. The department in the interim will adopt the following guidelines: adequate sanitation, bucket systems, local responsibility, household and individual responsibility and capacity building, education

and training. A National Community Water and Sanitation Training Institute is to be established at the University of the Limpopo with the support of the Water Research Commission as pronounced by the minister.

The institute will be a centre for the training of trainers and will seek to work together with the universities. It will build a national centre of expertise and research to address adult training and education methodology. Services as the key principle of the Reconstruction and Development Programme should be provided and paid for in a manner which does not require ongoing government funds to keep them running. The services should be self-financed at local level.

2.6. WATER QUALITY: A VITAL DIMENSION OF WATER SECURITY

The primary issues facing such initiatives are drinking water quality, safety of human contact and health of ecosystems. Dickson, Schuster-Wallace and Newton (2016:1567-1604) point-out that in rural, remote, or otherwise marginalised communities, an increasing number of factors pose challenges to development and the management of water resources, where evaluation, prioritisation and decision making indicators and indices have been developed at local level. The tone for infrastructure and institutional performance and water quality compliance is set by the regulatory legislative environment. The quality of drinking water management and monitoring in South Africa is governed by policies and regulations based on international standards (Rivett, Champanis & Wilson-Jones, 2013:409-414). The government makes political, technical and scientific decisions about how water will be used by setting standards for water quality. The most contaminated water resources are the Vaal River, Crocodile West in Limpopo, and the Umgeni and Olifants River systems, according to recent reports. The quality of water is not fit for all possible uses in many South African water systems. Parameters for water quality of particular concern countrywide relate to the following issues:

- Salinity – the increased costs are well documented for removing salts from the Vaal River system; as well as for acid mine drainage from gold and coal-mining

activities in the Witwatersrand, and from agricultural runoff which is where the salt originated.

- Eutrophication in dams such as Hartbeespoort Dam in the North-West Province is where it is clearly observed. The discharge of nutrient-rich effluents from agricultural fertiliser runoff from areas that are not serviced brings the increased nutrient level.
- Microbial inability to cope with larger loads, as well as with urban runoff from areas with inadequate sanitation services increases microbial contamination.
- Policies, standards, criteria and guidelines for water quality need to be developed for a water quality model.

Factors such as people's needs, drinking water standards, agriculture, industry, mining and the natural environment should be considered. In Africa, drought has been researched extensively regarding meteorological, agricultural and food security aspects and less attention has been given to the impact of drought on water security; especially ground water, that is dependent on rural water supplies (Calow, McDonald, Nicol & Robins, 2010: 246-256). By means of a high level, socio-economic cost-benefit analysis, using social discount rates and discounted cash flow methodology, the monetary value of the impact of poor water quality can be determined.

The Water Security Status Indicators assessment method was developed as the new approach method for assessing water security status and it has four innovative aspects which address important gaps in the literature (Norman, Dunn, Bakker, Allen & De Albuquerque, 2013:535-551). The way in which these drivers impact water quality causes and effects are as follows: to comply with water legislation, standards and guides, there is a lack of ability, attitude, resources, skills and competency; which in turn, is due to a lack of enforcement of legislation and standards. Leaks, spillages and blockages are experienced because of poor operating and maintenance practices when dealing with water and wastewater. In many rural areas the quality provision of drinking water is substandard and every year, an estimated 43,000 deaths are directly attributable to

diarrhoeal diseases, including twenty percent of deaths in the one to five years age group (Mackintosh & Colvin, 2003:101-105).

2.7. THE RIGHT TO WATER AND SANITATION

Everyone has the right to have access to sufficient and safe food and water. The Parliament has enacted the Water Service Act No. 108 of 1997 in order to give effect to this right. Its purpose is to provide for the right to have a basic water supply and sanitation services. Formulation of a right to sanitation that emphasises both the responsibilities of states, and the rights of individuals is led by the global recognition of the need for access to sanitation services (Obani & Gupta, 2015: 27-39). There are other regional treaties that enshrine the right to water and sanitation, which include; The African Charter on Human and People Rights (1981), The African Charter on the Rights and Welfare of the Child (1990) and The Arab Charter on Human Rights (2008). All these spheres have a duty to ensure that water and sanitation services are provided in a manner which is efficient, equitable and sustainable. National government has to operate through various water boards that manage water resources. Delivery of water and sanitation services to the community is the responsibility of the municipalities and they are required to draw up plans for delivery. Without any trade-offs of other basic rights, government must comply with this requirement. The following basic water and sanitation services must be provided by the government; at least 6,000 litres of water per household per month, as well as a toilet or ventilated pit latrine which is reliable and safe. No one can live for more than seven days per year without water. There have been growing calls to accept water and sanitation as a human right and establish a rights-based framework for water policy, with water and sanitation being important to the public's health (Meier, Kayser, Amjad & Bartram, 2013:116-133).

The United Nations General Assembly adopted the 2030 Agenda for Sustainable Development Goals, at the conclusion of the Millennium Development Goals conference in 2015. Pledges to ensure the availability and sustainable management of water and sanitation for all people by means of achieving Sustainable Development Goal (SDG) 6, which focuses on sustainable access to clean water and sanitation (Chitonge, Mokoena

& Kongo, 2020:207-218). Substantial, unnecessary and preventable human suffering results from a failure of the international aid community, nations and local organisations to satisfy these basic needs (Gleick, 1998:487-503). South Africa, within the set time frames, has also committed to achieve the Sustainable Development Goals. The Sustainable Development Goals deal with the right to water and sanitation services for all, as well as ensuring that the management of water and sanitation is available and sustainable for all. Nations have undertaken to achieve universal and equal access to safe and affordable drinking water for all by 2030, and to achieve access to adequate equal sanitation and hygiene for all by 2030. A significant political measure whose direct consequences are still being assessed was constituted in 2010 by the United Nations, for the recognition of the human right to water and sanitation (Brown, Neves-Silva & Heller, 2016:661-670). In South Africa, the rescaling of water governance responsibilities has allowed strong water services authorities such as the eThekweni Water and Sanitation Unit in eThekweni Municipality to play a leading role in shaping of water and sanitation policy (Sutherland, Hordijk, Lewis, Meyer & Buthelezi, 2014: 469-488). South Africa has a policy of free basic services, including solid water collection, water and electricity, in order to ensure that every month each household must receive its first free 6,000 litres; and anything above 6,000 litres must be paid for. For the provision of free water and sanitation, municipalities have different policies. In the Bill of Rights, the rights are interrelated. For example; it is difficult to learn at school and get an education without having water. Sometimes, people are not productive because they have to work without water and likewise, some women are afraid to go to the toilet at night because they fear for their safety.

The South African Human Rights Commission receives many complaints about water and sanitation. About 1,363 complaints about violations of the right to water and sanitation were received by the Commission between 2012 and 2016. Social protests by communities frustrated at the lack of adequate services was held because of violations of the right to access water and sanitation. The people are entitled to have access to water as guaranteed by the courts. Water and sanitation are often presented as being linked together within the human rights arena. Every human being needs water to survive (Ellis & Feris, 2014: 607). In order for the country to end inequality and poverty and

improve and protect other rights like health and education, the courts have recognised that the right to water and sanitation is important.

2.8. WATER AND SANITATION

The legislative mandate for the Department of Water and Sanitation (formerly known as Department of Water Affairs) is to ensure that the water resources of the country are protected, managed, used, and controlled in a sustainable manner for the benefit of all people and the environment. The strategic objectives of the Department are; that municipalities have sufficient water to implement water conservation, maintenance of a reliable and equitable water supply and to generate information that is used to inform decisions and management of water programmes. Water management has many challenges in South Africa, which are attributed to inadequate rainfall, and political rivalry between racial groups; and people living in poor areas are the most affected as they do not have access to potable water and proper sanitation (Molobela & Sinha, 2011:993-1002). The use of improved drinking water sources improved health from the 1990s by seventy-six percent globally and piped water was used by four out of five people in urban areas. Diarrheal disease, health infections and undernutrition are listed as having negative consequences for people's health (Hutton & Chase, 2017).

The Constitution of Republic of South Africa, 1996 and Bill of Rights enshrine the basic human right to have access to water and a sufficient, healthy and safe environment. The following pieces of legislation assisted the government to fulfil these rights through the Department of Water and Sanitation:

- The National Water Act of 1998, was needed to ensure that water for South Africa was protected, used, developed and managed in a sustainable and equitable manner, for the benefit of all the people.
- The Water Service Act, 1997 (Act No. 108 of 1997), was needed to ensure that municipalities provided a supply of water and sanitation, according to national standards and norms via water service authorities.

- The Water Research Act, 1971 (Act No. 34 of 1971) made it a legal duty for municipalities to ensure the provision of water related research initiating a Water Research Commission and a Water Research Fund.
- The National Environmental Management Act, 1998 (Act No. 107 of 1998), provided for co-operative environmental governance, and
- The National Water Policy was instituted which consisted of three fundamental principles, which included a sustainable and efficient environment.

While pursuing the consolidation and rationalisation of water boards to establish wall-to-wall water boards, the Department of Water and Sanitation (formerly known as Department of Water Affairs) undertook to make sure that the water and infrastructure establishment gained traction. According to The World Health Organisation (WHO) (2010), to attain the Millennium Development Goal target to halve by 2015, its progress towards accessing basic sanitation is not enough, to halve the proportion of people without sustainable access to safe drinking water and basic sanitation.

In many parts of South Africa, groundwater is a strategic resource that plays a vital role in water supply to small towns and villages in the drier parts of the country. South Africa has nine catchment management agencies, which are service delivery agencies and are listed in the Public Finance Management Act, 1999 (Act 1 of 1999). To deliver high quality services, all the stakeholders involved in usage, maintenance, recovery of costs and continuing support consider it to be in their best interest to comply with legal requirements (Carter, Tyrrel & Howsam, 1999:292-296).

A national programme managed by Resource Quality Services, with support from the Water Research Commission, the CSIR and various regional and provincial authorities is the National Aquatic Ecosystem Health Monitoring Programme. Its responsibility is the management of aquatic ecosystems. Its focus is on the biological attributes of rivers that serve as indicators of their ecological health. The Department of Water and Sanitation (formerly known as Department of Water Affairs) entered into collaborative relationships with countries such as Lesotho, Zimbabwe, the DRC, and Swaziland in the region, in line with our regional and international responsibilities in the water sector.

The countries were:

- Mozambique and Swaziland on the Inkomati and Maputo rivers.
- Botswana, Lesotho and Namibia on the establishment of the Orange Senqu River Commission.
- Botswana, Zimbabwe and Mozambique on the establishment of the Limpopo Watercourse Commission.
- Lesotho on the Lesotho Highlands Water project.
- Swaziland on the Komati River Development project.

South Africa's bilateral and multilateral relations in the African Union were improved by these agreements. Four of South Africa's main river systems are shared with six immediate neighbouring countries, being, Botswana, Lesotho, Mozambique, Namibia, Swaziland and Zimbabwe.

2.9. WATER POLLUTION – RAND WATER

Polluted water is water that is not safe for human consumption and is not healthy for people and animals to drink or to wash in. Polluted water is dangerous to water plants and animals. There is an increase in pollution and catchment destruction, as human population increases. A number of factors cause pollution; as more and more people move into towns and cities, namely, land physical disturbance due to construction of houses, roads, industries, etc, pollution that comes from chemical industries and mines, and poor collection and treatment of inadequate sewage.

Most diseases in the world are related to water and sanitation. About 1.1 billion people worldwide do not have access to safe drinking water and the hourly toll from biological contamination of drinking water is four hundred deaths of children (Gadgil, 1998:253-286). In South Africa, most rural communities do not have access to running water, or to toilets; and for urination and defecation they use watercourses. Water faecal pollution increases the infection risk of various diseases to those using these courses, as it is

regarded as their life supporting water source. Another water source: groundwater can become contaminated through unclean irrigation water. There are important things that can be done to decrease the risk of diseases, which include; not defecating or urinating next to a water source, not drinking water that is not clean, not leaving empty containers or litter lying around for disease transmitting insects to breed in; and washing hands with soap after using the toilet.

Water pollution can be caused by substances that can be divided into two groups: germs and chemicals. Germs are spread by diseases like malaria and cholera, whereas chemicals contamination arises from poisons that are produced in industry. In South Africa the deteriorating state of municipal wastewater and mismanagement of sewage treatment is one of the biggest factors contributing to the number of pollution problems experienced in most parts of the country and is a major contributor to problems of environmental and human health (Herbig & Meissner, 2019).

2.10. NATIONAL NORMS AND STANDARDS FOR DOMESTIC WATER AND SANITATION SERVICES

Policymakers have increasingly specified water and sanitation as being independent human rights which are expressed through the development of international law (Meier *et al.*, 2013: 116-133). A large contribution to the availability of water for households and their neighbours is self-motivated. There are still many challenges, particularly in overcrowded settlements where many residents lack access to clean water and safe sanitation, even though the South African government has made considerable progress in providing water and sanitation since the democratic transition came into being (Makaudze & Gelles, 2015:121-133). Drinking water quality is often poor in non-metropolitan communities, that have inadequate water supply services and there is a need for monitoring and management of water quality from raw water supply points to points of use, which is insufficiently recognised and is often performed while effective water treatment is accepted as necessary (Momba & Swartz, 2010). The noncompliance of municipalities in South Africa with regard to legislation promoting the constitutional right to sufficient potable water is both a failure of the rule of law and a betrayal of that right; and the underlying commitment to sufficient water remains unfulfilled, even though the

intervention of the judiciary has prompted formalistic compliance with the laws controlling water management (Stacey, 2018:796-826). During the last few decades in South Africa, the current norms and standards for water service levels focused on addressing services of water in urban areas and on the development of revised norms and standards for equitable water services to all citizens. However, considering the limited availability of water resources, financial challenges, geographical placement issues, servicing of disadvantaged groups and addressing the backlog; especially in rural areas, many beneficial initiatives have been initiated by the Minister of Water and Sanitation (Duncker, 2015:183-194). The majority of South Africans have struggled to secure their right to water because historically the access to the limited water resources was dominated by those with access to land and economic power (Gabru, 2005). There are 8,687.607 dwellings in South Africa of which 5,790,446 or sixty-six percent are defined as houses or parts of houses; according to a household survey undertaken by the Central Statistical Service (1995); and the other categories of dwellings include traditional dwellings (14.1 percent), shacks (7.8 percent), apartments (4 percent), hostels/rooms (3,5 percent), town houses (2.7 percent), shacks on the same site as houses and others (0.39 percent).

The production of fresh produce contaminated with pathogenic microorganisms because of increasing difficulties in many parts of the world to access safe water results in increased risk of human disease (Uyttendaele, Jaykus, Amoah, Chiodini, Cunliffe, Jacxsens, Holvoet, Korsten, Lau, McClure & Medema, 2015:336-356). An assessment of the economic value of the various water uses is needed in order for those responsible for management of water to address the policy objectives of efficiency in water usage, equity in access and the benefits and long-term sustainability of water (Kloos & Tsegai, 2009).

2.11. THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT No. 107 of 1998

In South Africa, many people live in an environment that is harmful to their health and wellbeing. Everyone has the right to a safe environment. The aim of this Act is to provide for co-operative, environmental governance by forming principles for decision making on matters affecting the environment and institutions that will encourage co-operative

governance and procedures for co-ordinating environmental functions exercised by state organs. The challenges of economic growth, job creation and effective service delivery in South Africa are regarded as key to the long-term development of the country (Thomas, Seager & Mathee, 2002: 251-261). The people and their needs must be placed at the forefront of their concern by Environmental Management, who should serve the people's physical, psychological, development, social interests and cultural needs equitably. People's development needs to be sustainably socially, economically and environmentally. Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, knowledge sharing and experience.

The rights of workers must be protected and respected for refusing to do work that is harmful to their health. In accordance with the law, decisions must be taken in a transparent and open manner, and provision of information must also be accessed in accordance with the law. In South Africa, regulations governing environmental impact assessments have been around for about three years, with the administration being delegated to individual provinces. In most provinces, personnel have sound qualifications but are inexperienced; and a lack of service contracts and poor salaries results in losses of experienced staff (Duthie, 2001: 215-222). Government at provincial level needs to ensure that a relevant provincial environmental implementation plan is compiled by each municipality within its province, and it also needs to ensure that municipalities follow relevant environmental implementation and management plans. South Africa has sufficient legal instruments that promote interactive participation of rural people in the management of natural resources (Holmes-Watts & Watts, 2008: 435-4430). The minister may make a recommendation to Cabinet and Parliament regarding access to international environment instrument ratification, for areas where the Republic is not yet bound by an international environmental instrument. Once a year, the minister should report to Parliament about international environmental instruments for which he/she is responsible. State land may be reserved by the minister who may authorise disposal of the land after consultation with other ministers.

2.12. REGULATIONS REGARDING THE SAFETY OF DAMS IN TERMS OF SECTION 123(1) OF THE NATIONAL WATER ACT, 1998.

Dam safety risks were assessed due to a high impact of dam failures and the objective way in which the public regards risks at dams (Dubler & Grigg, 1996:163-169). A fine or imprisonment for a period not exceeding five years can be imposed on any person who fails to comply with any provision of these regulations. If any licence is not issued within three months from the submission date of the application, the Director-General must provide reasons for the refusal. During recent decades dams' safety hazards affecting humans have increased to the point where human communities have been affected by problems with safety that then led to dam failure and settlements sometimes suffered substantial losses in downstream areas (Adam, Al-Ansari, Sissakian, Laue & Knutsson, 2020:23-40).

Many people live on the banks of dams. Therefore, in order to maintain the dams' safety, economic viability and a sustainable environment, dam safety information from governmental agencies is communicated to dam owners (Zuffo & Genovez, 2009:1854-1859). In cases of extreme environmental events such as floods and earthquakes, the dam owners and regulators must make sure that dams are operated safely that the risk to the public is minimal and that the seismic risk associated with dams is minimised by using dam safety programmes and that priorities for detailed evaluation should be established by dam owners or officials in charge (Singh, Kijko & van den Berg, 2011:72-90). Throughout the world, dam safety issues and equitable sharing of catchment run off are currently receiving more attention, and because of high costs the landholders often overlook the common obligation to review dams according to current standards, thus leaving landholders vulnerable to litigation if a dam fails (Pisaniello & McKay, 2007:176-200).

Small dams are usually built by individual owners and the government generally builds and manages the largest dams. Many dam safety aspects have changed over time, such as regards redistribution of population, meteorological information, methods of engineering and design standards, all of which raises doubts about dam adequacy

(Pisaniello & McKay, 2003:90-102). Large dams, because of their negative environmental and social impacts have been criticised and sometimes, due to changes in water and food security, increases in communicable diseases and the social disruption caused by construction of large dams, which may influence health (Lerer & Scudder, 1999:113-123). In many countries, the safety of medium and large-scale dams is addressed and limited attention is paid to smaller farm dam problems, particularly in larger catchments, where there are potential cumulative threats (Pisaniello, 2010:381-402).

2.13. SMALL WASTEWATER TREATMENT WORKS, DEPARTMENT OF PUBLIC WORKS (DPW) DESIGN GUIDELINES

The purpose behind small waste treatment works is to direct the design process for the best designed wastewater process for effluent, which is generated by small-scale on-site operations, which handle up to 100 m³/day such as border posts, police stations, etc.

Small wastewater treatment plants are located near tourist areas. A major environmental issue in the plants is noxious odours, as they are considered to be the main cause of disturbances due to the presence of the fumes and the resultant dislike expressed by the exposed population (Zarra, Naddeo, Belgiomo, Reiser & Kranert, 2008: 89-94). Domestic flows are expressed in litres per capita per day. The total domestic sewage flow is known as Average Dry Weather, the flow rate of which is measured in kl/d. and the flow rate is used when treatment units are designed. Depending on the domestic living standards of the contributors, the strength of the sewage arriving at a sewage treatment works varies considerably.

Various parameters can express the daily load per person, and these will also differ depending on the diet and social structure of the population served. Any wastewater treatment plant should be located as far as is practical from dwellings, public places and any sites which might possibly be built on within the life of the plant. Sufficient land should be set aside to allow for future extensions and alterations so that no offensive odours are detected at the property boundary.

One way the community energy managers can identify opportunities to save money, energy and water is by performing energy audits at water and wastewater treatment facilities (Foladori, Vaccari & Vitali, 2015:1007-1015). The location of the sewage pump stations should be as far as possible from present or proposed built-up residential areas and an all-weather road should be provided. The following should be considered: noise control, odour control and architectural design of the station. For future expansion or additions, the sites for stations should be of sufficient size. The pumping stations and treatment plants for the wastewater should be protected against flooding. During a 100-year flood event, the newly built plants should remain fully operational. A wastewater pumping stations that is fully staffed eight hours a day should have support facilities for the staff. There should be toilets. For all disinfecting systems and all remote pumping stations, an alarm system should be provided. When reliability property damage warrants consideration of a telemetry alarm; 24-hour monitoring stations or telephone alarms for duty personnel should be provided. As a minimum for all pump stations, alarms for high wet well and power failure should be provided. Alarms signalling pump and other component failures or malfunctions should be provided for larger stations. Facilities of the treatment plant should be designed in full compliance with the Occupational Health and Safety Act, No. 85 of 1993 South Africa.

For planning of municipal solid waste management systems, a basic requirement is a cost estimation. Rendering an economic analysis a complex task, made more complex by the scarcity of real cost data in a variety of organisational, financial and management schemes and by the continuously developing technological advancements which should be rendered (Tsilemou & Panagiotakopoulos, 2006:310-322).

The Department of Water Affairs (now known as Department of Water and Sanitation) might approve the plans if it is satisfied that the method, process or equipment will operate and meet the treatment requirements after a review of treatability data and a complete engineering report. The wastewater treatment works can only be operated by competent technicians, who are fully conversant with the recommended operating procedures, as stipulated in the operation and maintenance manual. Around the perimeter all facilities should have an approved security fence with an approved access gate. Chains and

tamper-resistance padlocks should be used to lock all the gates. Authorised personnel post signs restricting entry should be used. The usage of water from river, dam or underground sources for industrial purposes in South Africa is governed by the National Water Act, No. 36 of 1998, as amended. To attain the effluent standards of the Department of Water Affairs (now known as Department of Water and Sanitation) or for health reasons, chlorination of wastewater in small sewage plants should only be implemented if required. As stipulated in the Government Gazette 9225, Notice No. 399 of 1984 for specific catchment areas and rivers, disposal of Treated Effluent into Water Courses and Rivers must comply in all respects with the requirements of the Department of Water Affairs. A baffled weir should control the top water level of the pond. The influent flow metre should be situated on the influent side after screening, rag catcher and grit removal, where specified, and as required for the sewage treatment plant.

2.14. SUMMARY

This chapter has presented a descriptive assessment of the legislative framework on water in the context of South Africa, the Constitution of the Republic of South Africa, 1996, that provides that everyone has the right to have access to sufficient food and water. The Water Service Act (Act No. 108 of 1997) highlighted the provision of the rights of access to basic water supply and basic sanitation. The National Water Act (Act No. 36 of 1998) ensures that the nation's water resources are protected, used, developed, managed and controlled in ways which consider; among other factors, promoting equitable access to water and redressing the results of past racial and gender discrimination.

The Water Paper on Water Supply and Sanitation Policy (1994), sets out the policy for the new department with regard to water supply and sanitation services. The parameters that relate to drinking water, safety of human contact and ecosystems health are discussed under water scarcity. The right to water and sanitation is also discussed under the rights of individuals to access sufficient food and water. To ensure that the water resources of the country are protected, managed, used and controlled in a sustainable

manner for the benefit of all people and the environment, water and sanitation policy was discussed.

Water pollution from Rand Water was discussed to promote awareness about the increase of water pollution and catchment destruction. National norms and standards for domestic water and sanitation services were discussed as were the principles that guided the water service authority to provide water and sanitation services. The National Environmental Management Act No. 107 of 1998 provided that everyone has the right to a safe environment that is not harmful to their health and wellbeing. Regulations regarding the safety of dams in terms of section 123(1) of the National Water Act, 1998 were also discussed. Small wastewater treatment works, and DPW design guidelines outlined the purpose for achieving a direct process for the best designed wastewater processes.

In the following chapter that the researcher will present the literature review. It provides a threefold discussion, based on the review of scholarly literature on water scarcity and water deficit.

CHAPTER 3: WATER SCARCITY AND WATER DEFICIT: A LITERATURE REVIEW

3.1 INTRODUCTION

The previous chapter introduced the detailed discussions of legislations and legal frameworks governing water provision in South Africa. Water provision is mostly carried out by public institutions in most African countries. In many parts of the world and particularly in South Africa, water shortages have been experienced. Lack of access to clean water affects many households. In South Africa, most of the rural areas are experiencing the challenges of accessing water services because of payment affordability for municipal services. In fact, most rural dwellers around the world are facing major challenges when collecting sufficient and safe drinking water.

Water collection means that communities have to walk for hours to collect water, often from unhealthy water sources. Water is the main constituent of the human body because it plays many important roles in the body. Based on the above, this chapter highlights and explores the various reasons for water scarcity and water deficit in South Africa, and the effects of water scarcity and water deficit on households and businesses in South Africa. The chapter also seeks to reflect on the steps that could be taken by municipalities to manage water scarcity and water deficit in South Africa.

3.2. REASONS FOR WATER SCARCITY AND WATER DEFICIT IN SOUTH AFRICA

In South Africa, fresh water is decreasing in quality because of an increase in pollution and the destruction of river catchments; caused by urbanisation and increases in population. Climate change has affected water supplies within the region. A major multi-year drought in parts of South Africa, particularly the Northern and Eastern Cape provinces has seen a number of small towns threatened by total water supply failures and livestock farmers facing financial ruin.

3.2.1. Urbanisation and population growth

Population growth in a city usually calls for more water abstraction than a water source can supply. Gleick (2000:127) notes that the world population has grown from 1,6 billion from 1900 to 2000, and Sandra Postel in an interview with fresh Water Organisation on 12 February 2013 added, saying that world population explains why the population currently stands at seven billion and projects it to be eight billion and nine billion in 2025 and 2050, respectively. According to Buhaung and Urdal (2013:1-10), the world urbanisation population is projected to increase by more than three billion people between 2010 and 2050 because the majority of the population in the world now lives in cities and global urbanisation will grow at a high speed.

The growing numbers in world population explain the rapid population growth in the cities. The physical environment can be modified by human behaviour in such a way that useful water becomes scarce. Tremendous stress on local, regional and global air and water quality is created by increases in the global human population and urban development, both of which are increasing at unprecedented rates (Duh, Shandas, Chang & George, 2008:238-256).

Water could be scarce at some time in the future, due to growth in population and incomes. Godfrey and Julien (2005:137) argued that urbanisation opens the door to western diseases in less developed countries, including hypertension, heart disease, obesity, diabetes and asthma because the effects on the health of urbanised dwellers are two-edged. Alirol, Getaz, Stoll, Chappuis and Loutan (2011:131-141) reported that in 2007, the United Nations predicted that the urban population of the world would double from 3.3 billion to 6.3 billion in 2050, as the world is becoming more urban, and that urban growth is having a profound effect on global health. Madlener and Sunak (2011:45-53) stated that more than half of the population of the world has been living in cities for the first time in human history in the period since 2007, and the process of urbanization has led to a significant concentration of human resources, economic activities, and resource consumption in cities, because it is a key phenomenon of economic development. Buhaung and Urdal (2013:1-10) argued that global urbanization will continue at a high

speed and the result of high urban fertility rates and reclassification of rural land into urban areas will result in increased, rural-to-urban migration, which will cause a significant increase in future urbanization.

3.2.2. Climate change

Environmental degradation and climate change have further exacerbated the water shortage problem as they contaminate water resources and thus reduce the natural storage of water. Zareian and Eslamian (2019:317-331) reported that in recent years, the availability of water resources was affected by climate change which is one of the most important factors in the process of climate change and that due to climate change, many areas of the world are experiencing droughts and water shortages. Due to prolonged dry spells, the rate of evaporation is high, and this has led to the drying-up of water tables, which in turn, reduces the level and amounts of water available for use.

According to Zhang (2007:2), climate change is the cause of change in the distribution of the world's water. This conclusion boils down to the fact that water availability is also dependent on climatic conditions. Vairavamoorthy, Gorantiwar and Pathirana (2008:330-339) pointed-out that in developing countries the urban areas are facing increasing water scarcity and that, due to rapid changes in the hydro-environment in various ways, like changes in climate and its effects on land owners. They said that it is possible that this problem may be further aggravated. Hanjra and Qureshi (2010:365-377) stated that the emerging forces may include climate changes, water scarcity, and might affect the energy crisis as well as the credit crisis. All that may pose challenges for the humane goals of eradicating extreme poverty and hunger. Scarcity of water for domestic use may further be caused by low flow periods during summer. High temperatures during these periods might result in calls for more water for agricultural purposes (Middelkop, Daamen, Gellens, Grabs, Kwadijk, Lang, Parmet, Schandler, Schula & Wike, 2001:123). Garrote (2017:2951-2963) reports that in the regions that are facing water scarcity, the climate changes are a great worry in places where management of water is already challenged by many issues. Hoekstra (2014:318-320) argued that to move towards sustainable water use; consumer awareness, private sector initiatives, governmental regulation and

targeted investments are needed urgently because the changing climate and the growing scarcity of freshwater due to rising water demand are seen as a major risk for the global economy. Zakar, Zakar and Fischer (2020) reported that in some areas of the world the development of water scarcity might be affected by climate change and the capacity of the state to provide health care to the population might be reduced. The water sector has been impacted by climate change in a manner that decreases the size of harvests. However, the farmer is in a better position to manage the farm and maintain his income by managing climate change through adaptation measures that reduces their vulnerability (Pakmehr, Yazdanpanah & Baradaran, 2020:104798).

3.2.3. Drought

Water availability in South Africa is very low. The country is relatively dry and drought prone. The rainfall is generally low and irregular with a mean annual precipitation in the order of 500 mm compared to the 860 mm world average. Mishra and Singh (2010:202-216) stated that drought is best characterised by multiple climatological and hydrological parameters and as a natural hazard. However, recent years have witnessed much focus being placed on global drought scenarios, owing to the rise in water demand and looming climate change. Wang and Yuan (2018:1478-1490) also stated that drought with abnormally high temperatures is rapidly intensified by flash droughts which had greatly threatened crop yields and water supply and had aroused public concern about the warming climate. Worldwide, the most important factor for limiting crop yields is drought and therefore it is not surprising that there has been continuing interest in the ways in which drought affects crop yields (Jones & Corlett, 1992:291-296). Water availability in South Africa varies greatly, for example in the west, the rainfall water level is as low as 100 mm per year and in the east, it is as high as 1,500 mm per year. Fabrizz (2009:6) argues that the water levels in several catchments drop due to below average rainfall. When there is a dry winter the expected excess of water does not occur, which results with reservoirs not being adequately filled at the beginning of summer. Fabrizz (2009:2) also stated that water shortage is also common in summer even when it may not be excessively dry. Kogan (1997:621-636) stated that the most damaging environmental

phenomenon is drought and that it affected fifty percent of the 2.8 billion people on the planet during the period 1967-1991, who all suffered from weather-related disasters.

3.2.4. Surface runoff

Uitto and Biswas (2000:205) identified the surface run off as a cause of shortage of drinkable water. This is due to the fact that floods carry different objects from the ground and deposits them into drinkable water sources. The build-up of traffic generated by organic compounds in road surfaces, leads to their presence in water runoff and the resulting sediment affects water quality in rural areas (Nekhavambe, Van Ree & Fatoki, 2014:415-424). The rivers, fountains and dams that normally provide water to households may be rendered undrinkable during heavy floods and for some days or weeks after the floods have subsided. Wallace (2000:105) argued that runoff has been shown to cause a major loss of water. When rainfall is high and the infiltration rate is low because of steep slopes, runoff becomes higher and a large amount of water is lost. De Winnaar, Jewitt and Horan (2007:1058-1067) stated that poor rainfall, particularly within resource poor farming communities who rely on rain fed agriculture can be attributed to water scarcity such as in South Africa, that is subject to various hydrological constraints. There are many water related human interventions that alter the natural systems along the streams of water flowing in a river basin and an issue of concern for downstream water availability to sustain ecosystems is the increased water consumption at upstream level (Welderufael, Woyessa & Edossa, 2013:218-227).

McLeod and Hegg (1984:122-126) showed that in surface runoff, nutrient concentrations were more dependent on the amount of rainfall since application of fertiliser relies upon the quantity of rainfall or runoff. Lakes can be supplied by surface runoff that contains a variety of chemical substances. Their type and quantity may differ significantly, and it depends on the catchment area characteristics, geomorphology, and the amount of phytocoenosis type human impact (Klimaszyk & Rzymiski, 2013:191-197). Park, Lee, Park and Ha (2008:328-337) also indicated that in storm water runoff, the partitioning level of catchment modelling becomes an issue if the calculated results from the various sub-catchments show the same performance.

3.3. EFFECTS OF WATER SCARCITY AND WATER DEFICIT ON HOUSEHOLDS AND BUSINESSES IN SOUTH AFRICA

Many businesses rely on water as a strategic resource, and shortages of water may lead to a significant adverse economic impact, ranging from increased costs to having to procure water from alternative sources or the allocation of operations to lessen business interruption or slow down. The effects of water scarcity can be grouped into poverty, community livelihood and projects and health and social relations.

3.3.1. Poverty

Winsemius, Jongman, Veldkamp, Hallegatte, Bangalore and Ward (2015) stated that the shocks caused by natural disasters such as floods and droughts affect poor people who live in that vicinity because in hazard-prone areas there tends to be more poor people. People living in rural areas face the consequences of weak service delivery in respect to water. Sigenu (2006:20) stated that poorer people with the lowest status often suffer disproportionately when water supplies are limited. Poor people who cannot afford to pay for water services are those most affected by privatisation. Privatisation requires payment for water facilities which the poor cannot afford to pay. Moe and Rheingans (2006:51) stated that the global burden of poor access to water supply falls primarily on the poorest of the poor, due to a shortage of income. Strategies for poverty alleviation continue to be undermined by inadequate provision of water related services in developing countries; and the Water Poverty Index (WPI) was created so that water shortages should be addressed in a more systematic way (Perez-Foguet & Garriga, 2011:3595-3612). Klasen (1997:51-94) argued that among the African population, poverty has a very strong racial dimension with poverty being a concentrated and direct result of Apartheid policies. In some African countries poor black people are denied equal access to education, employment, services, and resources. Gambe (2019:105-122) reported that in Chitungwiza, water poverty mainly affects women and the effects of water poverty on the economic wellbeing of women remain are not yet fully understood. Feitelson and Chenoweth (2002:263-281) pointed-out that the development of indicators that detect water problems took much effort as the domestic supply of water is usually costly. The

situation where a nation or region cannot afford the cost of supplying sustainable clean water to all people at all times is referred to as water poverty.

3.3.2. Community livelihood and projects

Shortages of rainfall have resulted in a decrease in crop production. The use of manure does not help crops if there is no water to dilute it with. Similarly, Nazare, Mdluli, Babugura and Banda (2005:20) agreed that shortage of water can cause diseases, mortality and hunger. Cook, Fisher, Anderson, Rubiano and Giordano (2009:13-29) argued that as the risks of food insecurity increase, poverty and environmental effects on major river systems are exacerbated by conflicting demands for food and water and the livelihoods of all people are supported by water that is needed for water-consuming agricultural and industrial services, consumption and sanitation and environmental services. Shortage of water directly affects livelihoods in many ways. People may be left with nothing to eat, because maize and other crops will perish if there is a scarcity of water. Walter, Shuai, Fangli, Lerato, Masala, Sydney, Zeng, Bingfang, Wenwu, Nyathi and Eric (2020:91) stated that because of its importance to land management and the sustainable livelihoods of communities, landscape change studies have attracted increasing interest and in small rural communities in developing countries such as South Africa, the landscape change and its drivers are poorly understood.

The decline in the provision of multiple ecosystem services, which are important for livelihoods in rural areas and indigenous communities in South Africa is exacerbated by land degradation and global climate change (Sigwela, Elbakidze, Powell & Angelstam, 2017:272-280). Egoh, O'Farrell, Charef, Gurney, Koellner, Abi, Egoh and Willemen (2012:71-81) noted that where many people are poor and are reliant on natural resources in developing countries like Africa, human dependence on provisioning ecosystem services is usually acknowledged and the people's reliance on water and natural resources differs from place to place as types of vegetation and socio-economic conditions vary. The numerous benefits to rural communities and society at large offered by indigenous forests and savannas and plantation forests and forests and forestry play

a big role in contributing to livelihoods and poverty alleviation sustainability (Shackleton, Shackleton, Buiten & Bird, 2007:558-577).

Robledo, Clot, Hammill and Riche' (2012:20-28) stated that the majority of rural people in South Africa live in the former homelands and that the mainstay of the rural economy in many areas is cash derived from urban and government and the diverse livelihood requirements of rural households are not recognised. Bunce, Rosendo and Brown (2010:407-440) pointed-out that the world's poor living in coastal or rural-urban areas is rising along with direct dependency on marine resources as well as on goods and services provided by terrestrial ecosystems.

3.3.3. Health and social relations

Most people in the municipality do not treat water before using it. Although people had not previously treated water before using it, there has never been an outbreak of cholera in the Lepelle-Nkumpi Local Municipality. This was because people only used water from unprotected sources for domestic uses, such as cleaning and washing but not for drinking and cooking. Tarrass and Benjelloun, (2012:240-244) stated that public health and development shortages of water could become a major obstacle, and every year the global health burden associated with these conditions is estimated at 1.6 million deaths from diseases associated with lack of access to safe drinking water. Some people suffered from diarrhoea because they did not treat the water they obtained from unreliable sources. Most of those people were children, followed by men and this was because the people mostly lived near the community river. Hallowers, Pott and Dockel (2008:357-369) showed that in South Africa, a new dispensation which required a paradigm shift in the policies resulted in the creation of a social and political transformation. Wenhold and Faber, (2009:61-63) argued that a lack of water may lead to malnutrition and be particularly dangerous to children and people living with HIV and AIDS. In South Africa, thirty percent of child deaths are caused by poor water and sanitation conditions. Apart from health problems, people, especially women and children compromise their social

time looking for water when it is not available in or near their homes (Hall, Leatt & Monson, 2006:58).

Women and children forfeit quality time as a family with their fathers/husbands due to the fact that they are looking for water elsewhere. Safe and clean water promote a healthy living environment for human beings. To prevent adverse health effects and, in the case of irrigation, undue contamination of groundwater, Municipal wastewater that must be planned and regulated carefully can be an important water resource (Bouwer, 2000:217-228). Vitale, Afrić, Pavic and Holcer (2003:17-27) suggested that an emphasis on the impact of drinking quality water and the way it affects human health emerged from global problems, namely, limited water resources and increasing water use and pollution.

3.4. STEPS THAT CAN BE TAKEN BY MUNICIPALITIES TO MANAGE WATER SCARCITY AND WATER DEFICIT IN SOUTH AFRICA

South Africa has a complex problem of trying to find ways to solve the water crisis and municipalities need to work together with public authorities such as water boards on water quality and wastewater treatment methods, as many water problems occur at municipal level and municipalities are responsible for preparing regulations for implementing and enforcing the regulations in the National Environment Management Act and other environmental regulations.

3.4.1. Water pricing

Gleick (2000:34) stated that the pricing system that links water to the amount used encourages conservation. In terms of consumption behaviour, water is perceived to be cheap. By increasing the price of water, consumption behaviour may be influenced positively, resulting in improved water demand management and water savings. The current price of water does not necessarily include the cost of making water accessible and other related service costs. Although a pricing-based water demand management mix suffers from a paradox of split aims (Olmstead & Stavins, 2007:27) it can succeed in mitigating the water crisis in cities if it is well executed. local government and

municipalities face a problem of non-payment for water. Local government for example has allocated ten percent of the national fiscus and is expected to be self-sufficient. Yet people relocate to cities and towns looking for suitable economic opportunities that, in many cases, are not available. Nevertheless, these people continue to reside in areas that demand service delivery.

Fakoya and Imuezerua, (2020:1-18) stated that the inability of the traditional cost accounting method to provide enough water purification-related cost information to assist water scheme managers in making informed water management decisions, is related to the challenge of water pricing by water treatment schemes. Olmstead and Stavins (2007:15) stated that price increases in California during the drought of 1987 to 1992 achieved cumulative demand reductions of twenty to thirty percent. Razetti (1992) (b) and Russel and Shin (1996) in Olmstead and Stavins (2007:15) stated that 24,800 litres were saved per household per month in Phoenix and Arizona during the same period. To improve water use, efficient water pricing can be used. The users can get information from prices if they are designed accurately and can make choices regarding their water use. Neither water scarcity levels nor the size of their budget deficits can be explained by the willingness of countries to undertake water pricing reforms and implement them successfully (Dinar & Subramanian, 1998:239-250). The introduction of metred consumption in the city of Leaven Worth in Washington in 1990 reduced potable water demand by forty to sixty percent, (Olmstead & Stavins, 2007:17). South Africa is a water-scarce country with a high level of income inequality.

Over the years, the issue of water pricing for water services and raw water has been shaped to try to address both of these issues and ensure a revenue stream. A revenue stream with parliamentary appropriation is enough to fund provision of water, water resources protection management; and costs related to infrastructure (Schreiner, 2015:289-311). Speelman, Buysse, Farolfi, Frija, D'Haese and D'Haese (2009:1560-1566) pointed-out out that water pricing policies are developed for allocating water efficiently and achieving water system sustainability in many developing countries where agricultural water usage is still subsidised. Even if some costs were subsidised, the traditional policy was that all water should be paid for. Muller (2008:67-87) stated that the

water supply organisations, according to political legitimate policies, have been enabled to recover their costs and achieve the economic objective of financial sustainability.

Efficient water use can economically be promoted by incentive pricing programmes and the provision of a revenue source to pay for environmental damage. While meeting the subsistence needs of poor households, the pricing arrangement can promote water use pattern efficiency and sustainability goals set by the European Water Framework Directive, while meeting poor households' subsistence needs (Ward & Pulido-Velazquez, 2009:293-313).

3.4.2. Households' usage control

There are many ways of saving water in a house. For example, people may use a bowl for cleaning vegetables, instead of a running tap. A washing machine should only be used when there is a full load and also leaking taps should be fixed to curb water loss. Cars should be washed with a bucket instead of a hosepipe (Fabrizi, 2009: 9). Grass or a lawn should be allowed to grow a little longer during dry periods. Households should know that there is no need to water well established shrubs and trees. Fabrizi, (2009:10) suggested that rainwater for watering gardens can be collected; and recommended the usage of watering cans instead of a hosepipe. Water companies may impose a ban on domestic use of hosepipes and sprinklers. According to Fabrizi, (2009:8), the washing of cars using hosepipes and also the cleaning of extensions of buildings, other than windows may also be restricted. Water education through public information is crucial and school education programmes should be run to highlight the needs and benefits of initiating water demand strategies. These programmes could include brochures, advertising, newsletters, billboards, and newspaper advertisements, exhibits and informative billboards. Grey water utilisation at a domestic level can be beneficial for irrigating small gardens, and, to a lesser extent assisting in the recharging of ground water resources. This practice not only reduces water demand, but also relieves the volume of water used in waste management treatment works. The Department of Water Affairs and Forestry (2004) reports that the average water wastage due to plumbing leaks in households is estimated at twenty percent of the total indoor household water use. Consumers should be

encouraged to maintain their internal reticulation systems. Together with the use of educational programmes and pressure control systems, internal leaks can be reduced. For the elaboration of the water supply it is important to understand the effects of water supply time restrictions, especially for purposes of hygiene (Fan, Liu, Wang, Ritsema & Geissen, 2014:853-865). Adewumi, Llemobade and Van Zyl (2010:221-231) report that in South Africa many communities struggle to adequate quantities of potable water and access reliability for water requirements diverse and there is increasing interest in reuse of wastewater for non-drinking water. In this regard, Pickering and Davis, (2012:2391-2397) supported this when they contended that in Africa more than two-thirds of the population in order to get water for drinking and domestic usage, must leave their homes to fetch it and the volume of water collected by households has been influenced by time burden, as well as time spent on income generating activities and child care.

3.4.3. Ground water exploitation

Ground water may be another avenue to be visited in order to supplement the rivers and it has been estimated worldwide that more than two billion people depend on groundwater for their daily water supply. The aquifers may be artificially recharged by irrigation schemes and leakages from conveyance channels (Hiscock, 2011:207-225). Ground water is one of the very few underutilised water resources left in South Africa. Zuppi (2008:49-64) indicates that more than half of humanity's freshwater for everyday use such as drinking, cooking, and hygiene, as well as thirty percent of irrigated agriculture and industrial development is provided by groundwater, as is the most extracted natural resource in the world. Under our feet there are millions of cubic of water, hidden from the threat of increased temperatures and evaporation caused by climate change. Ground water extraction was assessed to be the cheapest, quickest large volume water augmentation option, as the operating and capital expenses are lower than alternative sources, and it requires less electricity to collect it than other options. An advantage of using ground water as a resource is that there is a significant time delay between the onset of drought and water availability. For example, the Cape Flats Aquifer supplying Cape Town requires a recharge of water supplies from treated wastewater and storm water.

Across the globe, irrigations using groundwater consumes considerable energy as well as water resources. Karimi, Qureshi, Bahramloo and Molden (2012:52-60) stated that pumping of groundwater consumes 20.5 billion kWh electricity and two billion of diesel fuel and contributes 3.6 percent of the total carbon emission of the country. Ground water is likely to be most severely affected, with the ground water table dropping due to a reduced recharge, particularly in the western parts of the country. Strict ground water management systems should be put in place with early warning mechanisms to report depleted ground water reserves. The long-term goal of the Department of Water and Forestry is that local authorities should manage their own water supply and demand. Masiyandima, Van der Stoep, Mwanasawani and Pfupajena (2002:935-940) reported that in South Africa the groundwater is a small component of water resources and at more localised scales, it plays a significant role in irrigation water supply and for more than twenty years, the aquifer has been the sole source of irrigation water for commercial agriculture. Elumalai, Nethononda, Manivannan, Rajmohan, Li and Elango (2020:103967) stated that in the upper part of Luvuvhu sub-catchment in Limpopo, South Africa, the quality of groundwater and its suitability for drinking and irrigation uses were assessed and multivariate statistical analysis were applied to understand the chemical characteristics of groundwater. Elumalai *et al.*, (2020:103967) reported that since 1970, groundwater has been used as the main source of water supply for the main cities, towns and dispersed rural communities across the country, as reticulated surface-water schemes provision is often expensive.

3.4.4. Proper use of irrigation water

Reinders, van der Stoep and Backeberg (2013:262-272) stated that all over the world irrigated agriculture plays a major role in the livelihoods of nations, and in South Africa it is no different and a water balance to a specific situation rather than by calculating various performance indicators is used to assess the irrigation efficiency. Boelee, Laamrani and Van Hoek, (2007:43-51) argued that water is not only used for irrigation of agricultural crops, all over the world in irrigation systems, but for a whole range of domestic and other purpose as well; and people depend on the irrigation system to provide them with drinking water when groundwater is unavailable or of low quality. Similarly, Van der Hoek,

Konradsen and Jehangir (1999:107-119) agreed that there is an increasing pressure on the irrigation sector in an environment of growing scarcity and competition for water, to make irrigation for crop production more efficient, and to transfer water to the urban, industrial and environmental sectors. Irrigation will become more dependent on poorly characterised and virtually unmonitored source of water in the race to enhance agricultural productivity. Impaired water and soil quality in many areas was increased by the usage of irrigation water (Malakar, Snow & Ray, 2019:1482). Zhao, Wang, Jiang, Zhai, Wang, He, Li, Zhang, Wang and Zhu (2020:122058) reported that in well irrigated districts agricultural irrigation involves both water and energy consumption and when pumping groundwater these processes are closely linked when one considers the energy used. Singh (2014:1-14) suggested that in achieving food security for the burgeoning global population and for sustaining livelihoods; proper planning and management of irrigation is important because if managed properly, irrigated agriculture is expected to provide more food. According to Chipfupa and Wale (2019:383-392), to realise the objective of enhancing agricultural productivity and commercialising smallholder irrigation farming, efficient and sustainable utilisation of irrigation water is the key; and for sustainable use, the scarcity of irrigation water needs to be valued and recognised. In water allocation and management explanation variations of smallholder irrigation, value of water is a critical element and at smallholder level it has been hampered by data deficiencies (Muchara, Ortmann, Mudhara & Wale, 2016:243-252). Mdemu, Rodgers, Vlek and Borgadi (2009:324-328) stated that to address future water scarcity, which is driven by increasing human population and potential climate and land use changes, improving productivity of water is an essential strategy. Similarly, Dinar and Mody (2004:112-122) stated that irrigation, food security and sustainable development need efficient use of water resources and for efficient allocation of different water pricing and cost recovery arrangements, efficient costing is necessary.

3.4.5. Increase in water storage reservoirs

Farfan and Breyer (2018:403-411) reported that throughout history, artificial water reservoirs have been created for a variety of purposes such as preventing flooding, seasonal water storage for irrigation, fishing, hydropower generation and energy storage.

Olufayo, Ochieng and Otieno (2010:55-58) postulated that in global terms, water resources in South Africa are scarce with a mean annual rainfall being fifty percent less than the world average of 860 mm/a. Water availability was further reduced by increasing economic development which resulted in water contamination. Arefiev, Badenko, Nikonorov, Terleev and Volkova (2015:20-25) agreed that as subsoil, forests, water resources, the sea shores and reservoir storage are in the same position and in recent decades, the urgency of coastal protection against erosion has increased.

One of the most vital practices for the development and management of water resources is the construction of reservoirs and many large reservoirs were built without systematic evaluation of the long-term environmental, social and economic interactions of various possible alternatives (Devic, 2015:561-575). According to Wen Shen (1999:743-757), new dams face a difficulty during construction when removing reservoir sediment accumulation for the extension of the useful life of a reservoir, which has received increasing attention.

Since dams supply water for human consumption, Schleiss, Franca, Juez and De Cesare (2016:595-614) reported that irrigation and energy production during artificial water storage required during dam construction, is essential for the sustainable health and welfare of civilians. Dam reservoirs provide protection for downstream valleys against extreme flood events and droughts; and such valleys are also used for recreation and exploration. Deemer, Harrison, Li, Beaulieu, DelSontro, Barros, Bezerra-Neto, Powers, Dos Santos and Vonk, (2016:949-964) agreed that the atmospheric conditions collectively created by dams is an important source of greenhouse gases and data availability and a methodological approach in order to consistently quantify, model and manage these emissions is essential.

Li, Chen, Chen, Chen and Shen (2020:104922) stated that around the world, reservoir construction has been associated with increased economic value and increased demand for electricity, as it is an important human activity. It is also crucial for coastal communities to have the ability to make well-informed decisions about protective strategies for rises in sea level. Wisser, Froking, Douglas, Fekete, Schumann and Vorosmarty, (2010:264-275)

reported that in small reservoirs, rainwater harvesting was overlooked in large-scale assessments of agricultural water supply and demand; and with its long history of supplying water for agricultural purposes, rainwater harvesting has been defined as the ideal method for collection and storage of surface runoff. Avisse, Tilmant, Muller and Zhang (2017:6445-6459) agreed that the availability of regularly updated information on reservoir levels and capacity is of paramount importance for the effective management of those systems in river basins with water storage facilities.

3.4.6. Usage of solar-powered water purifiers

Nieuwoudt (2003) argued that in Southern Africa, life is not easy for the low-income rural population. In informal settlements around cities more than half of the households are without running water because of shortcomings in basic services such as water, sanitation and electricity. Schafer, Hughes and Richards, (2014:542-556) stated that in many developing countries; particularly in rural locations, lack of access to safe drinking water remains an urgent concern; and membrane water treatment technologies have the potential to remove microbiological and chemical contaminants reliably and simultaneously from a wide range of water sources. Schutte (1998:279-285) stated that South Africa, as a result of its limited water resources and other complicating factors, is facing severe water supply and water quality problems and; to ensure economic prosperity and a reasonable standard of living for all South Africans, adequately educated and trained water practitioners are needed to address these problems.

A competitive solution for providing drinking water in many countries around the world is water desalination, which is increasingly becoming the most sustainable water resource option (Shatat, Worall & Riffat, 2013:67-80). Dackhammar and Hansson (2020) indicated that ninety percent of all disasters from the year 1995 to 2005 were consequences of weather-related events and that the lack of availability of clean water and lack of sanitation which causes pollution of water sources and damage to water infrastructure, which is often caused by natural disasters; is a growing global problem. Zhao, Guo, Zhou, Shi and Yu (2020:388-401) agreed that the basis for the development of eco-friendly and cost-

effective freshwater production is provided by solar-powered water evaporation; meaning the extraction of vapour from water, using solar energy.

Salau, Deshpande, Adaramola and Habeebullah (2020:377-387) showed that in major aspects of human life, especially for drinking, cooking, and for washing purposes, water is a vital resource, which is essential for energy generation, food production, and for cleaning; and that the spread of diseases was often caused by the lack of access to clean water.

Solar energy can purify the dirtiest or even the most evil smelling water into a usable form, which can be used for drinking purposes and is affordable. Solar energy purification units are small, light in weight and can complete the purification process in a short time (Varghese, James, Mathew & Abraham, 2020:187-190). Soni, Stagner and Ting (2017:8-18) stated that in developing nations, sustainable and cost-effective water treatment systems are critical elements and wastewater treatment systems that are adaptable, affordable and sustainable can be powered by wind/solar energy; which is a recommended solution, based on proven theory and technology. Elasaad, Bilton, Kelley, Duayhe and Dubowsky (2015) stated that in small remote communities in the developing world, the lack of clean water is a major health problem and that the best solution for solving sanitisation of water problems in small communities is water purification and desalination systems, powered by solar energy such as photovoltaic powered reverse osmosis systems (PVRO).

3.5. SUMMARY

This chapter reviewed the literature of the study that focused on the cause of water scarcity and water deficit, and the impacts and measures that were put in place for the management of water scarcity and water deficit in South Africa. It is also showed that water shortage is a global problem, and that water is becoming scarce in South Africa and the world at large. Reasons for the effects of both water scarcity and water deficit on households and businesses were discussed, in light of a variety of sources. Reasons such as urbanisation and population groups, climate change, drought and surface runoff

were discussed. The effects of water scarcity and water deficits such as those affecting poverty, community livelihoods and projects, and health and social relations were also discussed. Finally, steps that could be taken by municipalities to manage water scarcity and water deficit were discussed. These included water pricing, household usage control, ground water exploitation, proper use of irrigation water, increases in the number of water reservoirs and the usage of solar-powered water purifiers. The next chapter focuses on the research methodology and design.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1. INTRODUCTION

The previous chapter reviewed scholarly literature on water scarcity and water deficit. This chapter outlines how data was gathered for the study and also gives an account of the research design, the research paradigm, and the methodology and sampling techniques used, as well as the data collection tools. A qualitative research approach was employed by the researcher. The data collection methods used were review of documents and semi-structured interviews. The chapter went on to explain the data analysis procedures, as well as the trustworthiness of the collected data. The observance of several ethical considerations was used to reduce risks.

4.2. THE RESEARCH DESIGN

Kombrabail (2009:1) stated that the specification of methods and procedures for acquiring information needed, is the research design. The overall operational pattern or framework of a project stipulates what information was to be collected from which source, using what procedures. A research design requires the consideration of data collection methods, the sampling method and data analysis. Research design can be used when a researcher intends to conduct research using a plan or a blueprint (Babbie & Mouton, 2001:55).

This study followed a qualitative case study design. A qualitative approach was used for the purpose of gathering qualitative data from key informants with regard to the shortage of water in the Local Municipality. A qualitative case study adopts a particular design in order to gather naturalistic, holistic, ethnographic, phenomenological and biographic data for analysis. Meriam (2009:46) stated that case study methodology maintains a deep connection to core values and intentions that are descriptive and particularistic. Rather than analysing the methods of enquiry used, the research is defined by having an interest in individual cases. Stake, Denzin and Lincoln (1998:86-109) stated that the researcher and case intuition informs the selection of a method and makes use of naturally occurring

sources of knowledge, such as people or observations of interactions that occur in the physical space. Tetnowski (2015:39-45) agreed that for answering complex, real world questions, a qualitative case study can be a valuable tool.

4.3. RESEARCH PHILOSOPHY/PARADIGM

Saunders, Lewis and Thornhill (2016:124) stated that a system of beliefs and assumptions about knowledge development is defined as a research philosophy. There are five major research philosophies, namely, positivism, critical realism, interpretivism, postmodernism and pragmatism. For this study, an interpretive perspective and an interpretive approach was deemed the most suitable philosophy. An interpretive philosophy was adopted because it undergirds qualitative research methodology.

Kuhn (1970:43-53) described a research paradigm as a set of common beliefs and agreements shared between scientists about how problems should be understood and addressed. De Villiers (2005:11-13) defined interpretivism as like positivism; it is a paradigm that includes both ontological and epistemological perspectives. Saunders *et al.*, (2016:140) stated that the creation of new, richer understandings and interpretations of social words and contexts are the purpose of interpretivist research. Elster (2007:9-31) stated that the meaningful nature of people's characters and participation in both social and cultural life are emphasised by interpretivism. We need to know how to modify an old plan to fit a new situation and rely on past episodes to solve a new problem (Slade, 1991:42). Methodologies such as interviewing, or participant orientation are used when a researcher relies on a subjective relationship between the researcher and the subjects. The interpretivist paradigm is used to gather and analyse qualitative data that is aligned with research methodologies and methods. For example, Polkinghorne (1998) stated that for data analysis; narrative approaches were based on the Social Constructionist school of thought. The assumption that is made from interpretivism when it is used as a paradigm is that reality is subjective and can differ when one is considering different individuals. Scotland (2012:9-16) supported that view by saying that it could lead to the understanding that research participants prefer not to give general interpretations.

The researcher was enabled by the interpretivist paradigm to treat the context of the research and its situation as unique; considering the given circumstances associated with it; as well as the type of participants involved. Interpretivism can be divided into various strands. In this study, the lived experiences refer to participants who had past experiences of water shortage and deficit in the Lepelle-Nkumpi Local Municipality and those experiences were researched in the study.

4.4. RESEARCH METHODOLOGY

As stated earlier, a qualitative research methodology was utilised for this study. According to Polit and Hungler (2000:233), methodology refers to ways of gathering, organising and analysing data. Holloway and Wheeler (1996:1) explained qualitative methodology as a method that concentrates on the everyday life of persons, while also being grounded by the conviction that life is socially constructed and acknowledged.

Queiros, Faria and Almeida (2017:73-81) pointed-out that the intention of qualitative methodology is to understand a complex reality and in a given context to derive the meaning of actions and then perform analysis. Qualitative methodology is not concerned with accurate and reliable measurements or statistics. They further pointed-out that it becomes possible to formulate a more accurate, informed and complete choice by means of analysis of the advantages and disadvantages of each method. On the other hand, qualitative research methods does not require larger samples and do not need a long time for data collection (Rashman, 2020:67-71).

4.4.1. Study area

Lepelle-Nkumpi Local Municipality is a category B municipality situated within the Capricorn District, in the Limpopo Province. The municipality is located fifty-five kilometres south of the district municipality and Polokwane City. It is the second largest municipality in the district comprising at least eighteen percent of the district population (Lepelle-Nkumpi Local Municipality, 2020: Online). The municipality is predominately

rural and is divided into thirty wards. Four of them are located in the township called Lebowakgomo, which is one of the growth points for the Capricorn District Municipality. All sittings of the Provincial Legislature take place at Lebowakgomo's Old Parliament of the former homeland (Lepelle-Nkumpi Local Municipality, 2020: Online).

4.4.2. Population

Bless, Hingson-Smith and Kagee (2006:98) stated that the entire set of objects or people, in the area under review is the focus of the research; about which the researcher wants to determine some characteristics about the population. The Lepelle-Nkumpi Local Municipality has an estimated population of approximately 230,350 people with about 59,682 households. The municipality has thirty wards, which indicates that there are approximately thirty councillors in the municipal council; each representing a ward (Lepelle-Nkumpi Local Municipality, 2020: Online). The key informants for the study were individuals from households, small businesses and ward councillors within the Lepelle-Nkumpi Local Municipality.

4.5. DATA COLLECTION METHODS

Tools that were used to gather research data were qualitative data collection tools. Data collection utilised a number of methods, which included interviews, focus groups, surveys, telephone interviews, friends' notes, and taped social interactions and questionnaires (Heaton, 2004:37). The data collection instruments used included semi-structured interviews and an examination of relevant documents.

4.5.1. The study of documents

Erlandson, Harris, Skipper and Allen (1993:11) refer to documents as being a wide spectrum of written and symbolic records, including any available material and data. The researcher made use of official documents such as integrated development plans (IDP) documents, annual reports, policies and strategies from the Lepelle-Nkumpi Local Municipality. The focus was primarily on the documents released from 2016 until 2019, because this was the period which was covered by the study. Permission was sought

from the municipality to access documents that were not readily accessible online. Information obtained from official documents was compared and collated with information obtained through interviews, in order to present coherent findings.

4.5.2. Semi-Structured interviews

The primary data gathering method that was conducted by the researchers was interviewing. To allow for an in-depth probing of the participants, this study used semi-structured interviews. The study entailed face-to-face interviews in order for the researcher to arrive at qualitative information. Opdenakker (2006) stated that the preferred interview technique in the field of qualitative research was face-to-face interviews. Hawkins (2018) stated that the most common means of data collection in qualitative descriptive research is interviews with key informants. An interview guide was prepared and used to conduct interviews at community level. During the visit, community members who were available were questioned in an interview. Telephonic appointments were only made with councillors and business owners. Interviews were conducted during the day. The questions from the interview guide were provided by the researcher, who was also the interviewer and wrote down the responses. Corbetta (2003:269) stated that semi-structured interviews were interviews where questions with similar wording are asked in the same order. For the participants not to be influenced by the tone of the interviewer, the same tone was used for questioning (Gary, 2004:215).

In a semi-structured interview, the analysis and interpretation are ongoing sampling processes and the interviewees are chosen in a deliberate, and rarely random way. In social movement research, intensive interviews can maximise description, discovery and the active involvement of participants; as well as providing a way whereby interviewing methods can be used to create new theoretical insights. Semi-structured interviews are time consuming; labour intensive and interviewer sophistication is required. Analysing a huge volume of notes and sometimes many hours of transcripts, is usually an arduous task. In the estimation of the views of the population, semi-structured interviews are likely to encompass a large enough sample to yield substantial precision.

4.6. SAMPLING PROCEDURES AND PROCESSES

De Vos, Fouche and Delpont (2002:1999) define a sample as a small part of a set of objects or persons that together comprise the subject for the study. For the aim of this study, ten individuals from different households, ten small business owners, five councillors and five municipality representatives were sampled from the Lepelle-Nkumpi Local Municipality. The total sample was thirty individuals. Selection of participants involved in the study was based on researcher judgements. When using this technique, the researcher chose the option of selecting a sample that provided relevant information, because this sampling technique was suitable for this study. In data gathering, purposive sampling was used, together with a number of other techniques (Godambe, 1982:393-403). Allen (1971:47-51) stated that when using purposive sampling, it was important to be clear about the participant's level of education. Seidler (1974:816-831) pointed-out that the researcher should also be aware of possible biases surfacing among the participants. Zelditch (1962:566-576) argued that when documenting events, not everyone can attend or witness events, so purposive sampling is the best option.

To gather the necessary data to draw a conclusion often requires various types of sampling strategy and techniques for attaining the goals of the study. The various purposive sampling techniques that are available do provide researchers with justification to make generalisations from a sample. These efforts must be logical, analytic, or theoretical enough in nature to be varied. The flexibility of purposive sampling allows researchers to save time and money while they are collecting data. It offers a process that is adaptive for when circumstance change, even if they occur in an unanticipated way. Purposive sampling can look at averages, but it also helps researchers to identify the extreme perspectives that are present in each population group. When the typical case sampling approach is performed, using this process, researchers are usually studying an event that relates to who would be considered an average person in that specific demographic. It is even possible at times to pull information from past research opportunities to provide relevance to current data.

Purposive sampling is highly prone to researcher bias, no matter what type of method is being used to collect data. However, researchers must provide evidence that the judgement used to select the various units or individuals in purposive sampling was appropriate for the process used. The high levels of subjectivity cast an inevitable shadow of doubt on the results in almost every situation. The participants in purposive sampling can also manipulate the data being collected. Some participants may choose to provide incorrect information to create an unwanted outcome, as they have biases of their own that they want to make public. There is no way to evaluate the reliability of the expert or authority in purposive sampling, but there are occasional exceptions to that particular disadvantage.

4.7. DATA ANALYSIS PROCEDURES

A thematic data analysis method was used to make use of the qualitative data collected through interviews. All interviews were audio recorded during discussions with the research participants; to ensure that reflections about the views of the participants were accurate. Interviews were transcribed verbatim, and coding was undertaken in order to identify specific themes pertaining to the issues of water scarcity and deficit. Major themes were identified and common themes were grouped together. Basically, data collected through interviews was ultimately integrated with data gathered through document analysis.

4.8. TRUSTWORTHINESS OF COLLECTED DATA

Trustworthiness referred to as validity and reliability. It is pertinent to address how qualitative researchers establish that a research study's findings are credible, transferable, confirmable, dependable and authentic. Trustworthiness is all about establishing these five things, which are described in detail below:

4.8.1. Credibility

In order to help the researcher to establish credibility, Shenton (2004:63-75) explained that to establish credibility is to seek or to ensure that a study measures or tests what is supposed to be tested. Lincoln and Guba (1985:438-439) define credibility as the equivalent of internal validity. In quantitative research the aspect of truth-value is a concern. The researcher develops a rapport and trust with the research participants to enhance credibility. Interview guides were used to conduct the individual interviews with the participants. All interviews are recorded, and notes were taken of some participants to determine how accurately they match.

Polit and Beck (2012:1280-1298), described credibility as the truth of the data or the participants views and the interpretation and representation of them by the researcher. The one method of increasing credibility is the inclusion of member checking into the findings, which means you then gain feedback on the data, interpretations and conclusions directly from the participants.

4.8.2. Transferability

Shenton (2004:63-75) defines transferability as the extent to which the findings can be applied from one study to another. Houghton, Casey, Shaw and Murphy (2013:12-17) also agree that transferability refers to findings that can be applied to other groups or settings, transferability described by Lincoln and Guba (1994:106) describe transferability as the degree to which the results of qualitative research can be transferred to other contexts or settings with other respondents. The context of the research processes involved, such as data collection and analysis are described by the researcher. A detailed report of the study, including its findings, is provided by the researcher. To enable readers to appraise the significance of the meanings attached to the findings and make their own judgement regarding the transferability of the research outcomes, the researcher has to provide a rich, thick description of the study such that the data and the description speak for themselves.

4.8.3. Dependability

According to Shenton (2004:63-75), if the work is repeated in the same context, using the same methods and with the same participants, similar results are obtained, so dependability can be established. Dependability in this study was enhanced by the use of an interview schedule and an audio recording of all interviews. Guba and Lincoln (1994:106) describe dependability as the reliability of data over time and the conditions under which it was obtained.

Polit and Beck (2012:1280-1298) refer to dependability to the constancy of the data in similar conditions. The data and the descriptions of this research that was elaborate and rich required auditing for dependability and also was enhanced by altering the research design as new findings emerged during data collection.

4.8.4. Confirmability

Confirmability is described as a qualitative investigator's comparable concern regarding objectivity (Shenton, 2004:72). Guba (1981:75-91) agreed that triangulation to minimise the effect of admission of researcher's beliefs and assumptions is confirmability. Lincoln and Guba (1985:438-439) defined confirmability as the degree to which the findings of the research study can be confirmed by other researchers.

The researcher's ability to demonstrate that the data represents the participants' responses and not the researcher's biases or viewpoints is referred to as confirmability (Polit & Beck, 2012:1280-1298). Notes were taken during the interviews and were compared with transcribed data to establish confirmability whereby the researcher makes provision for a methodological self-critical account. It is good for a researcher to archive all collected data in a well-organised form so the data is available if the findings are challenged.

4.8.5. Authenticity

The qualities of genuineness, truth and reality are referred to as authenticity (Grayson & Martinec, 2004:296-312). People will judge anyway, even if it is difficult to evaluate someone else's authenticity (Moulerd, Garrity & Rice, 2015:173-186). The ability and extent to which the researcher expresses the feelings and emotions of the participant's experiences in a faithful manner is how Polit and Beck (2012:1280-1298) describe authenticity. The researcher process and critical appraisal of the evidence and interpretations were used to uphold valid interpretations of the data.

4.9. ETHICAL CONSIDERATIONS

The researcher complied with professional ethics when conducting this study. Hofstee (2001:118) stated that to secure participants' privacy and security attention to ethical matters should ensure that the researcher respects the persons that form part of the research and takes the necessary precautions.

The research adhered to the university's ethical guidelines in order to receive an approval from the research committee. In this regard, attention was paid to the following specific rights of participants.

4.9.1. Informed consent

The researcher is familiar with the university's ethical guidelines which require an approval letter to go ahead with the research. The approval letter was accompanied by a consent letter that permitted the researcher to utilise all premises attached to the study.

Fox and Bayet (2007:148) noted that there should be an undertaking by the researcher stating that prospective participants will be informed fully about the procedures and risks involved in a research study, before giving their consent to participate in the study. In addition to explaining the research it is important to state the participants' rights to withdraw should they wish to (Devlin, 2006:148). Participants were also alerted that notes would be taken, as well as of the use of an audio recorder during interviews.

4.9.2. Right to privacy

The participants were not subjected to any victimisation and the researcher ensured that their privacy was protected. The identities of the participants were not revealed. Their research data was restricted from access by law enforcement agencies to prevent any connection between participants being made and of the legal consequences of same. Participants were not asked to reveal their private personal details, such as their medical history, which included sexually transmitted diseases. Confidential information about a participant was not allowed to be shared with anyone, including family or friends, nor was talking about confidential information allowed anywhere they could be overheard. The participants were assured of their right to privacy and were informed that their identity would remain anonymous.

4.9.3. Confidentiality

The researcher guaranteed that participants' confidentiality would be protected by assuring them that identifying information would not be made available to anyone who was not directly involved in the study. Participants were assured by the researcher that all the information obtained from them would be kept strictly confidential and that their names would not appear in the research report. Devin (2008:162) agreed that private data identifying subjects should not be divulged. The participants' right to privacy and the right to refuse to answer certain questions, or to even be interviewed at all were respected.

4.9.4. Anonymity

The researcher ensured that participants' rights to anonymity was upheld by making sure that their identities, names or contact information was not disclosed to any third party, to avoid tracing of responses by some of the participants. In this regard, Mouton (2001:243) guaranteed that informants' identities would not be revealed. The extent to which identifying information was safeguarded was meticulously outlined, and participants were assured that whatever they revealed would not be shared with the wrong people.

4.10. LIMITATIONS TO THE RESEARCH METHODOLOGY

The current research study was limited to studying water shortages in households in the Lepelle-Nkumpi Local Municipality using a qualitative methodology, which prevented the findings from being generalised to the entire province or elsewhere. One of the major reasons why the finding of the study could not be generalised to other settings was attributed to the fact that the sample drawn from the target population was small and therefore not representative of the entire population. Despite the shortcomings associated with the chosen research methodology, the researcher engaged in prolonged discussions with participants during data collection phase to achieve data saturation. In other words, the research participants were interviewed until no new data could emerge from discussions. Having taken efforts to enhance the credibility of collected data, it can be argued that the findings of the study could be transferred to other similar settings.

4.11. SUMMARY

This chapter outlined the research design for this study. A qualitative research design was followed to collect qualitative data from the informants and to arrive at a qualitative result. The research method was also discussed, which included the study area, the population and the sample size and the method of selection. The data collection method and data analysis procedures, as well as the trustworthiness of the collected data was also presented and explained. Data was collected by means of a document study and interviews. The chapter also presented the limitations of the study that might have influenced its outcome. Finally, the study sought to eliminate risks by observing various ethical considerations. The next chapter deals with presentation and the analysis of data obtained via the various methods mentioned above.

CHAPTER 5: PRESENTATION OF FINDINGS AND DISCUSSION ON WATER SCARCITY AND WATER DEFICIT IN THE LEPELLE-NKUMPI LOCAL MUNICIPALITY

5.1. INTRODUCTION

The previous chapter focused on the research design and methodology followed in conducting the study. Specifically, the previous chapter which presented an outline of the research design and the research paradigm, followed by the presentation of the data collection and analysis methods that were applied. This chapter presents the findings of the study with a specific focus on the assessment of the reasons for water scarcity and water deficit in the Lepelle-Nkumpi Local Municipality. Secondly, the chapter examines how the water scarcity and water deficit affect individual households and small businesses in the municipality. The chapter concludes by identifying and explaining the measures that the municipality put in place to manage water scarcity and water deficit.

5.2. THE REASONS FOR WATER SCARCITY AND WATER DEFICIT IN THE LEPELLE-NKUMPI LOCAL MUNICIPALITY

This section presents the findings pertaining to the reasons for water scarcity and deficit in the Lepelle-Nkumpi Local Municipality.

5.2.1 Rotational systems

The findings of this study reveal that one of the factors that contribute to water scarcity and water deficit is the rotational system in terms of water supply in the areas surrounding the Lepelle-Nkumpi Local Municipality. In that regard, for the municipality to ensure that their communities and businesses are supplied with water, it decided to share the small amount of water among them via the rotational system. In essence this contributes to water shortage, especially when urban areas within the province and district municipality are given higher preference than rural areas. Some communities applied this with the help of other vendors, in order to obtain water. A participant below shared the following view concerning this matter:

Water is rotational here. Besides the water from municipality, as community we did make a plan and now, we use a borehole that Lonemill mine assisted us to use it. They just assisted. You see there is some tanks outside the village, but they are not covering the whole village, only our small area is provided. The water pump machine that is using is suffering because it must only run operate less than eleven hours, as it is assisted by the windmill. The windmill when there is no wind is not functional. It will be good around windy period (Councillor 4).

Some of the members of the community raised a concern that a rotational system in terms of water supply has disadvantaged them tremendously. At the same time, it emerged that in some areas of the municipality, water was supplied three times per week, while in other areas, water was supplied only twice a week. In areas where there is an extreme shortage of water, the municipality uses outsourced trucks to supply water. Members of the community articulated their views as follows:

They come from Lepelle River, where they pump them. We get water three times per week, and we store them in tanks and drums and also buy water from donkey carts for R35.00 drum and others charge R50.00 drum (Community member 5).

We get water from pipes at the street, each and every street has a pipe and also the households have taps in the yard. We get water two times per week and fill up the drums for storage (Community member 7).

Yes, we do have a water shortage problem since last year around November. We only get water two times per day and delivered by municipality water trucks (Community member 8).

Ndebele and Lavhelani (2017:340-356) agreed that due to poor service delivery, many municipalities have experienced difficulties in South Africa. Even though the water supply is rotated by the municipality, the rotational system is not consistent, as some areas are given preference in terms of the number of days in which they are supplied with water

than others. Nevertheless, it is not yet evident why communities are given preference over others in terms of the number of days in which water is supplied.

5.2.2. Communication breakdown and councillor vigilance

The findings from the study showed that communication breakdown and councillor vigilance, among other factors, contributed to the water shortage in the municipality. Communication was the main problem, as all the participants interviewed acknowledged that there was a water shortage problem in their areas, because there was a communication breakdown between the municipality and the residents since the councillor had continuously failed to engage members of the community. The participants were convinced that the councillor was less vigilant and attentive about the challenges facing the residents, especially water shortages. Nevertheless, the issue of communication was raised repeatedly as a major concern. The participants articulated their views as follows:

We do not know, because they are not telling us anything. When we asked, they just saying the water is a problem the whole Lepelle-Nkumpi, not Thamagane only (Business owner 2).

We do not know. The municipality did not tell us anything, even if we talk, we did not get answers (Business owner 3).

We do not know because nobody tells us anything. There was a contractor here and now we do not know what happens to them (Business owner 7).

I do not know, as I am saying just because we operate without proper registration there is no need for municipality to take care of us (Business owner 10).

In addition to the problem regarding communication, some participants indicated that they did not know their councillors since the residents had last seen them only during the municipal elections. There was no contact between councillors and their constituents. They explained why there were no community meetings to discuss water challenges

within the municipality, where residents could make inputs about solutions towards solving their problems. The statements below revealed that some of the participants did not know their councillors:

I do not know him, if I can have water to use, I will be fine (Business owner 1).

The councillor is still new, and we will see, but others came and gone without any positive feedback (Business owner 3).

I do not know because I do not stay here and not able to attend the community meetings (Business owner 4).

I do not know him, but he stays around. He just says water will be supplied. There are some pipes here, but no water. We do not know when will water come (Business owner 6).

I do not know him, but he stays at Kurung la Godimo Section (Business owner 7).

I do not know him, but they talk about them and promised that we will get them (Business owner 8).

Councillors did not call any community meetings to inform the communities about the water shortage problems. Instead, they relied on school kids to deliver messages to their parents. Unfortunately, school kids can easily forget, especially around the issue of water, which may not be of great concern to them. If proper communication channels were utilised, the community could be probably sensitised about different ways on how to save or store water. There were times when the water supply returned during the night when everybody was sleeping and, in the morning, when it matters most, the water stops. If there were proper communication channels to convey messages about planned water supply interruptions, community members would possibly be more alert about the schedules and would then plan to accumulate or collect sufficient water for consumption during interruptions. In line with these views, Genc (2017:511-516) stated that communication plays a vital role in any sustainable plan or strategy. Therefore, it is

important for people to express themselves internally or externally by, using appropriate communication modes, in order to plan and develop sustainability and sustainable strategies.

5.2.3. Pipe leakages and bursts

Water was lost through pipe leaks and the pipe bursts, which subsequently affects water supply and also contributes to water shortages in the municipality. Some of the burst pipes were due to the failure by the municipality to maintain the water reticulation systems; because if the water pressures were controlled and monitored, the pipe bursts could be avoided. Sadly, if the leaks are not repaired, the water supply is interrupted. The responses below by participants reflected their views on the matter:

All these pipes are going to those dams, they need to pump first, but because of pressure, water cannot reach the dams since the pipes are leaking (Community member 4).

We do have water taps that are dry because we hardly have water. The taps are dry due to burst pipes a result of excessive water pressure. Pipes burst on several occasions without repairs or fixing (Community member 5).

Water shortage is sometimes caused by burst water pipes (Councillor 2).

Due to water supply interruptions, most areas were affected because water could not reach all the communities. In some areas, due to pipe leaks, the water could not reach the reservoirs. Even though the pipe leaks and burst were reported, the municipality did not take immediate action. Addeji, Hamam, Abe and Abu-Mahfouz (2017:773), agree that a major challenge to the operational services of water utilities is a water loss caused by leaking pipes.

The engineers from the municipality are hardly ever seen in villages fixing the pipe leaks and bursts, which forces the community to take the initiative by trying to do the job by themselves. It is not clear why the townships are given more attention when it comes to fixing leaking or burst pipes, because when a pipe leaks or bursts at the township within

twenty-four hours, the problem is solved, whereas when burst pipes are reported in the villages, it takes weeks before damaged pipes are repaired. Sometimes unqualified residents end up taking the initiatives to repair damaged pipes themselves.

However, this results in more frequent leaks and bursts because the job is not done properly. The other pipes that are not underground are exposed to severe weather and children can easily fall. The above findings show that the pipe leaks and bursts contribute to water flow challenges since water is supplied on a rotational basis, it does not cover all the areas, which suggests that people may have to wait for longer periods to receive clean water.

5.2.4. Population increases

Population increases also contribute to water shortages and deficit problems in a municipality. The water demand also increased, meaning that if the demand is greater than the supply, the problem of water shortages will arise. In some areas, the population has increased exponentially, and the new residential areas were built for the new homeowners. They were RDP houses, meaning that the number of people who apply has risen. This is supported by the statements made by some participants:

In some villages, people relied on boreholes, especially in my area; people are drilling their own boreholes. During the former Lebowa government, there were reservoirs, but recently it showed that water supply is not good as the population increases (Councillor 5).

The Specon Reservoir is the main reservoir in the area, but within the villages there are small reservoirs that get water from Specon to supply the villages. But due to increase in population, Specon cannot cover all the villages (Councillor 5).

The capacity is small at Lepelle Northern Water, where they pump water. It cannot cover the whole area under the Lepelle-Nkumpi Local Municipality (Community member 6).

The reasons are increase in population and the infrastructure that is not developed. Municipality as the provider needs to engage Lepelle Northern Water to pump water into reservoirs (Councillor 5).

Gray (1983:35-41) stated that the emphasis of water management from issues of supply to issues of demand has been shifted by the possibility of water shortages and increasing water demands. Some reservoirs were built years ago with less population in mind, but new reservoirs were not constructed to match population increases. No one understands why the reservoir capacities were not increased as the population increased. The Specon Reservoir, which is the main source in the municipality supplied the areas with water more than decades ago and now it is still expected to supply the additional newly built residential areas with water, while its capacity remains the same. Instead of increasing the Specon Reservoir capacity, they linked the Polokwane areas to get water from Specon Reservoir.

In some areas, the community took their own initiatives to get water, by using the mining company to assist with the renovation of the old borehole. This did not sit well with the councillor, who threatened the mining company and accused them of not following the right channels. However, because the tribal local authority intervened, the mining company did not leave. People were assisted and had water to drink. These findings indicate the lack of commitment from the municipality when it comes to the water supply. They are aware that the population has increased, but nothing was done to meet the demands for water.

5.2.5. Illegal water connections

The findings from the study show that illegal water connections are part of the reason for water shortages and water deficits in the municipality. The poor service delivery from the municipality leads to illegal connections, because when the population increases, the municipality needs to find a way to ensure that people from the new areas will have water. After community members noticed that the municipality was failing them, they turned towards illegal connections. These illegal connections affect the water supply because

the community members do not care. They just connect to any pipe, irrespective of whether it is a main pipeline or not. This is supported by some participants:

We have a big problem with the illegal connections and people are tired about these because they affect the flow of water distributions (Councillor 4).

The only challenge we have is the pipe burst, our pipes are old and need to be replaced. The other challenge is illegal connections that affect water distributions. We only have the meetings to address the issue of illegal connections and appealed to people to stop it, so that everyone can have water (Councillor 1).

The municipality needs to address the illegal connections in community gatherings. Water theft is one of the many factors that contribute to the water shortages that a number of communities in South Africa are currently facing. Some of the community members are comfortable with making illegal connections because they know that no prosecution will be pursued against them. Some of the people who connect illegally are sometimes assisted by the pump operator, because it appears as though there is no control or policies put in place by municipalities to regulate water connections. If there is such a policy or regulation in place, then this could mean that members of the community are not aware of it.

The illegal water connections are not reported to anyone, and even if they are reported to councillors or pump operators, no action is taken. It is not yet clear why the local councillors are driving this through the education programmes, because this ongoing challenge has a great negative impact on the flow of water. Sometimes, the main pipe from the Specon Reservoir is hijacked by illegal water connections and this affects a large number of people, because the water will not reach its intended destination. The illegal water connections are costing the municipality a large amount in revenue, while placing the infrastructure under severe stress. Most of the pipes that are connected illegally burst more often because they are not connected properly. The councillors do not encourage the community to refrain from these acts and report the illegal connections. The

community members see the councillors as ordinary citizens, not as municipal employees and that is the reason why they are not afraid of them.

5.3. THE IMPACT OF WATER SCARCITY AND WATER DEFICIT ON HOUSEHOLDS AND BUSINESSES IN THE LEPELLE-NKUMPI LOCAL MUNICIPALITY

This section presents the findings relating to the impact of water scarcity and water deficit on households and small businesses in the Lepelle-Nkumpi Local Municipality.

5.3.1. Loss of business prospects

The findings also identified that most of the businesses are using water for their survival, and without water their businesses cannot survive. Furthermore, it is evident that the water shortages in the municipality made most businesses suffer because the survival of the businesses depends primarily on the availability of water. The participants expressed their opinions about this as follows:

They are affected, because most of the businesses use more water, example the hair salons, brick mortar and so forth. The citizens also use more water when they cook, wash and bath. If there is no water for long time the situation poses serious challenge to the community (Councillor 9).

If there is no water, we sit at home, we do not cook. What can we do? Nothing. That is when hunger will kill us (Business owner 10).

We buy drums for R100.00 but if we do not work, how are we going to afford to buy water? It means no money, no incomes and just hunger. It sometimes takes three months without water, meaning no business at that time (Business owner 3).

No, we cannot be able to operate without water. To cook and clean dishes we need sufficient water. No customer can agree to use the dirty dishes. Without water, my business is nothing (Business owner 10).

While some businesses cannot function without water, there are others who are not only losing business, but are also losing regular customers. This is explained by the participant below:

We work and stop but this affects me because we lose our best workers. If you stop, they move on to join other contractors that are busy and it is difficult to start with the new people, because you still need to know their style of working. That is our big challenge (Business owner 3).

The small businesses do suffer more as a result of water shortages because some have equipment that need to use water during business hours. For example, the car wash business. They are supposed to wash the cars with their washing machines, but they need more water to wash. Most customers need their cars to be washed with the washing machines, not by using buckets. Hyland and Miles (2008:149-168) argued that the main problem facing emerging economies is viewed as water shortages. Small businesses also lose their businesses, because while they are running short of water, customers are heading to Lebowakgomo Township to wash their cars. This is not only affecting the car wash businesses, but there are also the hair salons that are losing potential customers, because customers do not like to wait for too long to be served. When they find that a salon cannot offer certain services such as washing hair, they go to townships where they are quite sure they will be served well.

Water shortages in businesses may affect quality customer service, and as a result it becomes a loss for small businesses. It might create inconsistencies in terms of quality customer service because at one point one may be served properly when water is available, but later on, customers may not be served appropriately because of interruptions to the water supply. As a result, people may opt to take their businesses to townships where there is more consistency and reliability in terms of quality customer service. Equally important is the fact that nobody wants their business to stop working because some of the workers depend on the wages, they earn from the small business they work for to feed or take care of their families. Therefore, when a business has to stop working due to water supply interruptions or shortages, some of the workers may resign

to join other businesses where operations are not as easily disrupted by water shortages or interruptions. Unfortunately, this results in businesses losing faithful and trusted employees because by the time the water comes back, it is difficult to get their staff back. Furthermore, that then compromises good customer service because the owner has to frequently hire and train new employees.

5.3.2. Budget constraints

Budget constraints have been identified as another factor that contributes to a negative impact on small businesses and households. Most of the people who stay in the rural areas are dependent heavily on government grants for survival. As a matter of fact, some families depend totally on a social grant from an elderly person to take care of needs for schooling, food, clothing, and many more items. Unfortunately, their budgets tend to be overstretched because grant money must be used to purchase water without which one cannot survive. It appears that some of the household's sacrifice buying food in order to buy water because even if one has food it may be difficult to cook the food or bathe without water. Some of the residents make sacrifices in order to buy water, which is needed for survival. The participants below shared the following sentiments:

We buy one drum of water for R50.00 although prices do differ as some charge only R45.00. We are seriously struggling. Instead of buying chicken feet, we eat pumpkin seeds as our relish so we can afford to buy water because water is everything (Community member 1).

We buy water from the neighbours who have boreholes and donkey carts. At the borehole site we have to pay R10.00 for a drum while R20.00 per drum is charged for water transported in donkey carts (Community member 3).

We just buy electricity for R100.00 and then pay the borehole owner to collect water for the whole month. It is better since we have a borehole nearby (Business owner 8).

We can buy water from borehole owners. We buy twenty litres of water for R8.00 because a drum can hold many times twenty litres of water (Community member 6).

Islam (2019:91-107) agrees that in a month an increase of one standard deviation over the total duration of water shortages can lead to annual average losses of about 14.5 percent of the monthly sales earned per worker from the average informal firm in a sample that uses water for business activities. The findings show that most small businesses and households are using water for survival and are owned by some community members who started their businesses to avoid unemployment. With the low rate of employment, which is due to a lack of education and geographical location, households and business owners are negatively impacted, because if one does not have money to buy water, one's business may suffer and as a household, one may also suffer because water is essential for business operations. It was also noted that in villages around the Lepelle-Nkumpi Local Municipality there are no sewage systems, which implies that residents do not use flushing toilets that would require more water.

5.3.3. Extended water interruptions

It has been established in this study that water is taking too long to be restored to communities after interruptions, which implies that residents are denied access to sufficient water in municipal areas. Most areas in the Lepelle-Nkumpi Local Municipality have suffered from extended water interruptions for more than five months. Such extended water interruptions tend to affect the free flow of water because when the water is restored after a long period, most residents want to fill up their water tanks, which could ultimately prevent water from reaching other places within the same area. The participants shared their views as follows:

We do not have water here. We are struggling. It takes a very long time without water in this area (Community member 5).

Yes, we do have a water shortage problem whereby we can take more than three weeks without water. We share our water with other areas like Mashite,

Lebowakgomo and many other areas which explains why we have been without water for more than three weeks (Community member 6).

Yes, we do. There has been no water here since August 2021 (Community member 2).

Yes, we have had a water shortage since 2001 (Councillor 10).

It is true, we do not have water here, sometimes we have to take a few months without working (Business owner 3).

It is not clear why the municipality is supplying water inconsistently to some areas. Some areas take a longer time than others to have water restored or supplied. The control of water supplies or rotational water supplies is not correctly implemented, because all the areas fall under one municipality. Matamanda, Mphambuke and Chirisa (2020:763-773) stated that, to sustain life, water is an important resource that is needed, yet citizens do not always have access to potable water. This shows that the councillors who are actively involved in issues that affect residents shouldn't have a better water supply in some areas, than in others. The issue of corruption may also be problematic, because if one area can go for a month without water while other areas only have to go for a week without it, it raises great concerns. The findings revealed that no one, not even the councillors are getting involved in sorting out this problem. They are the ones in power, because local chiefs or indunas are overpowered by the councillors, they no longer have a control over anything.

Due to extended water interruptions, residents have decided to leave their water connections on for twenty-four hours because there are no water schedules and they do not know when water will be restored to their area. Taps are constantly left open to allow water to fill a container whenever it is restored. Nevertheless, when water is restored during the night when residents are sleeping, the water will fill up the water tanks and then start overflowing onto the ground. As for those who leave their water taps open when they go to work, when water is restored during the day in their absence, it fills up the water tanks and subsequently also overflows onto the street. While water shortages and deficit

pose a major challenge to livelihood and health, irresponsible acts that amount to a waste of water; a scarce resource cannot be condoned.

5.3.4. Buying water from donkey carts and borehole owners

Due to the water shortage and deficit, the communities and business owners found themselves having to buy water from donkey cart owners and borehole owners. This is done to ensure that businesses keep on operating. However, this takes them back to the 1980s when people relied too much on buying water from donkey carts. The participants shared the same feelings:

We buy water from the neighbours who have installed boreholes and also buy from vendors using donkey carts. At the borehole site, a drum of water costs R10.00, while vendors using donkey carts sell water for R20.00 per drum (Community member 3).

We buy water and one drum costs R40.00, twenty litres is R20.00. We buy from the households that have water boreholes as well as vendors using donkey carts to distribute. I use one drum per day throughout the month. At the end of the month, we use two drums of water (Business owner 2).

The boreholes are also a means of acquiring water for household consumption although some of the water is pumped by electrical pumps which may be negatively affected by load shedding. Two participants commented:

We do not know, if the dams are dry, we get the water during the night. We rely on a borehole from Semilwane Village, but because it uses electricity, sometimes we do not get water because of load shedding (Community member 8).

We do have water shortage problem which compels us to rely on water boreholes. Now as the population increases, the number of the water boreholes that exist cannot supply the whole population with water. Yesterday I was in Morotse Village, and they are still waiting for the bulk water supply.

Lenting Village is worse, other parts of the villages do not have water while others do have water. They also need of a drought relief programme as intervention (Councillor 6).

The community members are forced to use the little money they have from social grants to buy water. This impacts their living conditions because the social grant was only meant to cover buying clothing and food for the needy people. The donkey carts owners found that it created an opportunity to operate a business, as they generated more money from selling water. Moreover, they collect water free of charge and then sell it at an exorbitant price.

Residents who have boreholes in their yards sometimes sell water to the community and to businesses to safeguard the businesses' survival. Businesses are suffering as some of the business owners have to share the water they buy with customers. Arrangements were made between certain households and borehole owners, where the householder pays a certain amount of money per month to fetch water for the whole month. Other arrangements are made whereby a householder buys water on credit and pays later. As the community is relying on social grants for money, sometimes they are not able to pay back the debt to the owner of the borehole, which sometimes leads to quarrels within families or between neighbours.

5.4. MEASURES THAT LEPELLE-NKUMPI LOCAL MUNICIPALITY HAS PUT IN PLACE TO MANAGE WATER SCARCITY AND WATER DEFICIT

The previous section presented findings regarding the impact of water scarcity and water deficit on households and small businesses in the Lepelle-Nkumpi Local Municipality. This section presents the findings on the measures that have been put in place by the municipality to manage the water scarcity and deficit.

5.4.1. Drought relief programme

The findings of the study revealed that a drought relief programme was implemented in some areas to alleviate the water shortage and water deficit in the municipality. In some

areas the local municipality introduced plans to ensure that water was delivered to the citizens by water tank trucks, even though not all areas benefited from the initiative. The water supply by truck is appreciated by the citizenry even though it is not consistent. Some areas are supplied with water for more days whereas some areas are not supplied with water in the same way as others despite the fact that they reside within the jurisdiction of the same municipality. The discussion with the participants revealed the following sentiments about the drought relief programme:

We send trucks to supply water sparingly to communities. One supply by trucks to communities once a week and make community understand that each household can only be allowed small tank (Councillor 10).

We get water once per week and municipality truck supply two drums per household. We also buy water from borehole owners for R20.00 or R50.00 from the vendors who use donkey carts to supply water (Community member 9).

We are now getting water that is delivered by the municipality water tank truck. The truck delivers water three times per week in our area. We store water in our drums; each household is allowed to bring only three drums; we also buy the water from those who have the boreholes and they charge us R1.00 per twenty litres and R8.00 per drum (Community member 10).

It is drought relief, like supplying water tank trucks. The water provision is the responsibility of local municipality. We make applications like we did at Lenting Village, at Morotse Village where we got the water tanks after we had applied. We end up connecting to the boreholes that are not clean, because people are in need of clean water for consumption (Councillor 6).

Baisa, Davids, Salant and Wilcox (2010:1-12) stated that most water distribution systems throughout the developing world, are unreliable and serious distributional issues arise concerning water delivery that is not synchronised across households. The drought relief programme is not reliable because in some areas residents wait for the water tank trucks to come but they don't. Moreover, residents take drums to fetch water in anticipation of

the water tank truck's arrival, but sometimes they have to take them back to their homes when the water trucks fail to deliver water. There are no specific times when water tank trucks are expected to deliver water. Residents are just given a day when water deliveries will deliver, which might be in the morning, during the day or in the afternoon.

Drought relief programmes need to be implemented uniformly throughout the municipal areas because some areas within the boundaries of the municipality do not receive water while other areas within a radius of less than ten kilometres are supplied with water delivered in water tank trucks. It is not clear how the programme is driven because disparities are evident in water supply by water tank trucks, and this creates frustration among the residents. The manner in which the programme is being implemented needs to be revised, in order to ensure that the residents are equitably treated regarding the supply of water.

Unfortunately, during the rainy season, the Lepelle-Nkumpi Local Municipality area does not experience enough rainfall. The municipality should have a proper drought relief programme to alleviate the water shortages during dry seasons. The municipality should respond to drought by limiting water use. It needs to encourage people not to take showers so often, to reduce the irrigation of gardens with clean water and restrict washing of cars with hosepipes. The drought relief programmes should be planned for a longer period, because the water shortage problem in the municipality appears to be taking a long time before it can be addressed. Since residents of the Lepelle-Nkumpi Local Municipality are not charged for water services, the municipality should institute a budget for the entire municipality, and request additional grants through the division of revenue, from provincial government.

5.4.2. Repairs and maintenance

The findings of the study indicate that the municipality is not effective or efficient in dealing with repairs and maintenance of machinery and equipment. Some boreholes, stand-alone taps and other types of machinery were broken while others were stolen a long time ago and were not replaced. While some areas within the vicinity of the municipality have

sufficient water, the main problem is that the municipality is failing to repair and maintain the machinery. This is supported by the responses from the participants shown below:

We just need them to come and fix this machine, because the borehole has a lot of water. People can drink (Community member 2).

There was a machine that pumps the water to the dams, that machine was stolen and not replaced (Community member 9).

The problem started when a transformer was stolen and not replaced (Community member 10).

Yes, we do have a water shortage. We have two reservoirs that are not working at the mountain and all in all we have four reservoirs without water (Community member 9).

There is a perception that municipality employees are relaxing and fail to show a sense of urgency in the performance of their duties. This is attributed to the fact that the citizens keep on reporting broken machinery that needs an urgent response, but there is no response forthcoming from the municipality. Another participant echoed the same sentiments by saying:

The support that I need from the municipality is to speed up response when I report the burst pipes and also to add the number of their engineers, because it seems they are not enough. Sometimes you inform them, but they take long time before they respond (Community member 2).

Hope and Ballon (2019:1-9) argued that it takes a month or more to repair anything in Africa, when a rural waterpoint fails and to ensure a faster repair time, higher payments are associated with higher education. The municipality includes areas that have underground water, but it does not repair or service machines that are broken. In one area, there are eight broken boreholes and residents receive water only once a month. Meanwhile, the councillor and opposition political parties fight political battles about repairing water boreholes, at the expense of the community.

It takes longer for the municipality to repair broken machines in some areas because some of the water pumping machines were broken over a year ago and to date, have not been repaired. The newly elected ward councillor tried to arrange repairs for the broken machinery, but nothing was done. Pipes that leak and are not repaired hinder the flow of water because the water cannot reach the dam that is higher up on the mountain. All these broken machines were reported to the ward committees, water pump operators and councillors, but since then, no action has been taken.

It is not yet evident why the municipality did not train more people from the community and employ more engineers because it seems that the municipality is not coping. The community members in some areas are willing to assist the municipality's engineers by digging holes which would make it easier for the engineers to come and repair the pipes. Some residents manage to receive services more quickly, because they assist the engineers who are struggling with faulty underground pipes, by digging holes for them.

Some people from the community could be employed as security officers to reduce the problem of machines being stolen. Some machinery is particularly susceptible to theft. The infrastructure and transport are also problematic as engineers are struggling to reach the rural areas on badly maintained roads as sometimes, they have to drive for more than a hundred kilometres on gravel roads to reach their destination.

5.4.3. Payment for water services

To further alleviate the water shortage and deficit in the municipality, the payment for water services needs to be implemented as some citizens are eager and willing to pay for water services. Citizens and businesses are indirectly paying for water services because they are spending money to buy water from other people who sell water. The residents say that the municipality should introduce a billing system so they can pay for water supply services. The participants said:

When I walk all over my villages within my ward, they say to me bring water metres and we will pay. Without water, your life will be stuck. The

community is tired of fetching water from afar using drums. They need yard connections (Councillor 6).

I think that the citizens, as I move around, are prepared to pay for the water services. Now people are using water to irrigate, but they will need to ensure that everyone does pay for the water services while also using water wisely and sparingly (Councillor 8).

The areas that are paying for water services, are given higher priority than those who are not paying for water. In that regard, one participant agreed:

It takes water to Specon Reservoir to Lebowakgomo location and to Polokwane locations, we just get a little water here. The water is not enough. The problem is with us as a community because we are not paying for the water services, but the municipality is paying for us. It is the reason why we do not get enough water because municipality supply more water to the areas that are paying for water services (Councillor 8).

The community and business owners need to be educated to understand the importance of paying for their water services. The more people pay for water services, the easier it becomes to avoid misuse of water and to use water more sparingly. As the rural areas are mainly populated by unemployed people and the level of education is low, the municipality could implement a flat rate payment for water services. However, most of the households will qualify as indigents and therefore will be given six kilolitres of free water services, they might possibly be able to pay a flat rate amount. Rananga and Gumbo (2015:231-243) argued that in rural areas the provision of reliable and adequate drinking water services is important and that even without collecting water revenues, the municipality should make sure that it can provide six kilolitres of free basic water services to every citizen.

Households and business owners in the Lepelle-Nkumpi Local Municipality are not refusing to pay for water. However, they have become used to receiving a free water supply. Therefore, consultations and education could help by teaching stakeholders the importance of paying for water services. The municipality is also overspending on water

provision. For water to reach households, more money must be committed, for purification of water and for paying pump operators. Water metering systems need to be installed in all areas, and then people will start to be more accountable and take ownership of water usage.

5.4.4. Boreholes supply

The findings indicated that supplying boreholes could play a huge role in alleviating the water shortage and water deficit in the municipality. There is a belief that boreholes could be a solution to the water shortages in the municipality. Some of the areas have broken boreholes and if they could be repaired, they could contribute to the alleviation of water scarcity. Most of the participants interviewed believe that the solution to the water shortage that the municipality can adopt, is to provide more boreholes in the area. The participants suggested the following solutions:

Temporary measures are there, unfortunately, we have eight boreholes in our area that are not working. Municipality and Lepelle Northern Water must think about them and make a means (Community member 6).

If they can give us just one borehole, we will stop suffering (Community member 8).

We only need municipality to provide us with only one borehole, then we will survive (Community member 3).

I think the municipality needs to install water boreholes in the communities, and if each village can have a water borehole, it could be better. Secondly, they need to make sure that people are paying for water services (Councillor 9).

This study shows that community members and small business owners believe that if the municipality supplies them with boreholes, they will have the water they need. In one village, eight boreholes were not functioning but if they could be fixed, the community would benefit. During the 1990s, communities relied on boreholes for water supply, which

is the system that the current democratic government failed to sustain, although the municipality is experiencing extreme water shortages. In rural areas, the main method whereby people are accessing groundwater is through boreholes that are equipped with handpumps (Lapworth, MacDonald, Kebede, Owor, Chavula, Fallas, Wilson, Ward, Lark, Okullo & Mwathunga, 2020:064020).

In one area, the community took the initiative with the assistance of the mining company in the area, by refurbishing an old borehole that had been neglected for decades. Subsequently, the councillor complained, claiming that that he was not informed about the initiative and that some protocols were not followed. That just shows the councillor's negative attitude towards positive initiatives introduced by communities to address their own challenges, especially water scarcity and deficit. It is evident that the issue of water shortages is used for political gain by some political parties. In an area that had eight dysfunctional boreholes, one political party wanted to revive them so that the community could have a supply of water, but the governing party rejected the proposal and declined to support the initiative of reviving boreholes. Manual boreholes could be reintroduced instead of using boreholes that rely on electricity to pump water, to offset the challenges brought by loadshedding or utility power cut-offs. If the municipality chooses to equip the boreholes that need electricity to pump water, manual borehole pumps could be used as a backup. Electric boreholes are quicker to operate whereas the manually operated boreholes pump water more slowly.

It is inconceivable that the municipality did not prioritise borehole water supplies, because the water they are using from the Specon Reservoir, as the main supplier in the municipality is not flowing. The Specon Reservoir water mainly supplies the townships of Lebowakgomo and Polokwane with water for toilet sanitation. The municipality is not pushing the communities and businesses to pay for water services, but at the same time they are not supplying communities with boreholes.

5.4.5. Education about water harvesting and storage

The findings revealed that education about water harvesting and storage in general is among the factors that the Lepelle-Nkumpi Local Municipality needs to consider by

minimising the impact of water shortages and water deficit. Education is important in all sectors and people without the necessary information about water harvesting and storage might not understand these key issues. Consequently, it is important for the municipality, through their ward councillors, to educate the community about water saving usage, as well as water purification. The views held by some participants are:

We just need to educate people on how to store water, so that they can have something to use when there is no water (Councillor 1).

The communities are always advised to use water sparingly by local 'indunas' as well as ward councillors. The same role is played by the municipal manager who goes onto community radio to appeal to residents to use water responsibly (Councillor 10).

Most of the community members do not have any knowledge on how water is purified and on water saving measures. The municipality could save more water by educating residents about water harvesting, storage and purification. Liu, Brough and Wu (2022:61-69) stated that to enhance water sustainability, it is important to educate the public on household water saving, in view of projected water scarcity. Clearly, the municipality can save more water by embarking on educational initiatives. Some of the councillors need training themselves before they can educate the community. Only a few councillors have a matric certificate because there is no education requirement for one to become a councillor. The community also needs to be educated about the importance of sharing water, as the rotational water system is all about sharing. They need to be educated about the rotational system schedules and its importance. The community needs to be educated about the pressure systems used to supply water.

5.5. CONCLUSION

The last chapter presented the research findings, in line with the study objectives; thereby outlining the reasons for water shortage and water deficit in the Lepelle-Nkumpi Local Municipality. The study revealed that water scarcity and deficit is a major challenge in the municipality, due to the rotational systems that were introduced to ensure that areas are

able to share the small amount of water available in the reservoirs. Notably, poor communication and minimal vigilance by councillors, failure to repair leaking pipes and growth in population contribute to water scarcity in the surrounding areas of the Lepelle-Nkumpi Local Municipality, while poor service delivery has unfortunately led to illegal water connections. Secondly, the chapter presented a detailed assessment of the impact of water shortage and water deficit, as experienced by individual households and small businesses in the municipality. Business owners lost business prospects due to water shortages which resulted in customers leaving the area in search of better services in the townships where there is a more reliable supply of water. The researcher found that community members are affected immensely by water shortages as they have to buy water from borehole owners and donkey cart owners, using their social grant money.

The chapter presented the findings in relation to the measures that the municipality has put in place to manage the water shortage and water deficit. The study revealed that in some areas, the drought relief programmes were implemented to assist with water shortages. However, lack of efficiency and effectiveness in repairs and maintenance of machinery were still among the key challenges facing the municipality with regard to water supply. At the same time, it was noted that the municipality was taking too long to attend to the calls relating to water leakages in its area of jurisdiction. Since most residents seem to lack education about water harvesting and storage, the municipality needs to continue to emphasise and educate the residents about the importance of water harvesting and storage. In other words, the message about the significance of safe and responsible water usage must be cascaded to ordinary citizens. Equally important is the fact that borehole usage and refurbishment can be used as a measure to address water shortages in the municipality. The following chapter summarises the findings, the conclusion, and recommendations for further study.

CHAPTER 6: SUMMARY OF MAJOR FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1. INTRODUCTION

The previous chapter presented the findings with a specific focus on assessments of the reasons for water scarcity and water deficit. The chapter examined how water shortage and water deficit affect households and small businesses and it identified and explained the measures that Lepelle-Nkumpi Local Municipality has to put in place to manage water shortage and water deficit. This chapter starts by present a summary of major findings followed by conclusions reached. Equally importantly, the chapter outlines some practical recommendations for implementation by the municipality where possible, contributions were made in the study and suggestions for further research.

6.2. SUMMARY OF FINDINGS

The objectives of this study, were:

Firstly, to assess the reasons for water scarcity and water deficit in the Lepelle-Nkumpi Local Municipality.

Secondly, to examine how water scarcity and water deficit affects households and businesses in the Lepelle-Nkumpi Local Municipality.

Thirdly, to identify and explain measures that the Lepelle-Nkumpi Local Municipality has put in place to manage water scarcity and water deficit.

6.2.1. The reasons for water scarcity and water deficit in the Lepelle-Nkumpi Local Municipality

One of the major findings of the study is that there is water scarcity; and the participants revealed that providing of water only takes place once a week to once a month, and that sometimes there is no supply of water at all. The study found that people receive water

through the implementation of a rotational system, which sometimes did not cover the whole area of the Lepelle-Nkumpi Municipality. Some of the community members raised a concern that the rotational system of water supply has disadvantaged them tremendously. At the same time, it emerged that in some areas of the municipality, water is supplied three times per week, while in other areas it is supplied only twice a week. It is not yet evident why some communities are given preference over others in terms of days when water is supplied.

The study findings also indicated that communication breakdowns and lack of vigilance by councillors have been among the factors that contributed to the water shortage in the municipality. Most participants acknowledged that communication was a problem in the municipality and that they were not able to communicate with the municipality through their councillors or inform them about anything relating to water supply cut-offs. The councillors had no contact with the members of the community because they had seen them last during the last municipal local elections. The councillors had failed to call meetings to update residents about water shortage problems.

Pipe leakages and bursts were the factors that contributed most to water shortages in the municipality. Some of the pipes burst due to the failure by the municipality to maintain the water reticulation systems because if the water pressures had been controlled and monitored the pipe bursts could have been avoided. The water supply was affected and subsequently, water did not reach all areas. Even though the pipe leaks and bursts were reported, the municipality failed to repair them and in areas where they were repaired, they took several days to respond. The municipality engineers were hardly ever seen in villages fixing pipe leaks and bursts, which then gave the residents no option but to use their own initiative and do repairs by themselves.

It was also revealed that population increases contributed to water shortage in the municipality. The growing population and a new lifestyle increased the demand for water, but there was limited water available to satisfy the demand. Due to the unprecedented population explosion within the municipality's area of jurisdiction, the available water sources are unable to meet the demands for water. Some reservoirs were built years ago

with a much smaller population in mind, and the new reservoirs were not sufficient to match population increases. The findings presented indicate lack of commitment from the municipality and the national government regarding water supply. They were aware of the increases in population, but nothing was done to cater for the demands for water in the foreseeable future.

Lastly, the findings showed that illegal water connections are a major reason for water shortages and water deficit in the municipality. The connections happened because of the lack of service delivery from the municipality as well as due to population increases. Therefore, there is a need for the municipality to find a way to ensure that people located in new areas have water. When calls are logged to come and assist people with the proper connections, no one arrives and therefore, people decided to connect water illegally. The illegal connections affect the water supply because the community members don't care about proper legal connections. They just connect to any pipe they can find, irrespective of whether it is a main pipeline or not. The illegal connections are not reported to anyone, and even when they are reported to councillors or pump operators, no action is taken. Some of the community members are comfortable with performing illegal connections because they know that no prosecution will be pursued against them.

6.2.2. Ways in which water scarcity and water deficit affect households and businesses in the Lepelle-Nkumpi Local Municipality

The findings revealed that most small businesses and households were using water for their survival. It is further evident that the water shortage in the municipality caused most businesses and households to lose business because the survival of their businesses depended on the availability of water. Small businesses suffer more as a result of water shortages because some have equipment that needs to use water during business operations; for example, car wash businesses.

The water shortages experienced by businesses affect quality customer service, which translates to a loss of business opportunities. Therefore, when businesses have to stop working due to water supply interruptions or shortages, some of the workers resign to join

other businesses where operations are not as easily disrupted by water shortages or interruptions.

Budget constraints were identified as another factor that contributed to the negative impact on small businesses and households. Most of the people living in the rural areas depend heavily on government grants for survival. With the low rate of employment due to the lack of education and geographical location, households and business owners are negatively impacted because if there is no money to buy water, businesses and households will suffer.

It has been established in the study that, due to extended water interruptions, water takes a long time to be supplied to the people and, as a result, people are denied the right to have access to sufficient water in the municipal areas. Most areas in the Lepelle-Nkumpi Local Municipality experience extended water interruptions for more than five months. It is not evident why the municipality is supplying water inconsistently to some areas, while other areas have to wait a longer time to receive water. The issue of corruption may also be problematic because if one area can suffer from a month without water while other areas only have to survive for only a week without water, that raises great concern. The findings revealed that no one wants to be involved or seems to care about sorting out this problem.

The findings revealed that households and small businesses were negatively impacted because while waiting for water rotation to get to their areas; they have to use the small amount of money they obtain from government social grants to buy water from donkey carts and borehole owners in order to ensure that businesses and households can keep on operating. The boreholes are an alternative means of acquiring water for household consumption although some are pumped through electrical pumps, which may be badly affected by load shedding. The donkey cart owners found the opportunity to do additional business, as they can generate more money from selling water. At the same time, residents who have boreholes in their yards sell water to the community and some businesses to provide for the survival of all.

6.2.3. Measures that Lepelle-Nkumpi Local Municipality has put in place to manage water scarcity and water deficit

Drought relief programmes were implemented in some areas by some councillors to alleviate the water shortage and water deficit in the municipality. In some areas the municipality made plans to ensure that water was and is delivered to citizens by water tank trucks, even though not all the areas are benefiting from those initiatives. The drought relief programme is not reliable because in some areas residents have to wait a long time for the water tank trucks to come, but sometimes they fail to deliver the water. No specific time for delivery is communicated to residents. They are just given a day when water deliveries may happen, which could be in the morning, during the day or in the afternoon.

Drought relief programmes need to be implemented equitably by the municipality to all areas, as one measure to help manage the water shortage and water deficit. The manner in which the relief programme is being implemented needs to be revised in order to ensure that the residents are equitably treated in relation to the supply of water. The drought relief programme needs to be planned for a longer period as water shortages in the municipality appear to be taking a long time before they can be addressed.

Another measure that the municipality can use to control and manage water shortages is repairing and maintaining machines and equipment. The study showed that the municipality is not effective and efficient in dealing with repairs and maintenance. Some boreholes, stand-alone pipes, and other machinery was broken or stolen a long time ago which were not replaced or repaired. In some areas of the municipality, there were as many as eight boreholes that were broken and residents received water only once a month. It takes a long time for the municipality to repair broken machines in some areas because some of the water pumps were broken over a year ago and have still not been repaired. It has still not been revealed why the municipality does not train more people from the community and employ more engineers because it seems that the organisation is not coping. Some people from the community could also be employed as security officers because some of the machines are stolen.

The research revealed that to manage the water shortage in the municipality, a system for payment of water services needs to be implemented, as some citizens are eager to pay for water services. The residents believe that the municipality should introduce a billing system so that they can pay for water supply services. The community and business owners need to be educated and shown the importance of paying for water services. The more people are paying for water services, they will feel the pain of misusing water and start to use water sparingly. The rural areas are dominated by the people who are unemployed, and the level of education is low, the municipality could implement a flat rate payment for water services. Households and business owners in the Lepelle-Nkumpi Local Municipality are not refusing to pay water, it is because they are used to receiving a free water supply. For this reason, consultations and education could help and teach stakeholders the importance of paying for water services. The water metre systems need to be installed in all areas, and people will start to take accountability and ownership for water usage.

The supply of boreholes can play a huge role in managing and controlling the water shortage and water deficit in the municipality. This study shows that the community members and small business owners believe that if the municipality can supply boreholes that are not operated by electricity, but rather manually, they can have water. Some areas have broken boreholes that were broken ages ago and the community believes that if they are fixed the water shortage can be alleviated. The manual boreholes can be brought back into operation instead of using boreholes that rely on electricity to pump water to offset the challenges brought by load shedding or cut-offs of utility power. If the municipality chooses to dig boreholes that need electricity to pump water, manual borehole pumps can be used as a backup.

The findings of this study showed that education about water harvesting and storage in general is one of the factors that the municipality needs to look at, as one of the measures that need to be put in place to manage water shortages and deficits. It is important for the municipality, through their councillors, to educate the community about water saving usage and to show residents how water should be sanitised after being brought from the

Lepelle and Olifants Rivers. This will help the municipality to save more water and more areas can then be supplied with water. The community also needs to be educated about the importance of sharing water, as the rotational water system is all about sharing. They need to have knowledge about rotational system schedules and their importance.

6.3. CONCLUSION

The study was conducted to investigate the magnitude or scope of water scarcity and water deficit in the Lepelle-Nkumpi Local Municipality in the Limpopo Province. It was shown that the municipality has a water shortage and a water deficit problem and the reasons for the shortage and deficit were assessed. The following strategies were adopted:

- Water rotational systems were introduced to ensure that people shared the small amount of water they have.
- Communication breakdowns and lack of vigilance by councillors occurred because of a lack of contact between councillors and constituencies.
- A failure to repair leaking and burst pipes contributed to water shortages.
- Despite the population increases, the municipality did not increase the capacity of water supply reservoirs and lastly;
- Poor service delivery forced residents to connect to water supplies illegally.

The study also showed that water shortages and water deficit affected households and businesses in different ways. Business prospects were lost because customers migrated to other townships in search of better customer service; and people and businesses were negatively impacted by budget constraints because they had to use the minimal funds they had to buy water for survival, which in turn, led to more poverty. Extended water interruptions forced the people to buy water from donkey carts and borehole owners, as people cannot survive long without water.

Lastly, the municipality put in place measures to manage water scarcity and water deficit, as follows:

- Drought relief programmes were introduced in some areas to alleviate the water shortage, even though such programmes were unable to cover the whole municipal area.
- Repairs and maintenance of machinery and equipment was done to ensure that all broken machinery was repaired to achieve a smoother flow of water.
- It was discovered that people were willing to pay for water services to ensure that they received an equal amount of water in townships and measures were taken to ensure that water was used sparingly.
- Broken boreholes were repaired to ensure that communities were supplied with water from boreholes and also, it was decided that new boreholes had to be provided to all areas.
- It was decided that the lack of education about water harvesting, and storage needed to be corrected, as a lack of education and knowledge makes people feel that they were being robbed when they paid for water services.

6.4. RECOMMENDATIONS

The study revealed that the water supply in the Lepelle-Nkumpi Local Municipality was very poor. On this basis, the study recommends the following measures for the municipality, households and small businesses to adopt in order to avoid water shortages and deficits:

- Community members and small business owners need to be educated on how water should be shared when a rotational system is implemented. The municipality must ensure that the supply of water is applied to all areas in a fair and transparent manner.
- Manually operated boreholes should be supplied to all villages in the Lepelle-Nkumpi Local Municipality to alleviate the water shortage and water deficit. This will also serve as a backup plan so people will have a temporary measure to use in case the rotational system is delayed. All water users should have access to them.

- All water users (households and business owners) should pay for water services. A flat rate should be implemented and since water users are paying for water indirectly by buying water from vendors, they will be able to afford the flat rate. This will ensure that water is distributed equally to all areas, including townships and water users will have to use water sparingly. Water metre boxes need to be installed in every household and business premises.
- Drought relief programmes should be introduced and implemented fairly to all areas in the municipality and the ward councillors should monitor them. This will assist water users with water provision during the dry season. The programmes need to be planned for longer periods, as the municipal areas cannot rely on getting sufficient rains during the rainy season. More water tank trucks need to be purchased which could also be outsourced to external suppliers.
- The municipality should be actively involved in preventing illegal water connections, as this affects the water supply. Perpetrators should be reported and prosecuted for tampering with the water reticulation system. A free call centre number needs to be created and must be known by all water users so they can report illegal connections. The policies should be accessible to all the villages and be translated into all indigenous languages.
- Rotational schedules should be implemented by the municipality to ensure that all water pump operators drive and abide by them. This will ensure that community and small business owners can plan their daily lives and programmes.
- All broken machines and equipment for water supplies should be repaired by the municipality in all areas. More technicians should be employed and provided with vehicles to make mobility easy. All calls should be logged and repairs and maintenance should be resolved within seventy-two hours, to avoid a situation where residents attempt to undertake repairs on their own.

6.5. CONTRIBUTION OF THE STUDY

The study has made a contribution to the existing body of knowledge on water challenges by investigating the issue of water scarcity and water deficit in the Lepelle-Nkumpi Local

Municipality in the Limpopo Province. Firstly, the study contributes by examining the reasons for water scarcity and water deficit in the municipality. The reasons for water scarcity and water deficit were discussed in full. Secondly, the study discussed the impact of water scarcity and water deficit on households and businesses in the municipality, which forced people to use their minimal funds to buy water and also caused businesses to fail. Finally, the study has made a contribution to the literature on water security in the local municipality in Lepelle-Nkumpi Local Municipality in the Limpopo Province, by suggesting possible measures that the municipality has to put in place to manage water scarcity and water deficit. The study is likely to be beneficial to policy makers at the local municipal level, who make crucial decisions that affect poor water distribution directly in the municipality.

6.6. SUGGESTIONS FOR FURTHER RESEARCH

The water scarcity and water deficit was revealed and was proven by the study. Therefore, it is important to conduct further research on the water scarcity and water deficit in the Capricorn District Municipality, which is the mother body for the Lepelle-Nkumpi Local Municipality. Secondly, similar studies could be conducted in other municipalities within the Capricorn District Municipality to test whether they can produce similar results. The researcher only managed to conduct this study in Lepelle-Nkumpi Local Municipality, which is one of the municipalities within the Capricorn District Municipality, due to time and financial constraints. Further research in connection with water scarcity and deficit can be conducted to find out how farmers in South Africa are affected. In this way, such a study could establish water scarcity and deficit affect food production and livestock in farming areas.

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APPENDIX A: INTERVIEW SCHEDULES

INTERVIEW SCHEDULE FOR SMALL BUSINESS OWNERS

A. Reasons for water scarcity and deficit in the Lepelle-Nkumpi Local Municipality

In your view, do you think you are experiencing water shortages in your area? Please elaborate.

How do you gain access to potable or clean water for consumption in your area?

What do you think are the reasons for water shortage in your area?

What do you suggest should be done to address different aspects that contribute to water scarcity and deficit in your area?

Who have you contacted regarding the water shortage problem in your area?

What were their responses when you reported your grievances about the lack of drinkable water?

B. The way water scarcity and deficit affect households and small businesses

As a small business owner, will you please briefly narrate your experiences about the shortage of clean water in your area?

What are some of the challenges you face because of water shortages in your area?

In your view, how does the shortage of clean water in your area affect you and your fellow small business owners?

How do you deal with the shortage of clean water for consumption at your business premises?

C. Measures used by the Lepelle-Nkumpi Local Municipality to manage water scarcity and deficit

As a small business owner, what type of assistance does the municipality give you regarding the shortage of clean water?

In your view, what are the challenges you think are confronting the Lepelle-Nkumpi Municipality concerning the provision of clean water?

What type of support do you think the municipality needs to address the shortage of clean water in your area?

What kind of measures do you think the municipality needs to put in place, in order to deal with the shortage of drinkable water?

INTERVIEW SCHEDULE FOR COMMUNITY/HOUSEHOLD MEMBERS

A. Reasons for water scarcity and deficit in the Lepelle-Nkumpi Local Municipality

In your view, do you think you are experiencing water shortages in your area? Please elaborate.

How do you gain access to potable or clean water for consumption in your area?

What do you think are the reasons for water shortages in your area?

What do you suggest should be done to address different aspects that contribute to water scarcity and deficit in your area?

Who have you contacted with respect to the water shortage problem in the area?

What were their responses when you reported your grievances about the lack of drinkable water?

B. The way water scarcity and deficit affect households and small businesses

Will you please briefly narrate your experiences about the shortage of clean water in your area?

What are some of the challenges that you face because of water shortages in your area?

In your view, how does the shortage of clean water in your area affect you and your fellow residents?

How do you deal with the shortage of clean water for household consumption?

C. Measures used by the Lepelle-Nkumpi Local Municipality to manage water scarcity and deficit

As individual households, what type of assistance does the municipality give you in relation to shortages of clean water?

In your view, what are the challenges you think are confronting the Lepelle-Nkumpi Municipality concerning the provision of clean water?

What type of support do you think the municipality needs to address the shortage of clean water in your area?

What kind of measures do you think the municipality needs to put in place in order to deal with the shortage of drinkable water?

INTERVIEW SCHEDULE FOR MUNICIPAL WARD COUNCILLORS

A. Reasons for water scarcity and deficit in the Lepelle-Nkumpi Local Municipality

In your view, do you think the citizens are experiencing a shortage of clean water in your area? Please elaborate.

How do you ensure that citizens and small businesses have access to adequate potable or clean water for consumption in your area?

In your own analysis, what do you think are the reasons for water shortage in your municipal area?

What do you suggest should be done to address different aspects that contribute to water scarcity and deficit in your area?

Who should be contacted by the citizens and owners of small businesses with respect to the water shortage problem in the area?

How does the municipality respond when grievances about lack of drinkable water are reported to them?

B. The way water scarcity and deficit affect households and small businesses

What are some of the major challenges presented to individual households and small businesses because of water shortages in your municipal area?

In your view, how does the shortage of clean water in your area affect citizens as well as owners of small businesses?

How does the municipality handle shortages of clean water for consumption by households and small businesses?

C. Measures used by the Lepelle-Nkumpi Local Municipality to manage water scarcity and deficit

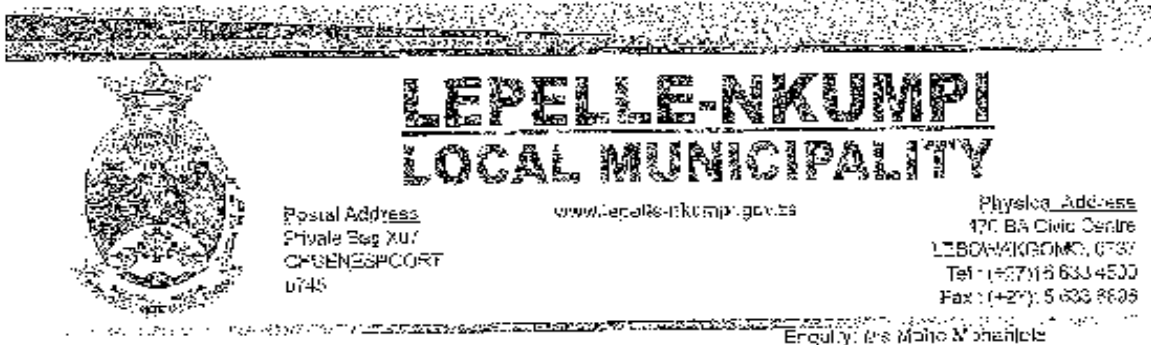
As a municipality, what type of assistance does the national government give you in order to deal with shortages of clean water?

In your view, what are the challenges you think are confronting the Lepelle-Nkumpi Local Municipality is doing about the provision of clean water?

What type of support do you think the municipality needs, to address the shortage of clean water in your area?

What kinds of measures do you think the municipality needs to put in place in order to manage the shortage of drinkable water?

APPENDIX B: PERMISSION LETTERS



Mr. Matsosanya T
4478 Umembesa Street
Extension 26
Birch Acres
Kempson Park
1819

Dear Sir,


**SUBJECT: PERMISSION TO CONDUCT A RESEARCH STUDY: STUDENT NO
35860614**

Your letter dated 04 January 2021 bears reference

Municipality hereby grants you permission to conduct research at Lepele-Nkumpi Municipality for your degree in Masters public Administration with University of South Africa (UNISA) as requested. We hope that the research will be conducted with strict adherence to all the human rights and research ethics and that once published, it will also benefit our local community.

Wishing you all the luck in your academic endeavours.

Kind regards.


MANKGA K.G (MS.)
ACTING MUNICIPAL MANAGER

21/01/2021
DATE

MUNICIPAL CALL CENTRE NUMBER: 0800 222 001

"Mang ka kollo ka betho"

Kgoro ya Magasa
(Tribal Council of Magasa)
Makurung village
14 April 2022

Mr Maleasanya Thipe
4478 Umembesa street
Ext 26
Kempton Park
1619

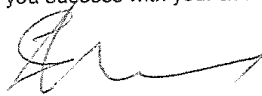
Dear Mr. T Maleasanya

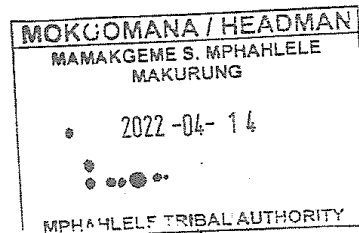
**PERMISSION TO CONDUCT RESEARCH ON WATER SCARCITY AND DEFICIT IN THE
LEPELLE-NKUMPI LOCAL MUNICIPALITY: LIMPOPO PROVINCE: STUDENT NUMBER
36860514**

Request for permission to conduct research entitled "Water scarcity and deficit in the Lepelle-Nkumpi Local Municipality: Limpopo Province" was received by the Tribal Council of Magasa. As Kgoro ya Magasa (Tribal Council of Magasa), we hereby grant you a permission to conduct research interviews with the residents of Makurung Village under the Lepelle-Nkumpi Local Municipality about water shortage, for the purpose of your degree in Master of Public Administration as requested. We have noted that you intend conducting interviews with household individuals, small business owners and ward councillors in the area. Since the envisaged research will be conducted during the COVID-19 period, we advise that you adhere to the COVID-19 protocols as pronounced by the President and the Ministry of the Department of Cooperative Governance and Traditional Affairs. Having stated this, you are given permission to conduct one-on-one interviews with the resident subject to strict compliance with human rights, COVID-19 protocols and research ethics. We will be happy to receive feedback on the findings of your study.

We wish you success with your academic endeavours.

Regards


M S Mphahlele
(Representative of the Tribal Council of Magasa)
060 638 9895



APPENDIX C: PARTICIPANT INFORMATION SHEET

Ethics clearance reference number:

Research permission reference number (if applicable):

12.10.2021

Title: Water shortage and water deficit in the Lepelle-Nkumpi Local Municipality.

Dear Prospective Participant

My name is Thihe Samuel Maleasenya, student number: 36860514 and I am doing research with Mr Paulus Hlongwane, a Senior Lecturer in the Department of Public Administration and Management towards a degree titled, Master of Public Administration at the University of South Africa. We are inviting you to participate in a study titled Water Shortage and Water Deficit in the Lepelle-Nkumpi Local Municipality.

WHAT IS THE PURPOSE OF THE STUDY?

I am conducting this research:

- To assess the reasons for water scarcity and water deficit in the Lepelle-Nkumpi Local Municipality.
- To examine how water scarcity and water deficit affect households and businesses in the Lepelle-Nkumpi Local Municipality.
- To identify and explain measures that Lepelle-Nkumpi Local Municipality has put in place to manage water scarcity and water deficit.

WHY AM I BEING INVITED TO PARTICIPATE?

The participants' contact details were obtained from the gatekeeper and you were chosen because you are living close to and working within the Lepelle-Nkumpi Local Municipality. Thirty participants including ten households, ten business owners, five councillors and five municipality representatives will participate in the study.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

The study involves audio taping and semi-structured interviews, and the interview will last for a maximum of forty minutes.

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and you will be asked to sign a written consent form. You are free to withdraw at any time without giving a reason.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

The potential benefits will be improved water provision and availability, as the water shortages and deficit are solved.

ARE THERE ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

No potential level of inconvenience and/or discomfort to the participant is expected, but if any injury or harm attributable to the study occurs, you can contact the research supervisor or UNISA Ethics Committee.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know about your involvement in this research AND your name will not be recorded anywhere, and no one will be able to connect you regarding the answers you give. Your answers will be given a code number, or a pseudonym and you will be referred to in that way in the data, in any publications, or in any other research reporting methods such as conference proceedings.

Your answers may be reviewed by the people who are responsible for making sure that the research is done properly, including the transcriber, the external coder, and members of the Research Ethics Review Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

Your anonymous data may be used for other purposes, such as a research report, journal articles and/or conference proceedings. *A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report.*

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

Hard copies of your answers will be stored by the researcher for a minimum period of five years in a locked cupboard/filing cabinet, for future research or academic purposes. Electronic information will be stored on a password protected computer. Future use of the stored data will be subject to a Further Research Ethics Review and approval, if applicable. Information will be permanently deleted and shredded.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

No payments will be made, as participation is voluntary.

HAS THE STUDY RECEIVED ETHICS APPROVAL?

The Ethics approval is pending.

HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?

If you would like to be informed of the final research findings, please contact Thipe Samuel Maleaseny on 082 549 3767/010 595 3636 or thipe.maleaseny@builders.co.za. The findings are accessible for five years.

Should you require any further information or want to contact the researcher about any aspect of this study, please contact 082 549 3767, thipe.maleaseny@builders.co.za.

Should you have concerns about the way in which the research has been conducted, you may contact Mr Paulus Hlongwane, 012 429 8499, hlongp@unisa.ac.za.

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

A handwritten signature in black ink, appearing to read 'T. Maleasenya', with a stylized flourish at the end.

Thipe Maleasenya

APPENDIX D: ETHICS CLEARANCE CERTIFICATE



**DEPARTMENT: PUBLIC ADMINISTRATION AND MANAGEMENT
RESEARCH ETHICS REVIEW COMMITTEE**

Date: 16 May 2022

PAM/2022/004 (Maleasenya)
Name of applicant: TS Maleasenya
Student#: 36860514

Dear Mr Maleasenya

Decision: Ethics Clearance Approval

Details of researcher:

Mr TS Maleasenya, student#: 36860514, email: 36860514@mylife.unisa.ac.za, tel: 0825493767

Supervisor: P Hlongwane, staff#: 90223969, email: hlongp@unisa.ac.za

Research project 'Water scarcity and deficit in the Lepelle-Nkumpi Local Municipality: Limpopo Province'

Qualification: MPA – Masters in Public Administration

Thank you for the application for **research ethics clearance** submitted to the Department: Public Administration and Management: Research Ethics Review Committee, for the above mentioned study. Ethics approval is granted. The decision will be tabled at the next College RERC meeting for notification/ratification.

For full approval: The application was **reviewed** in compliance with the *Unisa Policy on Research Ethics* and the *Standard Operating Procedure on Research Ethics Risk Assessment*.

The proposed research may now commence with the proviso that:

- 1) The researcher will ensure that the research project adheres to the values and principles expressed in the Unisa Policy on Research Ethics.



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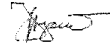
- 2) Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to this Ethics Review Committee.
- 3) The researcher will conduct the study according to the methods and procedures set out in the approved application.
- 4) Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
- 5) The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study, among others, the **Protection of Personal Information Act 4/2013**; **Children's Act 38/2005** and **National Health Act 61/2003**.
- 6) Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
- 7) Field work activities **may not** continue after the expiry date of this ethics clearance, which is 16 May 2025. Submission of a completed research ethics progress report will constitute an application for renewal of the ethics clearance certificate for approval by the Research Ethics Committee.

Kind regards



Mr ND Baloyi

Deputy Chairperson: Research Ethics
Review Committee
Department of Public Administration and
Management
Research Ethics Review Committee
Office tel. : 012 429-6181;
Email : ebaloynd@unisa.ac.za



Prof MT Mogale

Executive Dean:
College of Economic and Management
Sciences
Office tel. : 012 429-4805;
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APPENDIX E: PROOFREADING AND EDITING CERTIFICATE



20 Oester Street, Struisbaai, 7285, Western Cape, South Africa
Cell: +27 72 244 4363 / +27 82 807 0134
Email: info@busybeediting.co.za / brendanvansenburg2@gmail.com
Website: www.busybeediting.co.za

PROOFREADING AND EDITING CERTIFICATE

Busy Bee Editing has completed the proofreading, editing, syntax, language editing, layout, spelling, grammar and reference check on a dissertation titled: **WATER SCARCITY AND WATER DEFICIT IN THE LEPELLE-NKUMPI LOCAL MUNICIPALITY: LIMPOPO PROVINCE** by **THIPE SAMUEL MALEASENYA**, student number: 36860514 in partial fulfilment of the requirements for the degree of **MASTER OF PUBLIC ADMINISTRATION** at the **UNIVERSITY OF SOUTH AFRICA**

Busy Bee Editing will not be held responsible for any errors, spelling and grammar mistakes, amendments or alterations that were done to this dissertation after it had been received by **THIPE SAMUEL MALEASENYA** or by his supervisor **MR HLONGWANE PAULUS**. These errors, spelling and grammar mistakes, amendments or alterations are not covered by this proofreading and editing certificate. It is up to **THIPE SAMUEL MALEASENYA** to ultimately decide whether to accept or decline any amendments done by Busy Bee Editing. It remains **THIPE SAMUEL MALEASENYA's** responsibility at all times to confirm the accuracy and originality of the completed dissertation to her supervisor **MR HLONGWANE PAULUS**.

Hugo Chandler – BA Psychology and Drama (UCT) *Brenda van Rensburg*

For Busy Bee Editing: Hugo Chandler
Date: 22 April 2023

For Busy Bee Editing: Brenda van Rensburg