

DURBAN UNIVERSITY OF TECHNOLOGY

**FACTORS INFLUENCING THE PROVISION OF WATER SERVICES AT
UMHLATHUZE LOCAL MUNICIPALITY**

SIBONGEKILE PRINCESS MADLOPHA

AUGUST 2024



**FACTORS INFLUENCING THE PROVISION OF WATER SERVICES AT
UMHLATHUZE LOCAL MUNICIPALITY**

Mini-dissertation submitted in partial fulfilment of the requirements for the degree of

Master of Business Administration (MBA)

in the DUT Business School

Faculty of Management Sciences

at the Durban University of Technology

SIBONGEKILE PRINCESS MADLOPHA

AUGUST 2024

APPROVED FOR FINAL SUBMISSION

Supervisor: Dr Genius Murwirapachena

Signature

Date: 07/08/24

Abstract

South African municipalities are mandated with the efficient and effective provision of public services to communities. These services include water and sanitation, electricity and solid waste disposal, among others. Generally, municipalities experience several challenges in the provision of these public services and the consequences include the prevalence of public service delivery protests, which in some cases become violent. This study investigates the factors influencing the provision of water services using a case study of the uMhlathuze Local Municipality in KwaZulu-Natal. The study uses quantitative data collected from 383 household heads randomly sampled across the uMhlathuze Local Municipality. The principal component analysis technique is used to analyse the survey data and establish the key factors affecting water service provision in the municipality.

Findings from the study show that respondents were cognisant of the reality that South Africa is a water-scarce country. However, population growth, unsustainable water management, poor governance and deteriorating water supply infrastructure are among the determinants of water service delivery in the municipality. The study further reports that improving effectiveness in water service delivery may require the municipality to introduce prepaid water meters, conduct consumer education campaigns on water conservation and ensure the constant repair and maintenance of water supply infrastructure. Findings from this study essentially inform water policy making and implementation at the uMhlathuze Local Municipality and in other local municipalities with similar operating environments.

Keywords: Municipal efficiency; public service delivery; uMhlathuze Local Municipality; water service provision

Declaration by a student

I, Sibongekile Princess Madlopha, hereby declare that this mini-dissertation represents my own work. All other writers' information and quotes were indicated and acknowledged by in-text referencing and included on the reference list. This work has not previously been submitted at any other institution of higher education for the purposes of the awarding of a degree.

Signature

Dedication

This mini-dissertation is dedicated to everyone who participated in the study data collection and to everyone who believed in me.

Acknowledgements

Firstly, I am grateful to God Almighty for the strength, wisdom and intelligence he gave me to complete this thesis successfully. I would like to express my sincere gratitude to the following individuals and institutions for their support during this project. I am heavily indebted to my supervisor, Dr Genius Murwirapachena for his support, expertise, wise guidance, motivation, assistance and patience throughout this study. He is passionate about providing high-quality and excellent academic work. A special word of gratitude to the staff at the DUT Business School, especially Prof. Rawjee, Dr Jugmohan and Prof. Govender, for their unequivocal support.

I would also like to thank the uMhlathuze Local Municipality management team and my colleagues for their support, motivation and inspiration. I sincerely appreciate the permission granted by uMhlathuze Local Municipality to conduct a study about the organisation. My humble gratitude to the Skills and Development Section for partially funded my studies. I would like to express my heartfelt gratitude to the residents of the uMhlathuze Local Municipality for participating in the study. Finally, I also would like to thank my family and friends for their support and words of encouragement. A special word of gratitude also goes to my son, Syamthanda Mbatha, for his support and for understanding the pressure that I went through during my studies.

List of acronyms

DWAF	Department of Water Affairs and Forest
KMO	Kaiser-Meyer-Olkin
DWS	Department of Water and Sanitation
PCA	Principal component analysis
MOU	Memorandum of understanding
Stats SA	Statistics South Africa
WSAs	Water Services Authorities
WSPs	Water Services Providers

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CHAPTER 1

INTRODUCTION

1.1 Introduction and background of the study

Municipalities are mandated to provide water services to final consumers. The White Paper produced by the Department of Water Affairs and Forestry (DWA 1994) mandates the local government with the responsibility to provide water services (South Africa, Department of Water Affairs and Forestry 1994). This mandate was later legislated in the Water Services Act 108 of 1997 (South Africa, Department of Water and Sanitation 1997). The Act clearly distinguishes between water services authorities (WSAs) and water services providers (WSPs). WSAs have a governing role in ensuring access to water services. It is important to note that while only municipalities can be WSAs, not all municipalities are authorised to be WSAs. WSPs, on the other hand, can be any organisation hired by a WSA to provide water services to final customers in a specific municipal area. Thus, a WSA can provide water directly to final customers; in that case, the WSA will also be a WSP. Alternatively, a WSA can assign the water distribution responsibility to another entity to distribute water services on its behalf. In such cases, the hired entity becomes a WSP. The Act allows WSAs to appoint other municipalities, water boards, or any other entity to act as a WSP on its behalf. The relationship between the two parties is governed by a memorandum of understanding (MOU) (South African Government 2014).

Water consumers are categorised into residential, commercial, industrial and agricultural consumers (Mishra et al. 2021; Vollmer and Harrison 2021). The worldwide water demand is projected to increase between 20% and 25% by 2050; water stress has already been identified in about 25% of major cities (Kuzma, Saccoccia and Chertock 2023; Lund Schlamovitz and Becker 2021). Almost four billion people around the world experience severe water scarcity. The main reasons for this

scarcity include climate change, droughts, population growth, economic development and poor management of freshwater resources (Khatibi and Arjjumend 2019; Orimoloye et al. 2021). Consequently, around 2.2 billion people worldwide do not have access to clean drinking water (World Health Organisation, (WHO) 2019).

In South Africa, municipalities are expected to provide water services in a manner that addresses poverty and fosters economic development. Thus, it is crucial for the municipalities to improve the quality of life and the public provision of basic services like water (Masuku and Jili 2019). The municipalities should do this by organising their administration, budgeting and planning in a way that prioritises the fundamental needs of communities and fosters both social and economic development. However, several challenges in the provision of basic services like water are common across South Africa, especially in urban environments. Some of the major challenges causing water shortages in South African urban areas include factors like population growth, unsustainable water management, poor water governance, failing infrastructure and inefficient water usage (Millington and Scheba 2021; Ngcobo, Murwirapachena and Reddy 2023). Despite these challenges, municipalities are still expected to sustainably supply water services to all residents. Thus, municipalities should ensure that water services are provided equally and fairly to all citizens, without any exclusion based on economic or racial dynamics (South Africa, The Presidency Republic of South Africa 1996; South Africa, Department of Water and Sanitation 1997; Department of Water and Sanitation 2023).

1.2 Problem statement

Several municipalities in South Africa continue to experience challenges regarding water service delivery (Ngcobo, Murwirapachena and Reddy 2023). Industrialisation, agriculture and urbanisation continue to increase the demand for water, putting more strain on the water supply (Mishra et al. 2021; Vollmer and Harrison 2021). A total of 909 service delivery protest actions were recorded in South Africa between 1 August 2020 and 31 January 2021 (Martin 2021). These protest actions prove that South African municipalities are struggling to sustainably provide basic services like water.

Generally, South Africa is a water-scarce country with an average annual rainfall that is significantly below the world average (Ngcobo, Murwirapachena and Reddy 2023). While this reality is appreciated, it should be emphasised that the provision of water as a service is also a challenge across the country's municipalities. Generally, common drivers of this challenge include insufficient funding, aged infrastructure, population expansion, water scarcity, pollution and regulatory compliance (Khatibi and Arjjumend 2019; Orimoloye et al. 2021).

1.3 Aim and objectives of the study

The aim of this study is to investigate the factors influencing the provision of water services at the uMhlathuze Local Municipality in the province of KwaZulu-Natal. This aim is achieved through the fulfilment of three objectives, namely:

- i. To examine the provision of basic water services at uMhlathuze Local Municipality,
- ii. To identify the challenges in water service delivery at uMhlathuze Local Municipality and
- iii. To identify strategies to improve water service delivery at uMhlathuze Local Municipality.

1.4 Significance of the study

This study will identify strategies to improve water service delivery at uMhlathuze Local Municipality. The research will also address challenges faced by the municipality in ensuring effective water service delivery. The study's focus is on an essential aspect of municipal governance and the public administration of water services supplied to households. In the case of the uMhlathuze Local Municipality, providing water services would entail a variety of actions and procedures designed to guarantee a dependable

and long-lasting supply of water to citizens and companies (Enqvist and Ziervogel 2019).

Water scarcity, pollution, budgetary limits and regulatory compliance may all be major problems in providing water services to households. The municipality could investigate several options to enhance water service delivery, including investing in infrastructure improvements, putting effective water management practices in place, educating the public about water conservation and forming partnerships for financial and technical assistance. These strategies include investing in infrastructure improvements, putting in place effective water management procedures and launching public awareness campaigns to encourage water conservation.

After examining research goals, the study seeks to offer a thorough understanding of the water service delivery situation in the uMhlathuze Local Municipality as well as provide evidence-based recommendations for improving the municipality's capacity to offer consistent, secure and equitable water services to its residents. It is essential to identify any potential risks associated with alternative water supplies and distribution methods. The study will elaborate on short-term plans based on a second objective. Since the water crisis is a continuous challenge that requires funding to expand infrastructure long-term monitoring and mitigation plans should in place (Salehi 2022). It is crucial to understand how ethics determine in water policies in order to understand the water resource management that needs to be implemented (Groenfeldt 2019).

1.5 Organisation of the study

The study is organised into five chapters. This chapter introduced the study, the research problem, aim and objectives. Chapter 2 discusses the theoretical and empirical literature that underpins the study. The chapter positions the study within the existing body of literature. Chapter 3 discusses the methodology employed in the study. The chapter provides a detailed discussion of the research design, data collection, data analysis, pretesting of survey instruments and information such as ethical considerations. Chapter 4 discusses the results of the study. Chapter 5

summarises and concludes the study, providing recommendations and areas for future research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter discusses theories about the factors influencing the provision of water services at uMhlathuze Local Municipality. The literature has numerous theories and empirical studies that can be used to explain water service delivery. The literature research emphasises how the supply of water services in the municipality is multifaceted. Key issues include community engagement, disaster preparedness, infrastructure maintenance, water quality, equitable distribution, financial sustainability and cooperation. The study will provide evidence-based recommendations to improve the provision of water services and alleviate community dissatisfaction. This chapter discusses some of the theories and the empirical literature underpinning the study. This section is divided into two main subsections. The discussion starts with the theoretical literature presenting theories relevant to the study, followed by a discussion of some of the empirical literature supporting the study.

2.2 Theoretical literature

The theoretical literature review contributes to developing new hypotheses for testing and discovering theories relevant to the title, their relationships and the extent to which they have been studied. Several theories are used to explain the provision of water services, its challenges, findings and recommendations. This study is going to focus on the expectancy-disconfirmation theory. The key principle of this theory is that people have expectations of goods or services and whether or not these goods or services live up to those expectations determines whether or not people are satisfied with them (Zhang et al. 2022). When examining the expectancy-disconfirmation,

several relationships in the fundamental model must be taken into account. One of these connections focuses on the connection between satisfaction and performance. According to the expectancy-disconfirmation paradigm, expectations and performance produce both confirmation and disconfirmation (Van Ryzin 2004).

Residents frequently turn to a variety of means to voice their discontent with the lack of service delivery that they are entitled to receive from the municipality. They perceive that the services they receive do not represent value for money. They protest for service delivery to voice their discontent. It is important to highlight that service delivery protests have taken many different forms, including large gatherings, the submission of memoranda and petitions, processions and boycotts of elections. This has led to the conjecture that service delivery protests are essentially an impoverished group's rebellion against neo-liberal policies. Protests take place due to a lack of or inadequate service delivery. Additionally, they tend to reject additional problems related to a poor culture of governance in the municipality, including poor management, nepotism, fraud, corruption and the incompetence of council members and the failure of councillors and administrators to listen to residents.

The expectancy-disconfirmation theory was applied to explain citizen satisfaction with public services after apartheid in South Africa, but there are still issues that prevent municipalities from providing their residents with the best municipal services possible. The South African government gave municipal reforms top priority in an effort to address issues with service delivery and encourage direct service delivery to communities. Furthermore, the study emphasises that municipalities are responsible of providing infrastructure and services that are essential to people's well-being. They are also entrusted with fostering growth and development to improve community responsibility and engagement. By involving the public in the integrated development plan formulation process, local government is also required to interact with communities about the various types of fundamental services that they need.

2.3 Empirical literature

There are theories about water conservation in the literature. The premise that people's environmental views impact their conservation behaviour is shared by a sizable number of the hypotheses that are now in circulation. Given this supposition, the key to attaining sustainable water conservation is to encourage changes in people's beliefs. These theories specifically explain how people conserve water by focusing on their environmental concerns. The provision of water services is crucial to ensuring access to clean and safe drinking water as well as sustainable development (Bazaanah and Mothapo 2023; South Africa, The Presidency Republic of South Africa 1996; World Health Organisation, (WHO) 2019). Several studies focus on the delivery of water services (Aiyetan and Das 2021; Department of Water and Sanitation 2023; Groenfeldt 2019; Kunene 2023; Murwirapachena 2021) and some of the empirical literature on these facts is covered in this section. This section goes into more details on the literature about public service delivery in South Africa, as well as the typical difficulties encountered when delivering water services.

2.3.1 The provision of basic public services in South Africa

In terms of the Constitution of the Republic of South Africa Act 108 of 1996, local authorities have an important role in promoting social, economic and environmental reform (South Africa, The Presidency Republic of South Africa 1996). The White Paper on Local Government 1998 outlines the four major characteristics of a developmental local government, which comprise the assurance to maximise social and economic development, coordination and integration of resources, stakeholders democratising development and leading and learning (South Africa, Ministry for Provincial Affairs and Constitutional Development 1998). The protests in South Africa are concerns about service delivery, which continue to draw attention to a wide range of issues involving services and public housing delivery as a top concern for municipalities. Citizens expect the government to provide services that are of the highest quality and meet appropriate standards. It is a challenge to provide water services if citizens are not household owners (Khuzwayo, Kanyangale and Tefera 2020).

Municipalities are mandated by the law to provide the public with basic services and efficiently administer these services. The Republic of South Africa administers public administration provisions that must adhere to national legal frameworks and faithfully carry out the legitimate policies of the ruling government. The country's Constitution assigns the government the duty of ensuring that, to the extent possible given the resources at its disposal, these services are gradually made available to citizens. The state has to make sure that citizens, especially the impoverished and other vulnerable groups have access to essential services, which is one of the main characteristics of a developmental state. Therefore, the government's approach to most of these concerns is to gradually work towards universal access. Public services are health care, social welfare, housing, education, transport, electricity and energy, water and sanitation, refuse collection and waste removal.

The Local Government: Municipal System Act 32 of 2000 emphasise that for the municipalities to improve their debt collection rate, they need to ensure that accurate billing and charges for basic public services to citizens are delivered effectively and efficiently (South Africa, Ministry for Provincial Affairs and Constitutional Development. 2000). The sustainability of municipal service delivery across South Africa is still threatened by non-payment for services by the consumers (Murwirapachena, Kabange and Ifeacho 2023).

2.3.2 Water service delivery challenges in South Africa

South Africa faces serious challenges with regards to the delivery of water infrastructure projects. Findings from the previous studies suggested that delays in project completion, cost overruns, poor quality of work, poor fund utilisation and poor service delivery are major challenges to the delivery of water projects (Aiyetan and Das 2021; Imiru 2020; Mwale 2023). Apparently, the contradiction may have its roots in the fact that only a limited number of local water quality improvements are frequently considered. Particularly, the harm to the climate caused by water contamination has rarely been put into numbers (Najafzadeh, Homaei and Farhadi 2021). Consumer habits and patterns of water consumption have an impact on water challenges that

continue to threaten water scarcity (Murwirapachena 2021). The sizeable emissions from lakes and reservoirs and the possibility of additional emissions imply that enhancing water quality in lakes and reservoirs and preventing further deterioration are important goals (Downing et al. 2021).

COVID-19 also had an impact on the mobilisation of expanded services. The increase in the demand for water during COVID-19, resulted in a decrease in the supply due to the number of people in need of water distribution. The essential basic services that had to be provided included temporary shelter, food support and hygiene products (Agostino, Arnaboldi and Lema 2020; Local Government Bulletin 2020; Sharifi and Khavarian-Garmsir 2020). Furthermore, COVID-19 impacted municipal expenditures negatively. The municipalities redirected funds so that they could support citizens during the COVID-19 pandemic (National Treasury 2020). Several services had to be suspended, hence impacting service delivery. It was difficult to balance COVID-19 expenditures with the provision of basic services. Hence, it has been difficult for municipalities to deliver services like water, sanitation and electricity to communities.

The possible risks related to households saving water in building storage tanks to handle insufficient delivery of potable water related to frequent disruptions could be reduced with constant monitoring and the application of mitigation techniques. Many water consumers utilise in-house storage tanks to have some backup water during an interruption of water supply due to the unreliability of water supplies in certain areas (Negharchi and Shafaghat 2020). To create short- and long-term monitoring and mitigation plans, it is essential to identify any potential risks associated with alternative water supplies and distribution methods (Salehi 2022).

Municipalities are expected to sustainably supply water services to all residents. Thus, municipalities should ensure that basic water services are fairly provided to all citizens without any exclusion based on economic or racial dynamics (Smith 2009; Enqvist and Ziervogel 2019). It might be difficult to ensure fair water distribution in places that are rapidly urbanising. Due to poor infrastructure, informal communities frequently have inequities in water availability (Millington and Scheba 2021; Ngcobo, Murwirapachena and Reddy 2023). Social fairness requires approaches that ensure everyone has

access to water resources (Simatele and Binns 2012). Municipalities should implement a tariff policy, which includes water tariffs, but consider whether the existing increasing block tariff design addresses the issue of affordability, especially for lower-income groups. The process of setting water tariff rates for utilities is a very complex undertaking. Utilities cannot pursue economic efficiency only when setting tariffs but must also take into consideration social goals such as access, affordability, sustainability and the political economy (Mgwele 2020).

Effective water emergency response strategies are needed in cases of water supply problems. To avoid water supply interruptions, preparedness steps are essential, such as drought contingency plans and infrastructure resilience methods (Rajab, Adamowski and de Jong 2021). Water utility authorities have warned the public to expect low water pressure or no water during load shedding. Municipalities need power to pump water from the reservoir to the towers, which is a concern when load shedding is in effect. A decisive strategy to have backup power systems will prevent logistical traps and provide adequate water flow despite extended and frequent power outages (Nuwater 2023).

Key components of water service delivery in the uMhlathuze Local Municipality are infrastructure development and maintenance, which involve the construction, maintenance and repair of water supply infrastructure, including reservoirs, pipelines, pumping stations and treatment facilities. Regular maintenance is crucial to prevent leaks, burst pipes and other issues that could disrupt the water supply. Municipalities must ensure that water supplied to consumers meets health and safety standards through appropriate treatment processes. This might include processes such as filtration, chlorination and other purification methods. Water quality should be regularly checked and monitored to make sure it complies with legal requirements and is suitable for consumption. This entails taking water samples and analysing them in a lab from various distribution network locations (Lazarova et al. 2019).

UMhlathuze Local Municipality may encounter difficulties in providing water services due to insufficient funding, aged infrastructure, population expansion, water scarcity, pollution and regulatory compliance (City of uMhlathuze Local Municipality 2019). The

municipality could consider several options to enhance water services provision. According to the uMhlathuze Local Municipality, water demand exceeds supply, which is exacerbated by densification, illegal connections and aging infrastructure (City of uMhlathuze Local Municipality 2021). Security and fencing are deemed essential due to the prevalent challenges of vandalism and theft. Additionally, revenue collection poses a significant concern, with the district municipality itself owing money to the city. Plans are in place to address each of these issues (Kunene 2023).

Public service delivery at uMhlathuze Local Municipality involves investing in infrastructure improvements, putting effective water management practices in place, educating the public about water conservation and forming partnerships for financial and technical assistance. It is important to note that the specifics of water service delivery in uMhlathuze Local Municipality depend on the local context, regulations, available resources and community needs. It is crucial to remember that the specifics of providing water services in uMhlathuze Local Municipality rely on the environment, laws, resources and demands of the community.

The challenges faced by the uMhlathuze Local Municipality could be attributed to a lack of infrastructure, water shortages and poor functionality of existing infrastructure (Khatibi and Arjjumend 2019; Orimoloye et al. 2021). The critical elements and focus of these goals revolve around the issue of ensuring reliable services. Unreliable service delivery is a major concern as it is directly related to social and economic impacts associated with unhappiness, protest, unrest and vandalism leading to subsequent environmental pollution and health impacts. The uMhlathuze Local Municipality has many large industrial water users; their water usage has been stable over recent years, but future growth is expected from these industries as well as growth in domestic water use. There is a perception that the municipality currently does not monitor the provision of water and sanitation services to schools, tertiary institutions, clinics and hospitals in urban and rural areas. The severe drought has resulted in lower consumption by both the households and industries in the area (Chivangulula, Amraoui and Pereira 2023; Seakamela 2018; Vogel and Olivier 2018). Providing free water services to indigent customers is putting a strain on revenue generation and collection (uMhlathuze Local Municipality 2019).

The development and ongoing maintenance of infrastructure are crucial to the supply of water services. Water leaks, pipe bursts and disruptions can be caused by the aging infrastructure. A stable and effective water distribution system requires upgrades to pipes, pumping stations and treatment facilities (Raju, Murthy and Choudhury 2017). The financial viability of providing water services is intimately correlated with revenue collection and effective billing procedures. For upkeep and improvements, the deployment of water-saving measures and adequate financing are required (Marques, Giacomello and Llamas 2018).

2.3.3 Community engagement and awareness in South Africa

The community should be consulted and involved in the delivery of public services. Public awareness campaigns can encourage responsible water use and conservation methods. Local participation in water management can improve cooperation and compliance (Munene, Mcharo and Magigi 2020). The Batho Pele principle is a strategy to inspire public employees to care about helping people and look for methods to enhance service delivery. The public should be involved in this strategy in order to hold the public service providers accountable for the level of service rendered. The Batho Pele principle also aims to transform public service from one that relies heavily on rules and impedes the provision of services to one that promotes innovation and is results-oriented (Mnandi 2020).

Interacting with the community will assist the municipality to gather their input, address issues and educate local citizens about water-saving techniques and the significance of sensible water use. Proper consultation will assist in establishing emergency plans and procedures for handling water supply crises such as droughts, pollution, accidents or infrastructure breakdowns, and take action to encourage water conservation. Minimising water loss due to leaks and improve water supply and distribution systems and collaborate with key players, such as government organisations, non-governmental organisations and the corporate sector, to improve the delivery of water services and address water delivery issues.

COVID-19 impacted municipal revenues (Local Government Bulletin 2020). Municipalities were expected to provide extra services to communities during the lockdown period. They had to monitor the progress and responses in their communities. Municipalities had to add water supply, sanitise public transport and support communities that were vulnerable (Sharifi and Khavarian-Garmsir 2020). Municipality used online platforms in creating awareness and engaging with communities, so you must clearly indicate that during COVID19 they communicated and responded to community members through online platforms, therefore they are familiar with these platforms (Agostino, Arnaboldi and Lema 2020).

The City of uMhlathuze Local Municipality implemented an area-based management project that is a modern, effective and integrated technique for resolving basic service failures and breakdowns (City of uMhlathuze Local Municipality 2021). The uMhlathuze Local Municipality has been applauded for comprehensive environmental analysis, including related programmes such as those aimed at climate change and air quality management plans, as well as the registration of more waste handlers (Read 2021).

2.4 Key legislations governing the South African water distribution sector

The National Water Act 36 of 1998 aims to provide a fundamental framework for the national government that oversees the distribution and use of the country's resources and to ensure the fair and equitable distribution of water resources that may be unevenly distributed (South Africa, Department of Water and Sanitation 1998). By safeguarding the quality of water resources for the benefit of all water users, water resource management seeks to ensure the sustainable use of water. To ensure that everyone can contribute, integrated management of water resources is required, with management responsibilities delegated at the regional level when needed. There are provisions in place for sharing specific water resources with foreign nations.

The Water Services Act 108 of 1997, which requires municipalities to act as water services authorities and promulgate bylaws containing conditions for the provision of

water services, provides additional protection for residents against unfair treatment and fraudulent billing. Some of the main objects of the Water Services Act, 1997 Act 108 of 1997 emphasise access to basic water supply and the right to basic sanitation necessary to secure sufficient water and an environment not harmful to human health (South Africa, Department of Water and Sanitation 1997). The act sets a national standard, norms and standards for tariffs regarding the water services and lastly promotes effective water supply. These bylaws must clearly specify the standard of the services to be provided and the technical conditions of supply, including quality standards and units (Fourie and Opperman 2015).

The process of granting authority and responsibilities to local government is governed by the Local Government: Municipal Systems Act 32 of 2000. Ensuring municipalities obtain sufficient resources to carry out their designated authorities and tasks is crucial (South Africa, Ministry for Provincial Affairs and Constitutional Development 2000). It also aids in ensuring the coordinated operation of the three spheres of government. Municipalities should develop an integrated development plan to correlate the municipality's capabilities and resources to the plan's execution. The integrated development plans are the policy framework and overarching foundation upon which annual municipal budgets must be based. A municipality may enter into a contract with service providers to provide services, but the municipality is still in charge of making sure the service is provided. The municipality is required to control the service provider's tariff setting in accordance with its tariff policy and to manage the service's delivery. The municipality is responsible for overseeing service delivery and making sure the community's needs are met consistently. Although a service delivery agreement may allow the municipality to delegate certain tasks to the service provider, the municipality is still in charge of providing the service.

The White Paper on National Water Supply and Sanitation Policy (1994) emphasises the distribution of essential services is one area where this is most noticeable. Insufficient access to drinkable water is an ongoing issue which resulted to over 12 million people who experience challenges in accessing basic water and sanitation basic services (Department of Water Affairs and Forestry 1994). A primary indicator of poverty and underdevelopment is a shortage of basic services like clean water and

proper sanitation. To be effective, the delivery of these services needs to be integrated into a strategically designed development plan (Maurya et al. 2020). Naturally, the impact of water and sanitation services on development extends far beyond their effects on individual households. In the mining, agriculture, industrial, and power generation industries, water is a critical component of production.

Municipality policies should cater for low-income households, providing them with a monthly free basic allocation of water, which is defined at 6000 litres (6kl) per household. The Free Basic Water Policy (FBW) was put in place to guarantee the fulfilment of these rights and lessen the disparities in service delivery that were created during the apartheid era. For households and dependents who are unemployed and do not have any alternative source of income, if their total household income including government grants, is R3500 or less, they can apply for an indigent programme (City of uMhlathuze Local Municipality 2023a). The delivery of water services is a crucial component of municipal government since it affects the social well-being, economic growth and public health of the citizens. Incorporating fairness, equity, cost recovery, efficiency, sustainability and political viability into well-designed policy instruments, such as water tariff structures, could go a long way towards ensuring that all South Africans have equitable access to high-quality water services (Dikgang et al. 2019). Amendments to water policies, procedures and processes were implemented after previous studies were conducted for water service delivery challenges.

2.5 Conclusion

This chapter explored the literature on the provision of water service delivery that has a significant impact on social well-being, economic growth and public health, making it a crucial component of municipal government. Effective water service delivery, according to studies, is crucial for achieving sustainable development and guaranteeing that everyone has access to clean and safe drinking water. Theoretical and empirical literature were discussed in this chapter. The next chapter will discuss the research methodology of the study.

CHAPTER 3

METHODOLOGY

3.1 Introduction

A research methodology includes the techniques and approaches researchers use when conducting research. It illustrates the method used to address the objectives of the study (Mishra and Alok 2022). Research methodology usually includes the research design, data collection strategies, data analysis approaches and the general framework used for the study (Pandey and Pandey 2021). This chapter discusses the methodology adopted in the study to address the study's objectives. The chapter outlines the research approach, methods and techniques used to examine the factors influencing water service delivery at the uMhlathuze Local Municipality. The methodology adopted in this study aligns with the aim and objectives identified earlier in the study. This chapter is organised into several sections, namely, the research philosophy, research approach, design, population, target sample, sampling method, data collection instruments and collection process, validity and reliability, data analysis and ethical considerations.

3.2 Research philosophy

A research philosophy is a set of principles regarding the collection, analysis and use of evidence related to the study (Dudovskiy 2022). Positivism, critical realism, interpretivism, postmodernism and pragmatism are the common research philosophies in the literature (Saunders and Townsend 2016). Positivism was considered a suitable philosophy for the study since it applies a quantitative methodology approach and targets a large sample. Positivism is a philosophy that

upholds the idea that only information that is factual and derived from observation, including measurement, is reliable (Saunders, Lewis and Thornhill 2019).

Positivism promotes quantifiable observations that result in statistical analysis and has dominated research in the fields of business and management for many years. As a philosophy, positivism is in line with the empiricist theory, which holds that knowledge is derived from human experiences, according to some observations (Benton and Craib 2023). Experimentation is encouraged in positivist research to ascertain the study's reality and remove the external world's complexity. The primary goal of positivism is to confirm that it is linked to the development of laws that apply to all fields of study and asserts the search for generalisations.

3.3 Research approach

A research approach is a guideline and plan that determine the overall direction of a study, as well as the procedures for gathering, analysing and interpreting data (Leavy 2022). There are numerous considerations when choosing a research approach. Bougie and Sekaran (2019) suggest that these considerations include the nature of the study, its aim and its target population. Three common research approaches in the literature are qualitative, quantitative and mixed-method approaches (Bougie and Sekaran 2019; Wiid and Diggins 2017). Qualitative research is non-numerical and allows for the use of words to derive meaning and feelings and describe a situation (Wiid and Diggins 2017). Thus, it entails a thorough investigation of the participant's experiences, attitudes and viewpoints, where data are in the form of words. On the other hand, quantitative research involves an objective, systematic process that uses numerical data and mathematical and statistical tests to describe relationships among variables (Sekaran and Bougie 2013; Struwig and Stead 2021). Meanwhile, mixed-methods research, a study integrates quantitative and qualitative data.

This study adopted a quantitative approach to examine the factors influencing water service delivery at the uMhlathuze Local Municipality. A quantitative approach was deemed necessary given the study's aim, which required the collection of data from a

larger sample size in order to proffer recommendations that promote sustainability in the provision of water service delivery at the selected municipality. Thus, a self-designed questionnaire was used to collect quantitative data from selected heads of households across the municipality. Subsequently, statistical tests and some basic econometric modelling were used to analyse the collected data and derive the findings.

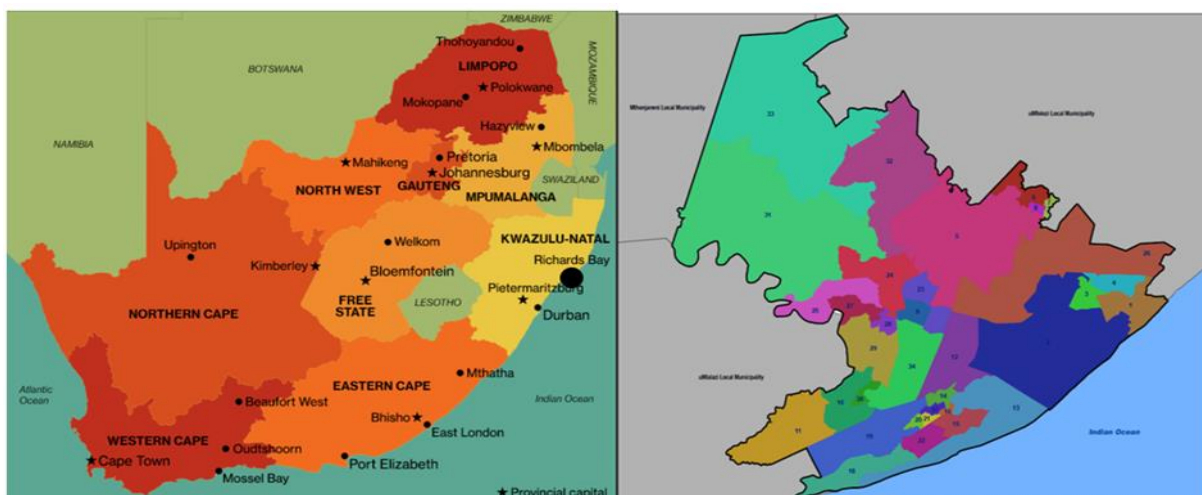
3.4 Research design

A research design is a plan that shows the process by which a study will be conducted, entailing problem formulation, objective formulation and data collection, analysis, interpretation and reporting (Sileyew 2019). Common examples of quantitative research designs include descriptive, correlational, causal-comparative/ quasi-experimental and experimental research. Although there are some significant distinctions, these designs are extremely comparable to actual studies (Bloomfield and Fisher 2019). Descriptive research examines matters as they truly are in order to provide a thorough description of individuals, events, or situations (Leavy 2022). A study can be conducted using one of the descriptive research techniques, namely, survey research, observational research, case study research, focus group research and ethnographic research (Sirisilla 2023).

Empirical studies apply cross-sectional designs to provide an overview of a population of interest. A cross-sectional descriptive design is a useful technique to compare and analyse individual variables among several subgroups (Saunders, Lewis and Thornhill 2019). This study identified and adopted a cross-sectional descriptive design as the most appropriate design to provide a detailed and accurate description of the factors influencing water service provision at uMhlathuze Local Municipality. A cross-sectional design was adopted because it monitors all variables simultaneously. It is generally easier to conduct, less expensive to implement and refrains from following respondents throughout the study.

3.5 Study site and population

The study was conducted at the uMhlathuze Local Municipality, one of the local municipalities under the King Cetshwayo District Municipality. The municipality was chosen as the study site because of its common water service provision challenges, which usually result in service delivery protests. The City of uMhlathuze Mayor Cllr X. Ngwezi confirmed that the provision of water has been a challenge, especially at eSikhaleni and the community expressed their dissatisfaction with the protest actions (City of uMhlathuze Local Municipality 2022). The municipality is located about 180 km north-east of Durban and has a total area of 1195 km², which is divided into 34 wards. These wards comprise urban and rural areas, where urban residential areas are predominantly townships. The 2016 Community Survey conducted by Statistics South Africa reported that the municipality has a population of about 410 456 people who live in 110 503 households, where the average household size is 4.7 people. The population is predominantly Black (91.72%), followed by Whites (4.59%), then Asians (2.97%) and Coloured (0.72%). Most of the households (97.04%) have access to piped (tap) water, which is supplied by the municipality and water backlog (2.96%) (City of uMhlathuze Local Municipality 2023b). Figure 3.1 shows the municipality's location on the South African map.



Panel A:
Position of uMhlathuze Local Municipality on the South African map

Panel B:
Map of uMhlathuze Local Municipality

Figure 3.1: The location of uMhlathuze Local Municipality on South African map

Panel A displays the South African map with nine provinces, their capital cities and the location of the uMhlathuze Local Municipality, while Panel B displays the 34 wards of the uMhlathuze Local Municipality. Due to financial and time constraints, data for the study was collected from three wards, namely, Ward 2, Ward 21 and Ward 33. Ward 2 is predominantly urban, with several residential areas being suburbs. On the other hand, Ward 21 consists of townships, while Ward 33 consists of rural and traditional areas. The population statistics of the respective wards are as follows: 12 254 people in Ward 2, 6 950 in Ward 21 and 10 710 in Ward 33 (City of uMhlathuze Local Municipality 2023b). The three wards have a combined population of 29 914. Due to the diverse spatial distribution of residential area types in the selected wards, they were deemed appropriate representatives of the uMhlathuze Local Municipality. This is mainly because the selected wards include suburbs, townships and rural areas, which are the main types of residential areas in the municipality. Thus, the data collected from these three wards was deemed representative of the practical dynamics within the municipality.

3.6 Sample and sample size

A sample is a more manageable and consolidated representation of a bigger group. Thus, it is a portion of a larger population that retains traits from the original population (Bryman and Bell 2014). Data for this study was collected from household heads sampled within three selected wards in the uMhlathuze Local Municipality. Given a total number of 110 503 households as indicated in the previous subsection, the Raosoft sample size calculator suggests at least 383 responses as sufficient for a 95% confidence in the results and an error margin of 5%. Thus, data was collected from 383 household heads sampled across Ward 2, Ward 21 and Ward 33. More precisely, 157 responses were collected from Ward 2, while 88 responses from Ward 21 and 138 responses from Ward 33. This distribution was determined according to the population statistics for each ward, given the total population of the three wards. The inclusion criteria require that the potential respondent should:

- be the head of household who is 18 years of age or older at the time of the survey,
- agree to voluntarily participate in the survey, and
- reside in one of the selected wards of uMhlathuze Local Municipality.

On the other hand, the exclusion criteria are:

- any minor who is younger than 18 years of age at the time of the survey,
- any respondent who feels uncomfortable participating in the study, and
- anyone who does not reside in the selected wards.

3.7 Sampling technique

Sampling is the process of choosing which group to use for data collection and analysis in the study (Struwig and Stead 2021). There are two classes of sampling, namely, probability and non-probability sampling. Probability sampling is a technique where an individual from a targeted population has an established probability of being selected for the sample; on the other hand, there is no probability that any unit in the population can be chosen in the context of non-probability (Saunders, Lewis and Thornhill 2019). Thus, non-probability sampling does not use a mathematically random process to choose its units from the population. The literature identifies five different types of non-probability sampling, namely, quota sampling, convenience sampling, purposive sampling, self-selection sampling and snowball sampling (Saunders and Townsend 2016). This study adopted the non-probability sampling technique to select respondents. More precisely, a convenient non-probability sampling technique was adopted because it is a quicker and cheaper approach to collecting data. Thus, questionnaires were distributed to conveniently sampled households within the selected wards of the municipality.

3.8 Data collection instrument

A self-designed questionnaire was used to collect cross-sectional data from households in the selected areas across the uMhlathuze Local Municipality. Questionnaires usually consist of a series of questions that are generally closed-ended (Saunders and Townsend 2016). Since the study adopted a quantitative research approach, a questionnaire was used as a data collection instrument. The questionnaire for this study was developed in the English language and translated to isiZulu for respondents who were not conversant in the English language.

The questionnaire designed for this study had two main sections: the first section collected biographical data, while the second section contained general questions on water service provision. Questions in the second section were closed-ended and predominantly on a 4-point Likert scale: “strongly agree, agree, disagree and strongly disagree”. Dichotomous questions were also included in the second section where the respondents were asked to choose between two options: yes or no. An open-ended question was included as the last question of the questionnaire. This question was meant to allow respondents to freely express their opinions on what the municipality should do to improve household satisfaction with water service delivery. It should be emphasised that the questionnaire was designed based on the objectives of the study, following a thorough review of the literature. Furthermore, the questionnaire was piloted on 10 respondents to improve the questions. The questionnaire took average of 10 minutes to answer. Copies of the English and isiZulu versions of the questionnaire are attached as Appendices 5 and 6, respectively.

3.9 Data collection process

Data collection is the process of gathering information with the aim of addressing stated study objectives (Alam 2021; Struwig and Stead 2021). Data collection only commenced upon receiving full ethics approval from the Faculty Research Ethics Committee (FREC) at the Durban University of Technology. All ethical standards were followed during the data collection. More precisely, a letter of information was provided

to each potential respondent prior to their participation in the survey. This letter introduced the study, providing all necessary information regarding respondents' rights, procedures and recourse. The letter of information was provided in both the English and isiZulu languages and each respondent chose the questionnaire prepared in the language of their choice. Both versions of the letter of information are attached as Appendices 1 and 2, respectively. All the respondents were advised that their participation was voluntary and that they could withdraw from the study at any time if they wished to do so. After they understood the information contained in the letter of information, respondents were asked to sign a written and dated letter of consent, indicating that they agreed to participate in the study at their own free will and without any form of coercion. A copy of the informed consent letter was provided in both the English and isiZulu languages and each respondent had to sign one in a language of their choice. Both versions of the consent letter are presented as Appendices 3 and 4, respectively. Data collection only commenced after the respondent had acknowledged the informed consent.

3.10 Data analysis

Data analysis entails interpreting collected data by applying scientific methods to identify trends, correlations, or patterns (Humble 2020). It helps with recommendations, debates, confirming prior research and leading to findings and conclusions. This study employed statistical techniques to establish the factors influencing the provision of water services at the uMhlathuze Local Municipality. More specifically, the factor analysis technique was adopted to establish the key determinants of water service provision at the selected municipality.

The literature identifies factor analysis as a technique that reduces a large number of variables into a smaller set of factors (Shrestha 2021; Taherdoost, Sahibuddin and Jalaliyoon 2022). The technique does this by extracting the maximum common variance from all variables and consolidates them into a common score, which can be used for further analysis. Thus, factor analysis is a useful tool for narrowing down the enormous number of connected variables to many factors prior to using them in other

analyses such as multiple regression or multivariate analysis of variance. While various types of factor analysis exist, principal component analysis (PCA) is commonly used in the literature (Hasan and Abdulazeez 2021; Kherif and Latypova 2020). Therefore, this study adopted the PCA as a tool to identify the key determinants of water service provision in uMhlathuze Local Municipality.

PCA is commonly thought of as a statistical technique for data reduction. The approach is used to reduce the number of variables in an analysis by describing a series of uncorrelated linear combinations of the variables that contain most of the variance. In addition to data reduction, the variances from a PCA are often inspected to learn more about the underlying structure of the data. The approach is used in the literature in studies from assorted domains and the most recent studies include the works of Aghimien et al. (2023), Hadji and Dib (2022), Moteki (2023), Patnaik, Yadav and Rajderkar (2022) and Zahedifar (2023). PCA is generally interpreted as a fixed-effects factor analysis with homoscedastic residuals, whose mathematical formulation is expressed as:

$$y_{ij} = \mathbf{a}'_i \mathbf{b}_j + e_{ij} \quad i = 1, \dots, n. \quad j = 1, \dots$$

where y_{ij} the elements of \mathbf{Y} , \mathbf{a}_i (scores) and \mathbf{b}_j (loadings) are f -vectors of parameters and e_{ij} are independent homoscedastic residuals. In the case of factor analysis, the scores \mathbf{a}_i are random rather than fixed and the residuals are allowed to be heteroskedastic in j . It then follows that (\mathbf{Y}) is a matrix rank of f , with f typically substantially less than n or p (Jackson 2003). In this manner, PCA is thought of as a regression model with a restricted number but unknown independent variables.

3.11 Validity and reliability

Validity is the extent to which the adopted data collection instrument measures what it is supposed to measure (Bryman and Bell 2014). For this study, validity is ensured by extensively consulting the literature to design a questionnaire that addresses the objectives of the study. Further, a pilot study was conducted on 10 respondents drawn

from the study site to ensure that the questionnaire is understandable and measures what it should be measuring. Respondents who participated in the pilot were excluded from the main study. Piloting a questionnaire for data collection assists in removing any detectable forms of ambiguity and biases (Koch and Brich 2020; Kock et al. 2021). Sufficient time is also given to both data collection and analysis as a measure to improve the robustness of the data and results.

On the other hand, reliability is the extent to which a research instrument indicates consistency. Thus, when another researcher uses the same research instrument, similar results should be attained. Generally, there are four types of reliability tests: namely, inter-rater, test-retest, parallel-forms and internal consistency tests. This study used the internal consistency reliability test. Furthermore, Cronbach's alpha was used to test reliability. Cronbach's alpha is a measure of internal consistency that shows how closely related a set of items are as a group. The test quantifies the level of agreement on a standardised scale that ranges from 0 to 1, where higher values indicate higher agreement between specified items. The decision rule is generally to accept 0.7 as a benchmark value for Cronbach's alpha. The Kaiser-Meyer-Olkin (KMO) sampling adequacy test is used to measure the suitability of the data for adopting PCA as an estimation tool. The test score of the KMO test ranges from 0 to 1, where 1 means extremely suitable and 0 means otherwise. The general rule for the test is to use PCA when a score of at least 0.5 is reported.

3.12 Confidentiality, anonymity and other ethical considerations

Confidentiality applies to the respondents' and the researcher's understanding when discussing human subjects' consent to the study (Research Integrity 2021). Adequate, data safeguards must be in place to protect the confidentiality of research data when using human respondents. Maintaining confidentiality necessitates protecting the data that the respondent has shared with others in a trustworthy relationship. Adherence to confidentiality involves refraining from sharing data with anyone else without the consent of the respondent unless it aligns with the initial disclosure. In this study, a

high degree of confidentiality was maintained by not disclosing respondents' identities during the reporting or publication of the findings of the study.

Anonymity of the respondents' data must be ensured in the study so that it is not identified. Collecting personally identifiable information about specific individuals or connecting respondent identities to individual responses must be avoided unless it is necessary for the study protocol. If any personally identifiable information is gathered, anonymity cannot be ensured. In this study, the data collected were handled anonymously. Respondents were not asked any questions that required identification. Ethical considerations in research are the set of guidelines that direct the methods and techniques. Voluntary contribution, informed consent, anonymity, confidentiality, the possibility of risks, results and communication are some of these guiding concepts that need to be outlined to respondents (Drolet et al. 2023).

The survey's results will only be used for research purposes and the data collected will be handled anonymously. There were no risks, current or anticipated to any research participant in this study. As part of their ethical commitment to consider the respondent's rights, the researcher accepted the duty to protect the respondents and their anonymity regarding their participation. The study maintained the ethical principle of self-determination and the respondents were treated as autonomous agents. All the respondents were informed of this principle before they participated in the survey. Respondents were also informed about the study, that their participation was voluntary and that they could choose to participate or withdraw from the survey at any time. Details of the researcher, the supervisor and contact details for the administrator of the ethics committee at the Durban University of Technology were provided to each respondent, who could use those details in the event of any complaint against the researcher. All ethical standards outlined by the ethics committee at the Durban University of Technology were strictly adhered to.

3.13 Conclusion

This chapter discussed the methodology used in the study. This chapter concisely outlined the research design, research philosophy, research approach and research methodology, including methods of data collection, sampling methods, research instruments and data analysis for the study. The study adopted a quantitative approach and data regarding the provision of water services at uMhlathuze local municipality were collected using questionnaires as a research instrument from households. Data collection processes, validity and reliability were discussed in this chapter. This chapter confirmed that the questionnaire was administered by the researcher. Furthermore, this chapter discussed respondents' confidentiality, anonymity and ethical issues up to the final stage of the study. The next chapter will present and discuss the results.

CHAPTER 4

RESULTS

4.1 Introduction

This study aimed to investigate the factors influencing the provision of water services at the uMhlathuze Local Municipality and this aim is further divided into three objectives. The first objective was to examine water service delivery at uMhlathuze Local Municipality. The second objective was to identify the challenges in water service delivery at the uMhlathuze Local Municipality. Lastly, the third objective was to identify strategies to improve water service delivery at uMhlathuze Local Municipality. A quantitative approach was used to accomplish these objectives. A survey was conducted to collect data from households. This chapter presents the study's findings. The chapter is organised into five sections.

4.2 Descriptive statistics

Descriptive statistics are concerned with condensing, arranging and presenting data understandably and efficiently. Tables and figures were used in descriptive statistics to present findings (Kelly 2023). There are two purposes for descriptive statistics. First, they provide fundamental details about the variables in a dataset and emphasise potential correlations between variables (Simplilearn 2023). Quantitative data were collected from 383 households sampled across the uMhlathuze Local Municipality between December 2023 and January 2024. Of the 383 responses, 157 were collected from Ward 2 in seven suburban areas, namely, Meerensee, Wildenweide, Veldenvlei, Richards Bay CBD, Alton and Small Craft Harbour. Furthermore, 88 responses were collected from townships of eSikhaleni and KwaMcwabe in Ward 21. Lastly, 138 responses were collected from rural areas in Ward 33, namely, Sabokwe,

Mancence and Mambuka. Therefore, the sample consisted of data collected from the municipality's different spatial areas. Descriptive statistics for the data are presented in Table 4.1.

Table 4.1: Descriptive statistics of respondents (n = 383)

		Frequency/ Statistic	Percentage
Gender	Male	139	36
	Female	243	63
	Other	1	1
Race	African	347	91
	White	14	4
	Indian	16	4
	Coloured	6	1
Education	Never attended school.	35	9
	Primary school	17	5
	High school	124	32
	Diploma	93	24
	Degree	69	18
	Postgraduate	45	12
Area type	Suburbs	110	29
	Township	204	53
	Rural	69	18
Tenure	Owner	199	52
	Tenant	147	38
	Other	37	10
Age (Years)	Mean	41	-
	Standard deviation	13	-
	Minimum	19	-
	Maximum	83	-
Household size (Number)	Mean	5	-
	Standard deviation	3	-
	Minimum	1	-
	Maximum	20	-

Most of the respondents were female (63%), which is consistent with the statistics in the 2016 Community Survey, where Statistics South Africa (Stats SA) reported that females were more than men at the uMhlathuze Local Municipality (Department of Statistics South Africa 2016). Most of the respondents were African (91%) and this

aligns with the municipality's population data, which reflects Africans as the majority of the population (City of uMhlathuze Local Municipality 2023b). In terms of the level of education, 86% of the respondents possessed at least a high school certificate, implying that most of the respondents were sufficiently educated to understand the questions. The sample had representations from each segment of the municipality's three main spatial distributions, which are townships, suburbs and rural areas. Responses from the townships constituted 53% of the data, while responses from the suburbs and rural areas were 29% and 18%, respectively. In terms of tenure, 52% of the respondents owned the property that they resided on. The average age of the respondents was 41, with the youngest respondent being 19 years old and the oldest being 83 years old. Thus, no minors below the age of 18 participated in the survey. The average household size was five, which is close to the average household size of the municipality of four, which was reported in the 2016 Community Survey by Statistics South Africa (2016). These descriptive statistics provide insights into the data.

4.3 Household opinions on public service delivery in South Africa

Respondents were asked to share their thoughts about basic public service delivery in South African municipalities. Ten (10) questions were asked using a 4-point Likert scale with the options "strongly agree, agree, disagree and strongly disagree". These questions were in line with the first objective of the study, which sought to examine the state of basic public service delivery in South Africa. This section presents results on respondents' opinions on the state of public service delivery in South Africa. The section is divided into three subsections. First, the section presents a reliability test of the questions. Second, the section presents the frequency distribution of responses. Finally, the section presents an analysis of the data using the principal component analysis (PCA).

4.3.1 Reliability test for the Likert scale questions on public service delivery

A reliability test was performed on the ten Likert scale public service delivery questions. The Cronbach's alpha (Cronbach 1951) test was used to evaluate the reliability of the summative questions. The Cronbach's alpha results for water shortage, budget allocation, excellent public delivery services, awareness of technology, awareness of water challenges and the effect of droughts were designated variables averaged to 0.719. Additionally, alpha results for climate changes, floods, water pollution and population growth designated variables alpha results were averaged to 0.6685. This test produces a scale that consists of an unweighted total. (Wenzelburger et al. 2022). The Cronbach's alpha test results for the ten public service delivery Likert scale questions are given in Table 4.2.

Table 4.2: Cronbach's alpha results for the public delivery questions

Item	Obs.	Sign	Item-test correlation	Item-rest correlation	Average interitem correlation	Alpha
Shortage	383	+	0.343	0.164	0.235	0.734
Budget	383	-	0.441	0.272	0.220	0.718
Excellent	383	-	0.478	0.314	0.215	0.711
AwareTech	383	-	0.524	0.368	0.208	0.702
AwareChallenges	382	-	0.438	0.268	0.221	0.718
Climate	383	+	0.681	0.559	0.184	0.671
Droughts	383	+	0.355	0.177	0.233	0.732
Floods	383	+	0.707	0.592	0.180	0.665
Pollution	383	+	0.688	0.569	0.183	0.669
Population	383	+	0.689	0.569	0.183	0.669
Test scale					0.206	0.722

Table 4.2 shows a test scale (overall Cronbach's alpha) of 0.722, which is greater than 0.5, indicating that the scale was moderate (acceptable). Table 4.2 also shows the Cronbach's alpha test results for each question. For each question, the least Cronbach's alpha produced was 0.665, with the highest being 0.734. Thus, all questions produced Cronbach's alpha results that indicate that the scale for all questions was moderately acceptable. This implies that the questions in the questionnaire on public service delivery were reliable.

4.3.2 Frequency distribution of responses on public service delivery

This subsection presents the frequency distribution of household responses to the ten public service delivery questions. A stacked bar graph was used to represent the frequency of responses where the frequency of each Likert scale option (i.e., strongly disagree, disagree, agree and strongly agree) for each question is presented in each bar. Figure 4.1 presents the frequencies (i.e., the percentage of each option for each question).

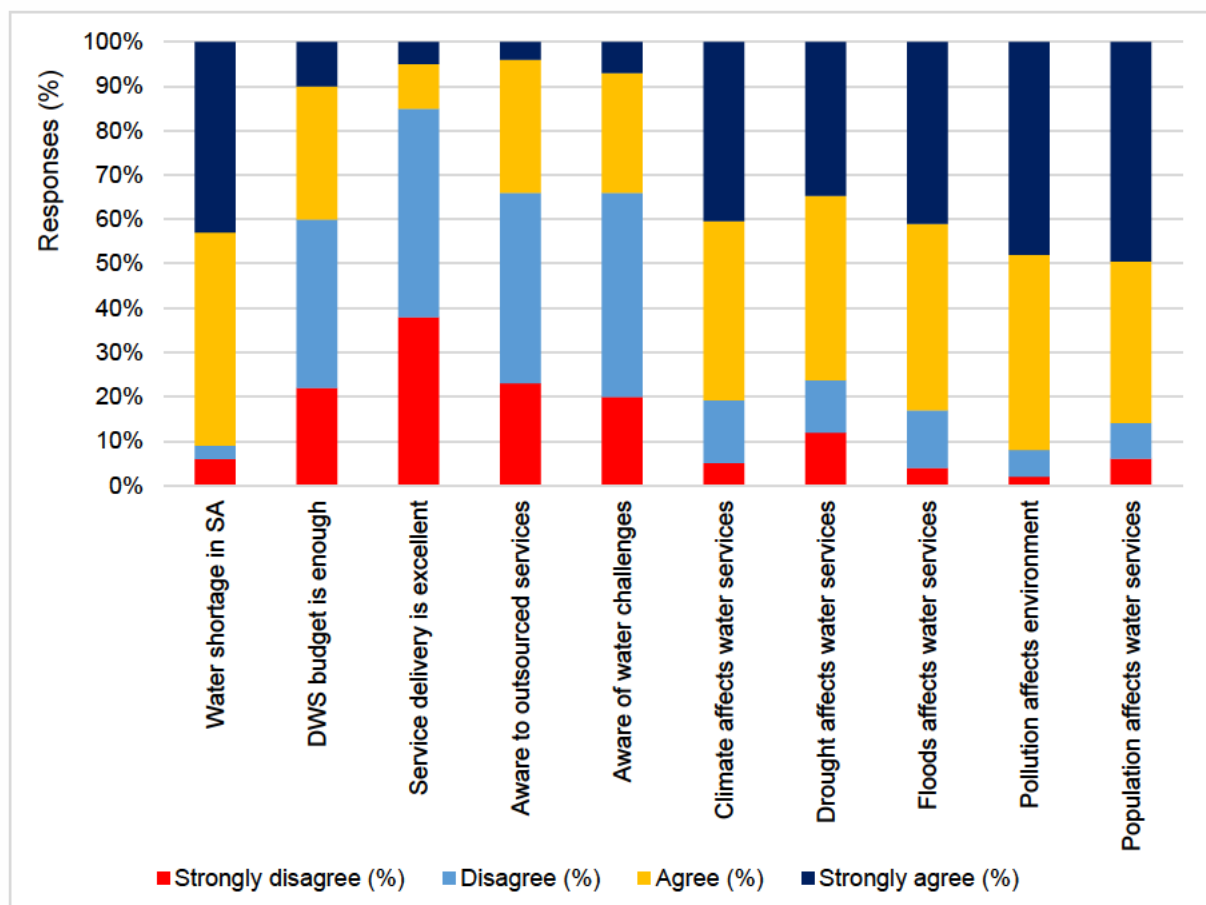


Figure 4. 1: Responses on public service delivery (n = 383)

Source: Author's own diagram

Figure 4.1 shows that 91% of the respondents understood that South Africa is naturally a water-scarce country and that the Department of Water and Sanitation is not allocating an adequate budget to attend to the water crisis. The consequence is public service delivery protests in the country. For example, the South Africa Incident

Registration Information System recorded a total of 909 service delivery protest actions that took place from 1 August 2020 to 31 January 2021 (Martin 2021). Around 60% of the respondents disagreed that citizens in the municipality receive excellent public service delivery. This is regardless of the reality that the local government sphere has the mandate to efficiently and effectively provide public services to communities (Masuku and Jili 2019). Majority of the respondents (85%) disagreed that citizens are receiving excellent public service delivery in the municipality, while 66% of them disagreed that citizens were aware of the role of the municipality's information technology in outsourcing public service delivery. Also, 66% of the respondents disagreed that citizens were aware of any challenges experienced by the municipality on water service delivery. Equally, most respondents agreed that climate change, environmental factors, floods and droughts affect water service delivery in the municipality. Also, water pollution and population growth were also identified among key determinants of water supply. These results are consistent with findings reported in other studies in the literature. Some of these studies include Khatibi and Arjjumend (2019), Orimoloye et al. (2021). Millington and Scheba (2021) which identify these challenges among the causes of water shortages in the cities.

4.3.3 Factor analysis of household opinions on public service delivery

This subsection tested the correlation of variables from the respondents' responses to their opinions about public service delivery. A statistical technique called factor analysis was used to express the variability between associated, observable variables in terms of a smaller number of possible unobserved variables known as factors (Taherdoost, Sahibuddin and Jalaliyoon 2022). This subsection discussed variable correlation matrices for the public service delivery variables, principal component analysis results for public service variables, principal component loadings for public service variables and the KMO measure of sampling adequacy for public service variables.

4.3.1.1 Variable correlation

This measures the link between two variables, indicating the strength and direction of the relationship between the two variables. Correlation coefficients range from 0 to 1, where the former indicates no relationship while the latter entails a stronger relationship between the variables (Saunders et al. 2019). Thus, the relationship between variables is deemed reasonably stronger if the correlation coefficient is 0.5 or higher; otherwise, it is considered weak. A negative correlation coefficient suggests an inverse relationship between the variables, while a positive correlation suggests a positive relationship between the variables. Thus, a principal component analysis can be performed given that some variables in the public service delivery set of questions have considerable correlation. Even if the variables are uncorrelated, PCA still identifies the most informative components and it still works effectively (Majumdar, Pal and Schehr 2020). A Pearson's correlation test was performed for the questions on public service delivery and the test results are presented in Table 4.3.

Table 4.3: Correlation matrices for the public service delivery variable (N=383)

	Shortage	Budget	Excellent	AwareTec	AwareCha	Climate	Droughts	Floods	Pollution	Population
Shortage	1.000									
Budget	0.066	1.000								
Excellent	-0.069	0.198	1.000							
AwareTec	0.001	0.261	0.492	1.000						
AwareCha	0.083	0.179	0.471	0.563	1.000					
Climate	0.175	-0.224	-0.115	-0.166	-0.103	1.000				
Droughts	0.203	-0.090	0.138	0.225	0.220	0.287	1.000			
Floods	0.203	-0.130	-0.071	-0.187	-0.133	0.575	0.339	1.000		
Pollution	0.181	-0.090	-0.160	-0.144	-0.092	0.473	0.320	0.617	1.000	
Population	0.141	-0.236	-0.103	-0.200	-0.100	0.525	0.242	0.535	0.594	1.000

Some of the variables reported correlation coefficients of 0.5 and above, indicating that some strong relationship exists among the variables (Hadd and Rodgers 2020; Wagavkar 2023). Thus, a principal component analysis can be performed given that some variables in the public service delivery set of questions have considerable correlation. Therefore, the next subsection presents a discussion of the results from the principal component analysis.

4.3.1.2 Principal component analysis results

Principal component analysis is a variable-reduction technique that accounts for most variances from the original variables (Ghojogh et al. 2023; Labrín and Urdinez 2020). Three components contributed 63% of the cumulative. Component 1, Component 2, and Component 3 have an eigenvalue of greater than 1. Results from an unrotated principal component analysis performed for the data on public service delivery opinions are presented in Table 4.4.

Table 4.4: Principal components for public services variables

	Eigenvalue	Difference	Proportion	Cumulative
Component 1	3.136	1.010	0.314	0.314
Component 2	2.125	1.102	0.213	0.526
Component 3	1.024	0.156	0.102	0.629
Component 4	0.867	0.216	0.087	0.715
Component 5	0.652	0.088	0.065	0.780
Component 6	0.564	0.062	0.056	0.837
Component 7	0.501	0.088	0.050	0.887
Component 8	0.413	0.003	0.041	0.928
Component 9	0.410	0.101	0.041	0.969
Component 10	0.309	0.000	0.031	1.000

Results in Table 4.4 show that three components have eigenvalues that are more than 1. The first component contributes about 31.4% of the variance in the data, while the second and third components, respectively, contribute 21.3% and 10.2% of the variance in the data. Thus, the three components contribute a cumulative variance of

about 63%, which is reasonably high. The second part of the principal component results presents the component loadings. This identifies the variables where each of the significant components load from. Results for the component loading for the public sector variables are presented in Table 4.5.

Table 4.5: Principal component loadings for public services variables

Variable	Component 1	Component 2	Component 3	Unexplained
Shortage			0.722	0.324
Budget			0.601	0.430
Excellent		0.448		0.386
Aware of outsourcing		0.495		0.294
Aware of challenges		0.507		0.342
Climate	0.425			0.391
Droughts		0.408		0.500
Floods	0.448			0.322
Pollution	0.436			0.353
Population	0.435			0.368

Table 4.5 shows that Component 1 loads from climate change, floods, pollution and population growth, which are linked to the environmental factors of public services. One of the most important environmental issues of the twenty-first century is climate change. The environmental phenomenon is transforming people, societies and humanity's understanding of climate change and other factors. The water sector is burdened by environmental factors that affect water quality, human health, the environment and water supply and distribution (Department of Water and Sanitation 2017). Policymakers from government agencies should evaluate their plans, policies, strategies, laws and regulations to consider environmental factors. Environment factors loading in Component 1 proved that it has an impact on public service delivery. Component 2 includes the factors that are linked to customer services and awareness. The way an organisation treats their consumers and keep them informed with the latest online systems and challenges faced by the state does have an impact on the provision of public service delivery. Component 2 loads from excellent public service, awareness technology, awareness challenges and droughts. Lastly, Component 3 loads from water shortage crisis and budget allocation by DWS. Variable loads from

the water shortage crisis and budget allocated are linked to each other; the more budget allocated, the lesser the water shortage crisis.

The commonly used test in the literature is the Kaiser-Meyer-Olkin (KMO) test, which is a statistical measure that determines whether the data are suitable for principal component analysis (Kaiser 1970). The KMO measure of sampling adequacy for public services variables had a minimum of 0.702 to a maximum of 0.847 which is the above the decision rule to accept a KMO value that is greater than 0.5. The KMO results for the public services questions are presented in Table 4.6.

Table 4.6: KMO measure of sampling adequacy for public services variables

Variable	KMO
Shortage	0.719
Budget	0.702
Excellent	0.721
Awareness of outsourcing technology	0.722
Awareness of water challenges	0.727
Climate	0.847
Droughts	0.777
Floods	0.794
Pollution	0.780
Population	0.818
Overall	0.775

Results in Table 4.6 shows an overall KMO value of 0.8, which implies that the questions and sample were strongly adequate for a principal component analysis. Furthermore, KMO values were also itemised for each question and results show KMO values greater than 0.5 for all questions. More precisely, the question with the least KMO had 0.702, while the highest KMO value for the questions was 0.847. This implies that sampling was adequate for all questions, suggesting that the principal component analysis results in this study are both robust and reliable.

4.4 Household opinions on water service delivery

Respondents were asked to share their opinions about water service delivery challenges in uMhlathuze Local Municipality. Respondents were asked fifteen (15) questions about challenges in water service delivery using a 2-point Likert scale with the options “yes and no”. These questions were in line with the second objective of this study, which sought to identify the challenges in water service delivery at uMhlathuze Local Municipality. This section presents the results of respondents’ opinions on water service delivery challenges at uMhlathuze Local Municipality. The section is divided into three subsections. The first subsection presents a reliability test of the questions. The second subsection presents the frequency distribution of responses. Finally, the third subsection presents an analysis of the data using the principal component analysis.

4.4.1 Reliability test for Likert scale questions on water service delivery

A reliability test was performed on the fifteen Likert scale water service delivery questions. Researchers frequently use Cronbach's alpha as evidence of the acceptability of tests and scales developed or used for research projects (Mohan, Sivakumar and Nalabothu 2021). Free basic water service, quality of water, effects of the load shedding, budget constraints, political interference, trained staff, staff capacity, emergency plan, water leak, delays in attending water leak, aging of the municipality infrastructure, illegal connections, non-payment of services, indigent customer and water consumer behaviour variables were averaged to 0.655. The Cronbach's alpha test results for the fifteen Likert scale questions on water service delivery challenges are given in Table 4.7.

Table 4.7: Cronbach's alpha results for water service delivery questions

Item	Obs.	Sign	Item-test correlation	Item-rest correlation	Average interitem correlation	Alpha
FBWS	383	-	0.229	0.069	0.125	0.666
Quality	383	+	0.191	0.031	0.127	0.671
Load shedding	383	+	0.437	0.293	0.111	0.635
Funding	383	+	0.441	0.299	0.110	0.634
Politics	383	+	0.331	0.178	0.118	0.651
Trained staff	383	-	0.347	0.194	0.117	0.649
Enough staff	383	-	0.408	0.263	0.113	0.640
Emergence plan	383	-	0.416	0.270	0.112	0.638
Leaks	383	-	0.425	0.280	0.111	0.637
Delays	383	+	0.456	0.315	0.110	0.632
Old infrastructure	383	+	0.474	0.335	0.108	0.629
Illegal connections	383	+	0.561	0.435	0.102	0.614
Non-payment	383	+	0.504	0.369	0.106	0.624
Indigent	383	+	0.543	0.414	0.103	0.617
Behaviour	383	+	0.445	0.302	0.110	0.634
Test scale					0.112	0.655

Table 4.7 shows a test scale (overall Cronbach's alpha) of 0.655, which is greater than 0.5, indicating that the scale was moderate (acceptable). Table 4.7 also shows the Cronbach's alpha test results for each question. The least Cronbach's alpha produced for each question was 0.614, with the highest being 0.671. Thus, all questions produced Cronbach's alpha results that indicate that the scale for all questions was moderately acceptable. This implies that the questions in the questionnaire on water service delivery were reliable.

4.4.2 Frequency distribution of responses on water service delivery

This subsection presents the frequency distribution of household responses to the fifteen water service delivery questions. A stacked bar graph is used to represent the frequency of responses, where the frequency of each Likert scale option (i.e., yes and

no) for each question is presented in each bar. Figure 4.2 presents the frequencies (i.e., the percentage of each option for each question).

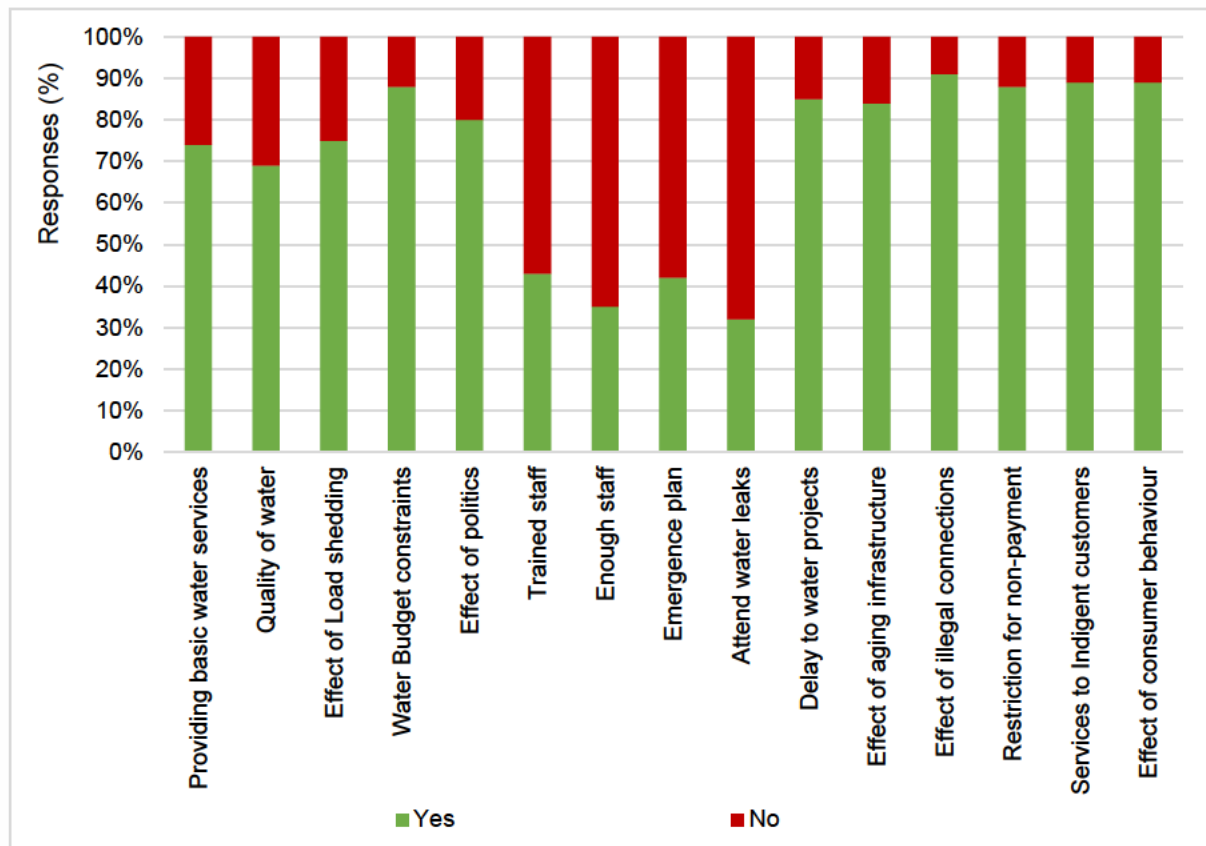


Figure 4.2: Response on water service delivery (n = 383)

Source: Author's own diagram

Figure 4.2 shows that most of the respondents confirmed that the uMhlathuze Local Municipality experiences water service delivery challenges. The study identified the challenges in water service delivery at uMhlathuze Local Municipality through the responses from the respondents. Many respondents confirmed that the municipality provides water that complies with the chemical, physical, and biological characteristics of water based on the standards of its usage, generally achieved through treatment of the water. Equally, 75% of the respondents confirmed that load shedding affects water supply to communities, while 88% of them suggested that budget constraints affect water supply in the municipality. Politics was also identified by many respondents as having an impact on water service delivery in the municipality. Furthermore, several respondents suggested that the municipality does not have an emergency plan to

attend to water emergency issues, water leaks are not urgently fixed. Most respondents confirmed that aging municipal infrastructure has an impact on service delivery and that illegal water connections result on a huge loss on the municipality. Equally, the non-payment for services was also reported to be a major challenge facing the municipality.

4.4.3 Factor analysis of household opinions on water service delivery

This subsection tested the correlation of variables from the respondent's responses to their opinions on water service delivery. The principal component analysis (PCA) is commonly used when correlation matrices on variables are equal to 1 (Hasan and Abdulazeez 2021; Kherif and Latypova 2020). This subsection discussed variable correlation matrices for the water service delivery variables (N = 383), principal components for water service variables, principal component loadings for water service variables and KMO measured sampling adequacy for water service variables.

4.4.3.1 Variable correlation

This measures the link between two variables, indicating the strength and direction of the relationship between them. A correlation test was run to test the correlation between the variables from 383 respondents' opinions on water service delivery. Table 4.8 shows the correlation matrices for the water service delivery variables (N = 383).

Table 4.8: Correlation matrices for the water service delivery variables (N=383)

	FBWS	Quality	Loadsh	Funds	Politics	Trained	Enough	Emerge	Leak	Delay	Oldinfra	IllegalCo	Nonpay	Indigen	Behavior
FBWS	1.000														
Quality	0.185	1.000													
Loadsh	0.078	0.079	1.000												
Funds	-0.021	0.009	0.212	1.000											
Politics	0.027	0.098	0.329	0.226	1.000										
Trained	0.248	0.127	-0.101	0.006	0.115	1.000									
Enough	0.153	0.047	-0.170	-0.095	0.042	0.314	1.000								
Emerge	0.272	0.068	-0.028	-0.002	-0.026	0.243	0.275	1.000							
Leaks	0.237	-0.001	-0.037	-0.050	0.001	0.177	0.238	0.464	1.000						
Delays	0.004	0.055	0.103	0.112	0.080	-0.138	-0.173	-0.073	-0.042	1.000					
Oldinfra	0.057	0.055	0.088	0.145	0.085	-0.130	-0.018	-0.184	-0.181	0.163	1.000				
IllegalCo	-0.067	-0.001	0.149	0.207	0.148	-0.043	-0.028	-0.159	-0.162	0.242	0.304	1.000			
Nonpay	0.028	0.038	0.187	0.291	0.102	0.045	-0.088	0.037	0.007	0.241	0.184	0.365	1.000		
Indigen	0.078	0.182	0.130	0.200	0.113	-0.013	-0.042	-0.038	-0.099	0.229	0.263	0.402	0.321	1.000	
Behavior	0.122	0.098	0.175	0.035	0.035	-0.038	-0.031	0.074	0.039	0.187	0.199	0.207	0.430	0.420	1.000

Correlation coefficients of the variables should be 0.5 and above to indicate that there is a relationship exists among those variables (Hadd and Rodgers 2020; Wagavkar 2023). Results in table 4.8 show that no correlation coefficients of 0.5 and above, despite the lack of correlation between the factors. PCA still identifies the most informative components and it still works effectively. Thus, a principal component analysis can be performed given that some variables in the water service delivery set of questions have considerable correlation. Therefore, the next subsection presents a discussion of the results from the principal component analysis.

4.4.3.2 Principal component analysis results

Principal component analysis is a method of reducing variables that explains the majority of deviations from the original variables (Hasan and Abdulazeez 2021; Kherif and Latypova 2020). The principal component analysis produced eigenvalues greater than one for five components. It also provided the proportion of variances range between 0.028 to 0.190 for each component as well as the cumulative variance from successive components. Results from an unrotated principal component analysis performed for the data on water service delivery opinions are presented in Table 4.9.

Table 4.9: Principal component analysis result

	Eigenvalue	Difference	Proportion	Cumulative
Component 1	2.841	0.713	0.190	0.189
Component 2	2.128	0.869	0.142	0.331
Component 3	1.258	0.092	0.084	0.415
Component 4	1.167	0.084	0.078	0.493
Component 5	1.083	0.201	0.072	0.565
Component 6	0.881	0.025	0.059	0.624
Component 7	0.856	0.084	0.057	0.681
Component 8	0.773	0.029	0.052	0.732
Component 9	0.744	0.105	0.050	0.782
Component 10	0.639	0.014	0.043	0.825
Component 11	0.625	0.053	0.042	0.866
Component 12	0.571	0.052	0.038	0.904
Component 13	0.519	0.028	0.035	0.939
Component 14	0.491	0.066	0.033	0.971
Component 15	0.425	0.000	0.028	1.000

Results in Table 4.9 show that five components have eigenvalues that are more than 1. The first component contributes about 19.0%, the second component contributes about 14.2%, the third component contributes about 8.4% of the variance in the data, while the fourth and fifth components, respectively, contribute 7.8% and 7.2% of the variance in the data. Thus, the five components contribute a cumulative variance of about 57%, which is reasonably high. The second part of the principal component results presents the component loadings. This identifies the variables where each of the significant components loads from. Results for the component loading for the water sector variables are presented in Table 4.10.

Table 4.10: Principal component loadings for water service delivery

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
Free basic water		0.409			-0.378	0.480
Quality				0.360	-0.597	0.342
Load shedding			0.535			0.354
Funding						0.534
Politics			0.633			0.313
Trained staff		0.391		0.335		0.444
Enough staff		0.345		0.369	0.343	0.370
Emergence		0.470				0.360
Water leak		0.414		-0.376		0.388
Delays in project						0.664
Old infrastructure		0.303		0.328		0.571
Illegal Conn		0.385			0.311	0.416
Non-payment		0.374				0.417
Indigent		0.389				0.456
Behaviour		0.335				0.435

The table shows that no variables are loading to Component 1. However, internal factors of customer services are loading to Component 2 by adopting sustainability and efficiency principles into practice to encourage water conservation, eliminate water losses, and improve water distribution and supply facilities. Factors such as free basic water services, trained staff, enough staff, emergency plans for the water crisis, water leaks, old infrastructure, illegal connections, non-payment of services, indigent customers and consumer behaviour are loading to Component 2. On the other hand, external factors are loading to Component 3 a wider understanding of how the municipality's water service delivery should be in line with larger objectives, which can be obtained by taking into account worldwide trends in water management, sustainable development goals and broader national policies. Load shedding and politics load to Component 3. It is crucial to understand that each aspect of providing water services in the uMhlathuze Local Municipality depends on the demand of the community, local regulations and available resources. Therefore, Component 4 loads from water quality, trained staff, enough staff, water leaks and old infrastructure. Component 5 loads from free basic water services, water quality, enough staff and

illegal connections are internal factors that have an impact on the provision of water services.

The KMO test measures the sampling adequacy for each variable in the model as well as the adequacy of the complete model. 0.716 was the KMO value measured the sampling adequacy for water service delivery. The higher the KMO value, the more suited the data are for principal component analysis. Generally, the decision rule is to accept a KMO value that is greater than 0.5. The KMO results for the water services questions are presented in Table 4.11.

Table 4.11: KMO measure of sampling adequacy for water service delivery

Variable	KMO
Free basic water services	0.672
Quality of water	0.642
Load shedding	0.652
Funding	0.802
Politics	0.589
Trained staff	0.643
Enough staff	0.671
Emergence plan	0.696
Water leaks	0.698
Delays in projects	0.817
Old infrastructure	0.770
Illegal connection	0.753
Non-payment	0.746
Indigent	0.763
Consumer behaviour	0.722
Overall	0.716

Results in Table 4.11 show an overall KMO value of 0.8, which implies that the questions and sample were strongly adequate for a principal component analysis. Further, KMO values were also itemised for each question and the results show KMO values greater than 0.5 for all questions. More precisely, the question with the least KMO had 0.642, while the highest KMO value for the questions was 0.817. This implies

that sampling was adequate for all questions, suggesting that the principal component analysis results in this study are both robust and reliable.

4.5 Household opinions on strategies to improve water service delivery

Respondents were asked ten (10) Likert scale questions for uMhlathuze Local Municipality to consider for improving water service delivery. These questions were in line with the third objective of this study, which was to investigate the factors that influence the effectiveness of water service delivery at the uMhlathuze Local Municipality. Ten (10) questions were asked using a 4-point Likert scale with the options “strongly agree, agree, disagree and strongly disagree”. This section presents the results of the respondents’ opinions on strategies to improve water service delivery at uMhlathuze Local Municipality and is divided into three subsections. First, the section presents a reliability test of the questions. Second, the section presents the frequency distribution of responses. Finally, the third section presents an analysis of the data using principal component analysis.

4.5.1 Reliability test for questions on improving water service delivery

A reliability test was performed on the ten-point Likert scale on strategies to improve water service delivery questions (Silveira *et al.* 2021; dos Santos Barros *et al.* 2022). Alpha results averaged to 0.821 for variables of implementation of prepaid water meters, consumer education campaigns, expand, repair and maintain water services infrastructure implementation credit control actions, increase budget, leak response, address water theft and clean sources. The Cronbach's alpha (Cronbach 1951) test was used to evaluate the reliability of the summative questions (Park 2021). The Cronbach's alpha test results for the ten strategies to improve water service delivery Likert scale questions are given in Table 4.12.

Table 4.12: Cronbach's alpha results for improving water service delivery

Item	Obs.	Sign	Item-test correlation	Item-rest correlation	Average interitem correlation	Alpha
Prepaid	383	-	0.068	-0.094	0.408	0.861
Campaigns	383	+	0.242	0.082	0.379	0.846
Expand infrastructure	383	+	0.714	0.619	0.298	0.792
Repair infrastructure	383	+	0.795	0.723	0.283	0.781
Maintain infrastructure	383	+	0.802	0.732	0.282	0.780
Credit control actions	383	+	0.331	0.177	0.363	0.837
Increase budget	383	+	0.812	0.744	0.281	0.778
Leak response	383	+	0.838	0.779	0.276	0.774
Address water theft	383	+	0.837	0.778	0.276	0.775
Clean sources	383	+	0.745	0.658	0.292	0.788
Test scale					0.314	0.821

The table shows a test scale (overall Cronbach's alpha) of 0.821, which is greater than 0.5, indicating that the scale was moderate (acceptable). Table 4.12 also shows the Cronbach's alpha test results for each question. The least Cronbach's alpha produced for each question was 0.774, with the highest being 0.861 (Cuadros *et al.* 2021; Linzer 2022). Thus, all questions produced Cronbach's alpha results that indicate that the scale for all questions was moderately acceptable (Amirrudin, Nasution and Supahar 2021). This implies that the questionnaire's questions on public service delivery were reliable.

4.5.2 Frequency distribution of responses on improving water service delivery

This subsection presents the frequency distribution of household responses to the ten strategies to improve water service delivery questions. A stacked bar graph is used to represent the frequency of responses, where the frequency of each Likert scale option (i.e., strongly disagree, disagree, agree and strongly agree) for each question is presented in each bar. Figure 4.3 presents the frequencies (i.e., the percentage of each option for each question).

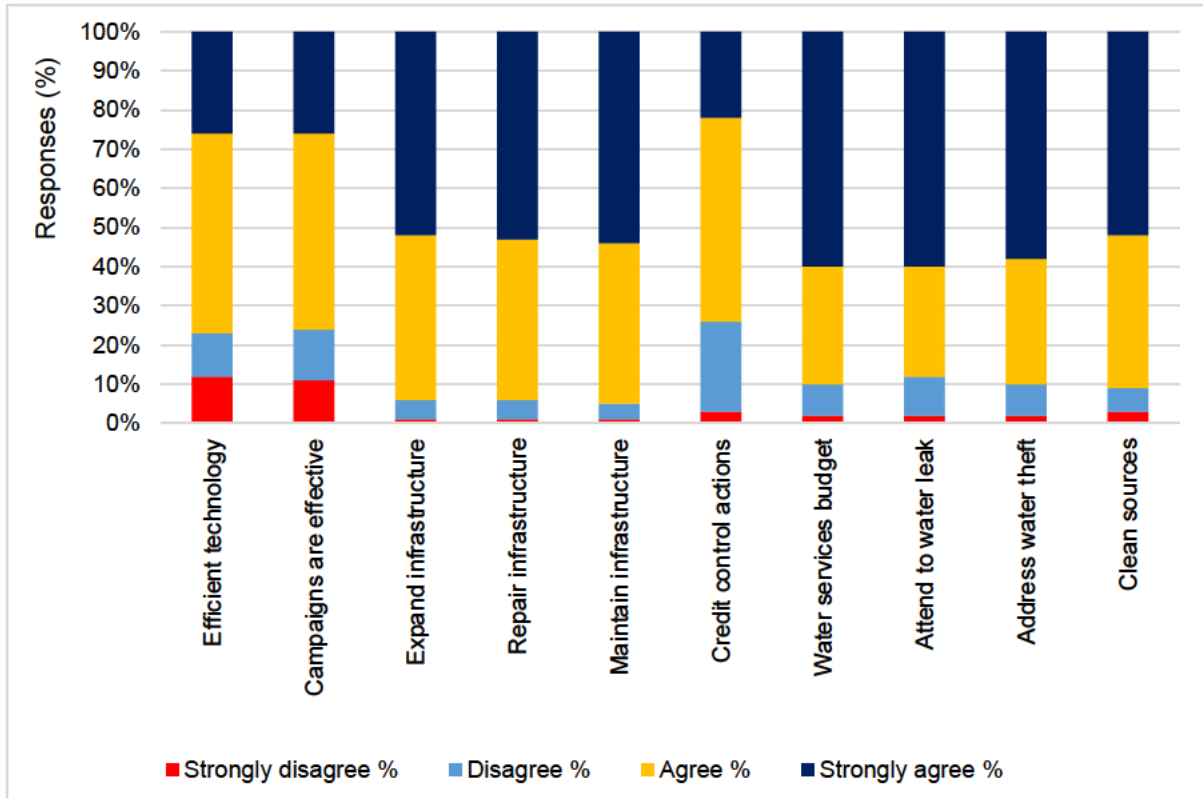


Figure 4.3: Responses on strategies to improve water service delivery (N=383)

Source: Author's own diagram

Figure 4.3 shows that many the respondents confirmed that installing prepaid water meters would improve water service delivery and that the municipality should conduct consumer education campaigns to educate citizens about going green and saving water. A very large number of respondents suggested the municipality should expand, repair and maintain infrastructure for water services, which would lead to providing an uninterrupted supply and distribution of water services. The literature suggests that this would minimise community protests (Millington and Scheba 2021; Ngcobo, Murwirapachena and Reddy 2023). Equally, most respondents suggested that the municipality should implement credit control for non-paying customers so that the municipality can generate more revenue, prevent consumers from being referred to debt collection and improve the municipality's debt collection ratio. Recommendations along this line are also made in other studies in the literature, including in the work of Murwirapachena, Kabange and Ifecho (2023) and that of Worku (2018). It further emerged from the results that the municipality should allocate enough budget for water services so that citizens can have running water and avoid delays in attending to water

service challenges. Equally, respondents also suggested that the municipality should attend to water leaks urgently to reduce water loss and wastage as well as address illegal water connections. The problem of illegal water collection across municipalities is flagged in the academic literature (Marques, Giacomello and Llamas 2018).

4.5.3 Factor analysis of opinions on improving water service delivery

This subsection tested the correlation of variables from the respondents' responses to the strategies to improve water service delivery. A statistical technique called factor analysis was used to express the variability between associated, observable variables in terms of a smaller number of possible unobserved variables known as factors (Taherdoost, Sahibuddin and Jalaliyoon 2022). This subsection discussed variable correlation matrices for improving water service delivery variables, principal components for strategies to improve water service variables, principal component loadings for strategies to improve water service variables and KMO measured sampling adequacy for strategies to improve water service variables.

4.5.3.1 Variable correlation

This measures the link between two variables, indicating the strength and direction of the relationship between the two variables. Correlation coefficients range from zero to one, where the former indicates no relationship while the latter entails a stronger relationship between the variables (Saunders et al. 2019). Thus, the relationship between variables was deemed reasonably stronger if the correlation coefficient was 0.5 or higher; otherwise, it was considered weak. A negative correlation coefficient suggests an inverse relationship between the variables, while a positive correlation suggests a positive relationship between the variables. A Pearson's correlation test was performed for the questions on the strategies to improve water service delivery and the test results are presented in Table 4.13.

Table 4.13: Correlation matrices for strategies to improve water service delivery variables (n = 383)

	Prepaid	Campaigns	Expand infrastructure	Repair infrastructure	Maintain infrastructure	Credit control	Increase budget	Leak response	Water theft	Clean sources
Prepaid	1.000									
Campaigns	0.526	1.000								
Expand infrastructure	0.008	0.146	1.000							
Repair infrastructure	0.033	0.155	0.753	1.000						
Maintain infrastructure	-0.012	0.060	0.687	0.772	1.000					
Credit control	0.314	0.430	0.071	0.114	0.151	1.000				
Increase budget	-0.017	0.069	0.484	0.567	0.570	0.140	1.000			
Leak response	-0.112	0.071	0.439	0.555	0.623	0.133	0.758	1.000		
Water theft	-0.112	0.065	0.466	0.569	0.572	0.132	0.774	0.817	1.000	
Clean sources	-0.045	0.024	0.376	0.466	0.517	0.191	0.642	0.674	0.671	1.000

The correlation test results are demonstrated in Table 4.13. Ten Likert scale questions on strategies to improve water service delivery were asked to the respondents, and the correlation matrices showed the results of the correlation on variables before proceeding with a PCA. When the correlation reflected 1, it was completely positive. (Hadd and Rodgers 2020; Wagavkar 2023). Since some of the variables reported correlation coefficients of 0.5 and above, indicating that some relationship exists among the variables. Thus, a principal component analysis can be performed given that some variables in the strategies to improve water service delivery set of questions have considerable correlation. Therefore, the next subsection presents a discussion of the results from the principal component analysis.

4.5.3.2 Principal component analysis results

The majority of deviations from the original variables can be explained by the variable-reduction technique principal component analysis (Majumdar, Pal and Schehr 2020). Principal components for strategies to improve water service variables have three components with eigenvalues that are more than 1 total to 76%. Results from an unrotated principal component analysis performed for the data on the strategies to improve water service delivery opinions are presented in Table 4.14.

Table 4.14: Principal components for strategies to improve water service variables

	Eigenvalue	Difference	Proportion	Cumulative
Component 1	4.711	2.868	0.471	0.471
Component 2	1.843	0.802	0.184	0.655
Component 3	1.042	0.390	0.104	0.760
Component 4	0.652	0.159	0.065	0.825
Component 5	0.492	0.130	0.049	0.874
Component 6	0.363	0.055	0.036	0.910
Component 7	0.308	0.090	0.031	0.941
Component 8	0.218	0.005	0.022	0.963
Component 9	0.213	0.053	0.021	0.984
Component 10	0.160	0.000	0.016	1.000

Results in Table 4.14 show that three components have eigenvalues that are more than 1. The first component contributes about 47.1% of the variance in the data, while the second and third components, respectively, contribute 18.4% and 10.4% of the variance in the data. Thus, the three components contribute a cumulative variance of about 76%, which is reasonably high. The second part of the principal component results presents the component loadings. This identifies the variables where each of the significant components is loading. Results for the component loading for the public sector variables are presented in Table 4.15.

Table 4.15: Principal component loadings for improving water service delivery

Variable	Comp1	Comp2	Comp3	Unexplained
Prepaid		0.596		0.340
Campaigns		0.615		0.281
Expand infrastructure	0.334		-0.544	0.165
Repair infrastructure	0.376		-0.423	0.144
Maintain infrastructure	0.381		-0.313	0.213
Credit control actions		0.492	0.314	0.402
Increase budget	0.389			0.231
Leak response	0.395			0.170
Address water theft	0.395			0.171
Clean sources	0.351			0.288

Table 4.15 identifies variables loading to component 1, 2 and 3 to improve water service delivery. Variables are loading to Component 1 to ensure the allocation of funds for infrastructure repairs and improvements. Variables such as expand, repair and maintain infrastructure, credit control actions, increase budget, leak response, address water theft and clean sources are loading to Component 1. The municipality should consider strategies such as investing funds in infrastructure improvements, implementing effective water management techniques and conducting public awareness campaigns to encourage water conservation. These strategies can be fulfilled in Component 2, where factors such as prepaid water meters, awareness campaigns and credit control actions are loading to Component 2. Repairing, developing and maintaining water supply infrastructure, such as reservoirs, pipelines,

pumping stations and treatment facilities, is essential in order to avoid leaks, burst pipes and other challenges that could interrupt the water supply. This can be achieved through expand, repair, maintain infrastructure and credit control actions variables, which are loading to Component 3.

0.847 was an averaged KMO value that measured the sampling adequacy for strategies to improve water service delivery. A KMO value more than 0.5 is typically accepted as the decision rule. The more suitable the data are for principal component analysis, the higher the KMO score. The KMO results for improving water service delivery questions are presented in Table 4.16.

Table 4.16: KMO measure of sampling adequacy for improving water service delivery

Variable	KMO
Prepaid	0.585
Campaigns	0.558
Expand infrastructure	0.853
Repair infrastructure	0.852
Maintain infrastructure	0.861
Credit control actions	0.700
Increase budget	0.911
Leak response	0.860
Address water theft	0.874
Clean sources	0.936
Overall	0.847

Results in Table 4.16 show an overall KMO value of 0.8, which implies that, the questions and sample were strongly adequate for a principal component analysis. Further, KMO values were also itemised for each question and results show KMO values greater than 0.5 for all questions. More precisely, the question with the least KMO had 0.558, while the highest KMO value for the questions was 0.936. This implies that sampling was adequate for all questions, suggesting that the principal component analysis results in this study are both robust and reliable.

4.6 Conclusion

This chapter presented the empirical results of the study based on the data collected from 383 household heads sampled across the uMhlathuze Local Municipality. Descriptive statistics, frequency distributions and the principal component analysis technique were used to analyse the data. Key findings were reported in the chapter. The next chapter concludes the study findings and provides possible recommendations for improving water services delivery at uMhlathuze Local Municipality.

CHAPTER 5

CONCLUSION

5.1 Introduction

This chapter concludes the study. It provides a summary of the study, makes recommendations based on the study's findings and provides limitations of the study and areas for future research. Thus, the chapter is organised into four sections after this introduction. The first section provides a summary of the study. Secondly, recommendations based on the key findings are presented. The third section discusses areas for future research. The final section delimits the study.

5.2 Summary of the study

This study aimed to establish the factors influencing water service provision in the uMhlathuze Local Municipality, KwaZulu-Natal. Three objectives were clearly established to achieve this aim. The first objective sought to provide an overview of public service delivery in uMhlathuze Local Municipality. The second objective was to identify the key challenges in water service delivery at the municipality, while the third objective sought to identify strategies to improve water service delivery at uMhlathuze Local Municipality. Those factors have positively impacted the effectiveness of water service delivery at the municipality. To improve water service delivery municipality should also adopt effective water management techniques and invest in infrastructure improvements. A quantitative research approach was adopted and a questionnaire was used to collect cross-sectional data from 383 household heads randomly selected across the different spatial segments of the municipality (i.e., townships, suburbs and rural areas). The principal component analysis (PCA) was applied as a tool to establish

factors that influence water service delivery at the municipality. Three key findings were reported in the study.

First, the study found that respondents were cognisant of the reality that South Africa is a water-scarce country. They generally expressed the opinion that the budget allocated by the national Department of Water and Sanitation (DWS) towards addressing water supply challenges in municipalities is not sufficient. In addition, respondents expressed the view that climate change, droughts, floods, water pollution and population growth are among the key drivers of water supply challenges in South Africa. Second, the key drivers of water service delivery challenges at the uMhlatuze Local Municipality were identified. These drivers were population growth, unsustainable water management, poor governance and deteriorating infrastructure. Third, factors that influence the effectiveness of water service delivery at the municipality were established. These include the municipality introducing prepaid water meters, conducting consumer education campaigns to educate citizens about water conservation and the constant repair and maintenance of water supply infrastructure. Equally, the implementation of credit control for non-paying customers, the allocation of sufficient budget towards water service provision and urgency in attending to water leaks were also deemed necessary for effective water service provision in the municipality. Furthermore, the need to decisively address illegal water connections within the municipality also emerged as a key determinant of effective water service delivery.

5.3 Recommendations

The study proposes four key recommendations based on the results reported. These recommendations may improve the municipality's capacity to provide clean, reliable and affordable water services to residents. First, the study recommends the municipality install prepaid water meters in a bid to improve water service delivery. Prepaid water meters entail that residents receive reliable billing for water usage, which will reduce non-payment for water bills, which may be caused by disputed water bills. Moreover, the introduction of prepaid water meters means residents will buy

water services and adopt water conservation practices as a measure to minimise their monthly water bills. In doing this, scarce water resources are conserved, municipal revenue is improved, and the municipality will no longer incur meter-reading costs. Nevertheless, it should be emphasised that the implementation of water meters should be carefully planned, with indigent households clearly identified to avoid exclusion from access to water services based on economic status, which will be a violation of citizens' constitutional rights.

Second, the study recommends that the uMhlathuze Local Municipality conduct intensive consumer education campaigns to educate citizens about water conservation. Engaging in public awareness campaigns, interacting with the communities to resolve issues, educating residents on water-saving techniques and the value of responsible water consumption can promote effective water service delivery. This has also been advocated in studies conducted in other South African cities (Murwirapachena 2021; Ngcobo, Murwirapachena and Reddy 2023; Thiam, Dinar and Ntuli 2021). Involving communities in water management activities helps improve collaboration and compliance, which is usually rare across South African municipalities.

Third, the study recommends constant maintenance and replacement of water supply infrastructure. Currently, the aging water supply infrastructure is constantly characterised by water leaks that often lead to frequent water supply disruptions. The municipal budget for water infrastructure improvement, expansion and maintenance should be increased. The uMhlathuze Local Municipality budgeted 25% of the total municipal budget for water management capital expenditure and 23% of the total municipal budget for operational costs related to water management (City of uMhlathuze 2023c). A comparison of the capital budget for water management was conducted with eThekweni Municipality and Jozini Local Municipality for 23% and 17%, respectively (eThekweni Municipality 2023; Jozini Local Municipality 2023). The uMhlathuze Local Municipality has a higher percentage of a capital budget for water management, but it still experiences challenges in providing water services.

Fourth, the study recommends the implementation of proper and effective credit control procedures and clearly outlines consequences for non-paying customers because the municipality's financial stability and sustainability are hugely challenged by non-payment. Some studies in the literature identify the non-payment for municipal services in South Africa as a culture that emanated from the apartheid era, where civil disobedience resulted in boycotting the payment of rates (Murwirapachena, Kabange and Ifeacho 2023; Worku 2018). Earlier studies, including the work of Fjeldstad (2004), reiterated that the non-payment for municipal services is due to a lack of trust. Three dimensions of trust that affect compliance are trust in the municipality to use the revenue for service delivery, trust in the municipality to adopt fair revenue collection practices for all residents and trust in other residents to also pay their bills (Fjeldstad 2004). Residents will generally not comply with the payment of water bills if they lack trust in these three dimensions. Thus, the municipality should work on improving all trust dimensions to promote financial stability and sustainability through revenue collection.

5.4 Areas of future research

It would be beneficial to investigate the factors affecting water service delivery in other South African municipalities. This is because South African municipalities are diverse, with different municipalities having different operating environments and internal policies. More importantly, South Africa categorises municipalities into three broad categories (i.e., metropolitan, district and local); hence, each category may experience different water supply challenges and drivers as socio-economic dynamics in these municipal categories differ. More research is required for other municipal categories to establish a more macro perspective on water supply challenges in South Africa. Further, this study collected data from household heads and recommends future studies consider collecting data from residents in general, irrespective of whether they are household heads or not. This can assist in formulating an effective water policy, which may result in findings that are more comprehensive.

5.5 Delimitation of the study

This study was conducted in the uMhlathuze Local Municipality, KwaZulu-Natal. While the findings from this study may be applicable to other municipalities, this should be done with caution because different municipalities have different operating environments. As such, the findings in this study are more relevant to the uMhlathuze Local Municipality and should be applied with caution even to other local municipalities.

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List of appendices

Appendix 1: Letter of information (English language version)



LETTER OF INFORMATION

Title of the Research Study: Factors influencing the provision of water service delivery at uMhlathuze Local Municipality.

Principal Investigator/s/researcher: Sibongekile Princess Madlopha, Post Graduate Diploma in Management Sciences - Business Administration

Co-Investigator/s/supervisor/s: Dr Genius Murwirapachena, PhD in Economics

Brief Introduction and Purpose of the Study:

Greetings, thank you for showing interest in this study. I am a student registered for the Master of Management Sciences in Business Administration at the Durban University of Technology. I would like to invite you to participate in this study. The aim of this study is to investigate factors influencing the provision of water services at the uMhlathuze Local Municipality. This is important given existing evidence on the challenges commonly reported by residents across the country. Therefore, I would like to invite you to participate in the study by responding to the questionnaire attached.

Your participation in the study is voluntary and under no circumstances should you feel uncomfortable. I would like to emphasise that you can withdraw from the study at any time should you feel uncomfortable to continue participating. As part of the procedure, I will give you a questionnaire that you would go through and complete as

honestly and freely as possible. If you need us to go through the questions together, I will gladly go through the questions with you.

Participating in this study should not result in you experiencing any discomfort or significant risk. I will not perform any painful procedure on you or on anyone from your household. Therefore, there will be no discomfort or risk to you as a participant. Furthermore, there will be no negative consequences if you choose not to participate or withdraw participation in the survey. There will also be no expected injuries from participating in this study.

As mentioned earlier, you can choose to withdraw or stop participating in the study at any time without having to provide reason. There will be no negative consequence if you decide to withdraw your participation. Kindly also note that we will withdraw you from the study if you do not follow the instructions given or decided not to honour your commitment.

Kindly also note that you will not be compensated for your participation in the survey. Your participation is voluntary and will inform policy making and the academic literature. Further, it is important to also indicate that you will not incur any expenses by participating in this study.

The information collected in this study will be managed and stored in a manner that ensures that your confidentiality and anonymity is always maintained. Kindly avoid recording your personal and any other identifying information. The results of this study will be published after the data has been thoroughly analysed. If any findings emerge during the research, we will make all respondents aware of such.

Please note that the data collected in this study will be stored in a manner that ensures that your confidentiality and anonymity is maintained. All completed questionnaires will be stored in my supervisor's office in a locked cupboard for a period of up to 5 years. Only the researcher and her supervisor will have access to the completed questionnaires.

Persons to contact in the Event of Any Problems or Queries:

In the event of any problem or query, please contact me on 078 241 2545 or madlopha17@gmail.com. You can also contact my supervisor Dr Genius Murwirapachena on 031 373 5193 or geniusm@dut.ac.za. Alternatively, you can call the DUT-Institutional Research Ethics Administrator on 031 373 2375 or report complaints to the Acting Director: Research and Postgraduate Support on researchdirector@dut.ac.za.

Appendix 2: Letter of information (IsiZulu version)



INCWADI YOLWAZI

Isihloko socwango: Izingqinamba zokuhanjiswa kwamazi emphakathini abhekene nazo uMasiphala waseMhlathuze.

Umcwangingi: Sibongekile Princess Madlopha, oneziqu zePost Graduate Diploma in Management Sciences - Business Administration

Umpathi: Dkt Genius Murwirapachena, oneziqu zePhD in Economics

Isingeniso esibanzi nenjongo yocwango:

Ngokuzithoba, ngiyabingelela, ngiyabonga ukukhombisa uthando lokufisa ukuba yingxenye yalolucwango. NginguMfundisi ofundela iziqu eziphezulu zeBusiness Administration eNyuvesi yaseThekwini yezobucwepheshe (Durban University of Technology). Ngingathanda ukunimema ukuba nihlanganyele ecwangingweni engilwenzayo ezindaweni zaseRichards Bay. Injongo yalolucwango ukuthola izindlela uMasiphala angazisebenzisa etheni angweme izingqinamba zokuhanjiswa kwamazi emphakathini abhekene nazo uMasiphala waseMhlathuze. Lokhu kubalulekile ngenxa yobufakazi bezinkinga zokuphakelwa kwamanzi ekunezikhazazo ezibikiweyo izwe lonke. Ngakho ke, ngicela ukukumema ukuthi ubambe iqhaza kulolucwango ngokuthi uphendule uhlu kwemibuzo enekiziwe lana.

Ukuba yingxenye yalolucwango kuya ngokuzithandela kwakho, awuphoqiwe futhi akukho ndawo lana ekumele uzizwe ungakhululekile. Ngithanda ukugcizelela ukuth ungahoxisa ukuba yingxenye yalolucwango noma inini uma uzizwa ungakhululekile ukuth uqhubeke ube yingxenye. Njengohlelo, ngizokunika uhlu lwemibuzo ozoyifunda

bese uyayiphendula ngokweqiniso. Uma udinga ukucaciseleka ngemibuzo, ngikhona ukukusiza ukuth ucaciseleke siyifunde imibuzo ndawonye.

Ukubamba iqhaza nokubayingxenyane yalolucwaningo akumele kukwenze uzizwe ungakhululekile noma impilo yakho ibesencupheni. Ayikho imibuzo engozoyibuza kuwe nomndeni wakho ezonizwisa ubuhlungu. Ngakho ke, akukho ubungozi kuwe oyingxenyane yalolucwaningo. Ngaphezu kwalokho, akukho okuwumthelela omubi uma ukhetha ukungabi yingxenyane yalolucwaningo. Futhi akukho ukulimala okulindelekile uma uyingxenyane yalolucwaningo.

Njengoba besengishilo ngaphambilini, uvumelekile ukuhoxa kulolucwaningo noma inini ngaphandle kokusho isizathu. Akukho okuwumthelela omubi uma ukhetha ukuhoxa kulolucwaningo. Ngokuzithoba, yazi ukuth uzohoxiswa kulolucwaningo uma ungasifezi isthembiso sokuzinikela kulolucwaningo.

Ngicela wazi ukuthi bonke abayingxenyane angeke bathole umhlomelo noma yiziphi izinzuzo zemali ngokuhlanganyela kulolucwaningo. Ukuba yingxenyane yalolucwaningo kungokuzikhethela wena futhi kuzosiza abaphezulu ngenqubomgomo noma ngezinqumo kanye nangokwe mfundo. Ngaphezu kwalokho, kubalulekile ukucacisa ukuthi angeke kubekhona izindleko zakho zokuba yingxenyane yalolucwaningo.

Imininingwane ezotholwa ngalolucwaningo izogcinwa iyimfihlo nokuqikelela ingaziwa. Uyacelwa ungalolulwazi lwakho nelo ye umuntu.

Imiphumela yalolucwaningo iyokhishwa mhla sekuqediwe ukuhlahlela ngokwanele. Uma kukhona imiphumela ekhishwa phakathi nocwaningo, bayokwaziswa bonke ababeyingxenyane.

Sicela wazi ukuthi imininingwane ezotholwa kulolucwaningo izogcinwa iyimfihlo futhi ingaziwa. Yonke inqubomibuzo ephenduliwe izogcinwa iphephile nguMeluleki wami eHhovisi ekhabethe lakhe elikhiywayo iminyaka emihlanu. Yimi naye kuphela esizokwazi ukufinyelela kwinqubomibuzo egcwalisiwe ngokuphelele.

Abantu ongaxhumana nabo esimeni sanoma iziphi izinkinga noma imibuzo:

Kunoma iziphi izinkinga noma imibuzo, ngicela uthinte mina ku 078 241 545 noma madlopha17@gmail.com. Ungamuthinta nomeluleki wami uDkt Genius Murwirapachena ku 031 373 5193 noma geniusm@dut.ac.za. Okanye, ungafonela eDUT-Institutional Research Ethics Administrator ku 031 373 2375 noma ubike izikhalazo ku Acting Director: Research and Postgraduate Support researchdirector@dut.ac.za.

Appendix 3: Consent letter (English language version)



CONSENT

Full Title of the Study: Factors influencing the provision of water service delivery at uMhlathuze Local Municipality.

Names of Researcher: **Sibongekile Princess Madlopha**

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, **Sibongekile Princess Madlopha**, about the nature, conduct, benefits and risks of this study – Research Ethics Clearance Number: **IREC 225/23**.
- I have also received, read and understood the above written information regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	Date	Time	Signature/Right Thumbprint

I, _____ herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full Name of Researcher	Date	Signature

Appendix 4: Consent letter (IsiZulu version)



IMVUME

Isihloko esiphelele socwango: Izingqinamba zokuhanjiswa kwamazi emphakathini abhekene nazo uMasiphala waseMhlathuze.

Ama/i/gama lomcwani noma abacwani: Sibongekile Princess Madlopha

Isitatimende sesivumelwano sokubamba iqhaza ocwani:

- Nginyaqinisekisa ukuthi ngazisiwe ngumcwani, **Sibongekile Princess Madlopha**, mayelana nesimo, ukuziphatha, izinzuzo kanye nobungozi balolu cwani – Inombolo yemigomo elawula ukwenziwa kocwani ngu: **IREC 225/23**.
- Ngiphinde ngathola, ngafunda futhi ngayiqondisa yonke imininingwane ebhaliwe mayelana nocwani.
- Ngiyazi futhi ukuthi imiphumela yocwani ebandakanya imininingwane yami yobulili, iminyaka, usuku lokuzalwa, izinhlamvu zokuqala zamagama ami kanye nesifo esingiphethe kuzoba yimfihlo emiphumeleni yocwani.
- Ngokwezidingo zocwani, ngiyavuma ukuthi imininingwane eqoqiwe kulolucwani ingasetshenziswa ngokusebenzisa ubuchwepheshe bekhompuyutha.
- Ngingahoxa noma inini ngaphandle kokuphoqwa ekubambeni iqhaza.
- Ngibe nethuba elanele lokubuza ngaze ngazizwa ukuthi sengikulungele ukubamba iqhaza ocwani.
- Nginyaqonda ukuthi okusha okuzotholakala kulolucwani okungahlobana nokubamba iqhaza kwami kuzokwenziwa ukuthi nami ngikuthole.

**Amagama aphelele
Alobo
obambe iqhaza**

Usuku

Isikhathi

**Usayina/Isithupha
sokudla**

Mina, _____ nginyaqinisekisa ukuthi umhlanganyeli ongenhla wazisiwe ngokugcwele mayelana nesimo, ukuziphatha kanye nobungozi bocwani olungenhla.

Full Name of Researcher

Date

Signature

Appendix 5: Questionnaire (English version)



Factors influencing the provision of water services at uMhlatuze Local Municipality

My name is Sibongekile Princess Madlopha, a Master's student in the Department of Business School at the Durban University of Technology. I am conducting research on Factors influencing the provision of water services at uMhlatuze Local Municipality. This survey collects data that will inform public policy on water service delivery. The survey is divided into two sections. Section A collects biographical information of the respondents, while section B contains general questions on citizens' satisfaction with water services provided by government. Kindly note that all information collected will be used for academic purposes only and all personal information will be treated confidentially. Please take some time to answer the following questions as truthful as possible.

Date: ____ / ____ / ____

Place: _____

Section A: Personal information

Please put **X** in the appropriate box

1. Please indicate your gender.

Male	
Female	
Other	

2. Which population group do you belong to?

African	
White	
Indian	
Coloured	

3. What is your year of birth?

--

4. What is your highest level of education?

Never attended school	
Primary school	
High school	
Diploma	
Degree	
Postgraduate	

5. Which area do you reside in?

Urban	
Township	
Rural	

6. Are you the owner or tenant in this house?

Owner	
Tenant	
Other	

7. How many people live in your household?

--

Section B: General Questions

Please mark the appropriate box with an **X** for the following statements.

8. Basic public service delivery in South African municipalities.

		Strongly disagree	Disagree	Agree	Strongly agree
1.	South Africa is experiencing water shortage.				
2.	Budget allocated to the Department of Water and Sanitation is enough to attend to water crisis.				
3.	Citizens are receiving excellent public service delivery in the municipality.				
4.	Citizens are aware of the role of the municipality's information technology on outsourcing public service delivery.				
5.	Citizens are aware of the challenges of water service delivery.				
6.	Climate changes does have an impact on water services.				
7.	Droughts affect the country's water service delivery.				
8.	Floods affect the country's water service delivery.				
9.	Water pollution affects the environment.				
10.	Population growth affects water supply and distribution.				

9. Challenges in water service delivery.

		Yes	No
1.	Municipality is providing basic water services.		
2.	Municipality supplies clean and health water.		
3.	Load shedding has effects on water supply.		
4.	Budget constraints have impact on water supply and distribution.		
5.	Political interference has impact on service delivery.		
6.	Municipality officials are well trained to assist the community.		
7.	Municipality have enough employee to perform water functions.		
8.	Municipality have plan to attend water emergency issues.		
9.	Water leaks are attended as soon as possible.		
10.	Unattended water leaks result in a delay to water projects.		
11.	Aging municipal infrastructure have impact on service delivery.		
12.	Illegal water connections result on huge loss on the municipality.		
13.	Non-payment for services result in restriction to provide with water services.		
14.	Indigent customers must be provided with water services.		
15.	Water consumer behaviour has effect on water sustainability.		

10. Key strategies to improve water service delivery at uMhlathuze Local Municipality.

		Strongly disagree	Disagree	Agree	Strongly agree
1.	Prepaid water meters improved service delivery.				
2.	Municipality should conduct consumer education campaigns to educate citizens about going green and to save water.				
3.	Municipality should expand water services infrastructure.				
4.	Municipality should repair water services infrastructure.				
5.	Municipality to maintain infrastructure water services.				
6.	Municipality should implement credit control for non-paying customers.				
7.	Allocate enough budget for water services.				
8.	Attend to water leak urgently.				
9.	Address illegal water connections.				
10	Ensure that there are no objects at water resources.				

11. In your own opinion, what should be done to improve your satisfaction with water services delivered by the uMhlathuze Local Municipality. (Write your response in the box below).

Thank you for taking your time to participate in this survey.

Appendix 6: Questionnaire (IsiZulu version)



Izinqinamba zokuhanjiswa kwamazi emphakathini abhekene nazo uMasiphala waseMhlathuze.

Igama lami ngingu Sibongekile Princess Madlopha, umfundi owenza iziqu eziphezulu kwaDepartment of Business School enyuvesi yase Thekwini yezobuchwepheshe. Ngenza ucwaningo ngezinqinamba zokuhanjiswa kwamazi emphakathini abhekene nazo uMasiphala waseMhlathuze. Inhlolovo iqoqa ulwazi oluzokwazisa inqubomgomo yomphakathi ngenhlahlandlela nozisombulul ekuhanjiseni kwamazi emphakathini. Lenhlolovo ihlukaniswe Kabili. Ingxenye yokuqala iqoqa imininingwane echaza ngomuntu ophendulayo, kanti ingxenye yesibili inemibuzo ejwayelekile ngokuthuthukiswakenzinqinamba ekuhanjweni kwamazi. Ngomusa yazi ukuthi lonke ulwazi oluzoqoqwa lungolwazi lwemfundo kuphela, futhi yonke imininingwane yomuntu izophathwa ngemfihlo. Ngicela uthathe iskhathi uphendule lemibuzo engezansi ngokweqiniso.

Usuku: ____/____/2023

Indawo: _____

Ingxenye yokuqala: Imininingwane eqondele nawe

Ngicele ukhethe okufanele kumbuzo ngamunye ngokufaka uphawu **X**

1. Ngicela ukhethe ubulili bakho.

Owesilisa	
Owesifazane	
Obunye ubulili	

2. Ungowaluphi uhlanga? (Akuphoqelekile)

umAfrika	
uMlungu	
iNdiya	
iKhalathi	

3. Imuphi unyaka wakho wokuzalwa? (Akuphoqelekile)

--

4. Izinga lemfundo yakho?

Awukaze ufunde	
Isikole sebanga aliphansi	
Isikole sebanga aliphezulu	
Iziqu zemfundo ephakeme yaseNyuvesi - idiploma	
Iziqu zemfundo ephakeme zaseNyuvesi - iDegree	
Iziqu zezemfundo eziphezulu	

5. Iyiphi indawo ohlala kuyo?

Indawo yasemadolobheni	
Indawo eyilokishi	
Indawo esemakhaya	

6. Ingabe ungumnikazi walendlu noma uyisiqashi?

Umnikazi	
Isiqashi	
Okunye	

7. Bangaki abantu abahlala kulelikhaya?

--

Ingxenywe yesibili: Imibuzo ejwayelekile

Ngicele ukhethe okufanelekileyo kulezizitatimente ngasinye ngokufaka uphawu X

8. Izidingo eziyisekelo zomphakathi ezilethwa omasipala baseNingizimu Africa.

		Angivu mi kakhulu	Angi vumi	Ngiya vuma	Ngiyavuma kakhulu
1.	INingizimu Afrika ibekene nenkinga yokushodelwa amanzi.				
2.	Uhlahlo mali oluqondene noMkhakha wezaManzi noKuthuthwa kwendle alwanele ukubhekana nenkinga zamanzi.				
3.	Ubahlali baseNingizimu Afrika bathola izidingo zomphakathi eziseqophelweni eliphezulu.				
4.	Abahlali bayazi ngendima edlalwa umasipala ekuletheni intuthuko emphakathini nokusetshenziswa kwezobuchwepheshe.				
5.	Abahlali bayazi ngezinqinamba ezibhekene nohulumeni ukuletheni izidingo zomphakathi – Isidingo samazi.				
6.	Ukuguquka kwesimo sezulu sinomthelela ekulethweni kwamanzi.				
7.	Isomiso sinomthelela omkhulu ekulethweni kwamanzi ezweni.				
8.	Izikhukhula zinomthelela omkhulu ekulethweni kwamanzi ezweni.				
9.	Ukugcola nezinto ezingadingeki emanzini ziba nomthelela kwezemvelo.				
10.	Ukwanda kwabantu kunomthelela ekulethweni nokuhanjizwa kwamanzi.				

9. Izingqinamba ekulethweni kwamanzi emphakathini.

		Yebo	Chabo
1.	uMasipala uyaziletha izidingo eziyisisekelo eziqondene namanzi.		
2.	uMasipala unikezela ngamazi ahlanzekile futhi anempilo.		
3.	Ukucishwa kukagesi kunomthelela ekulethweni nokuhanjiswa kwamanzi.		
4.	Ukushoda kwemali kunomthelela ekulethweni nokuhanjiswa kwamanzi.		
5.	Ukungenelela kwepolitiki kunomthethela ekulethweni kwezidingo emphakathini.		
6.	Abasebenzi bakwaMasipala bafundiswe ngokwanele ukulekelela umphakathi.		
7.	uMasipala unabasenzi abanele ukwenza imisebenzi eqondene namanzi.		
8.	uMasipala unecebo lokubhekana nezimo eziphuthumayo eziqondene nezinkinga zamanzi.		
9.	Amanzi avuzayo alungiswa ngokushesha.		
10.	Ukungalungiswa kwamanzi avuzayo kudala izinkinga ekulethweni kwamanzi.		
11.	Ukukhula kweminyaka yezinqalazisinda kunomthelela ekulethweni kwezidingo.		
12.	Ukuzigxumela amanzi ngokungemthetho kudala umasipala lahlekelwe kakhulu.		
13.	Ukungakhokhelwa kwazidingo kunomthelela ekuncishishweni kwamazi.		
14.	Amakhasimende anga thathi lutho entweni kumele awathole amanzi.		
15.	Ukuziphatha kwabantu ekusebenziseni amanzi ukunomthelela ekubeni namanzi		

10. Izindlela ezinenqubekela phambili zokuthuthukiswa kokulethwa kwamanzi ezindaweni ezakhele umasipala waseMhlathuze namaphethelo.

		Angivumi kakhulu	Angivumi	Ngiyavuma	Ngiyavuma kakhulu
1.	uMasipala waseMhlathuze ulethe uhlobo lamamita amanzi ozithengela wona ukuze uthuthukise ukulethwa kwezidingo zamanzi.				
2.	uMasipala unezinhlelo zokufundiswa ngomphakathi ngokuvikela invelo nokonga amanzi.				
3.	uMasipala mawube nezinhlelo zokwandisa izinqalazisinda ezibekelene nokulethwa kwamanzi zisesimweni eziphilile.				
4.	uMasipala mawube nezinhlelo ukulungisa izinqalazisinda ezibekelene nokulethwa kwamanzi zisesimweni eziphilile.				
5.	uMasipala mawube nezinhlelo zokucina izinqalazisinda ezibekelene nokulethwa kwamanzi zisesimweni eziphilile.				
6.	Ukuthathwa kwezinyathelo ezinqala zamakhasimede angamkhokheli uMasipala.				
7.	Ukwenziwa kohlalo zimali oluqondene namanzi.				
8.	Ukulungisa ngokushesha amanzi avuzayo.				
9.	Ukubhekwa kwabantu abazuxhumela amanzi ngokungemthetho.				
10.	Ekwenza isiqinisekiso sokuthi zonke izinziza zokuletha amanzi azibi nazo izithiyo.				

11. Ngokubona kwakho, yikuphi okumele kwenziwe ukuthuthukisa ukwaneliseka kokulethwa kwamanzi kubantu endaweni ohlala kuyo. (Bhala impendulo yakho ngezansi).

Ngiyabonga ngokuthola isikhathi sokuphendula lemibuzo.

Appendix 8: Ethics clearance letter



4 December 2023

Ms S P Madlopha
P O Box 3071
Richards Bay
3900

Dear Ms Madlopha

Factors influencing the provision of water services at uMhlathuze Local Municipality
Ethical Clearance number IREC 225/23

The DUT-Institutional Research Ethics Committee acknowledges receipt of your notification regarding the piloting of your data collection tool.

Kindly ensure that participants used for the pilot study are not part of the main study.

Please note that **FULL APPROVAL** is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the DUT-IREC according to the DUT-IREC SOP's.

Please note that any deviations from the approved proposal require the approval of the DUT-IREC as outlined in the DUT-IREC SOP's.

It is compulsory for a student or researcher to apply for recertification on an annual basis. The failure to do so will result in withdrawal of ethics clearance. It is the responsibility of the researcher and the supervisor to apply for recertification.

Please note that you are required to submit a **Notification of Completion of Study** form together with an abstract to the DUT-IREC office on completion of your study.

Yours Sincerely

Prof J K Adam
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Appendix 9: Summary of Turnitin report

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