

Municipal water financing models and partnerships in South Africa



MCom

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Acknowledgments

"If I have seen further, it is by standing upon the shoulders of giants" - Isaac Newton

These words have never meant more. These past few years has been filled with many good and challenging moments. I have struggled, I have learnt and eventually thrived. Firstly, I would like to thank all my classmates. I could not have undertaken this journey without your support, encouragement, and robust discussions.

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And finally, to me, without whom this thesis would not have been possible.

Abstract

Water is necessary for both survival and development. Despite this, many individuals in South Africa lack access to safe and clean drinking water. In most developing countries, water provision is primarily the responsibility of the government. Given the current constrained environment and the significant challenge of increasing water provision, there is a case to be made for adopting various configurations, including more private sector involvement. Drinking water that is clean and safe is a global issue that affects both the public and private sectors. While South Africa has made progress in improving water services, it has been inconsistent, with a substantial percentage of the poor being unserved. Concerns about institutional and financial capability, infrastructure maintenance, apartheid-era spatial planning challenges, and corruption are just some of the challenges that South Africa faces.

The researcher investigates the water service delivery models used in South African municipalities in this study. The study aims to answer the following question: *“How do municipalities operating in a constrained environment, with limited capacity to enforce regulations, ensure adequate water provision for all its citizens?”* The researcher posits that one way to answer this question, is to determine which model of water provision is best suited to South Africa. To better understand the theoretical and empirical considerations with various water configurations, the researcher starts off with an extensive literature review, looking at developed and developing nations and focuses on the South African context. In answering the main research question, the researcher undertakes a mixed method research strategy that incorporates both quantitative and qualitative data.

The study shows that water service authorities with public-sector contracts outperform those with private-sector contracts. According to the study, publicly designed water service authorities outperform privately configured ones in terms of efficiency, financial sustainability, accessibility, affordability, and customer centricity. The key factors underpinning this performance include the degree of urbanisation, the ability to cross-subsidize, and the demography of the region. That said, the private sector's efficiency and financial discipline yielded improved performances in the privately configured Water Services Authorities.

The main conclusion is that there is no one-size-fits-all approach. The study finds that a public configuration is better suited to expanding water service delivery in the South African context based on a performance scorecard adopted in the study. The sector's complexity as well as South Africa's diversity, necessitates a customized approach that incorporates fundamental elements from both configurations.

394 words

Keywords: Water, water supply, configurations, public, private, efficiency, sustainability, accessibility, affordability

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List of Abbreviations

PA	Principle -Agent Theory
PSP	Private Sector Participation
PPP	Public Private Partnerships
PUP	Public Public Partnerships
SDG	Sustainable Development Goal
TCE	Theory of Economics
TCTA	Trans-Caledon Tunnel Authority
UCT	University of Cape Town
UK	United Kingdom
WSA	Water Services Authority

Chapter 1: Introduction to the study

1.1: Introduction to the study

The debate over whether water should be provided in a public or private system is an age-old one, with varied solutions in different empirical circumstances. Water provision is mostly the responsibility of the government, as it is in most developing countries. Due to the current constrained environment and the sizeable task of expanding water service, there is a case to be made for considering additional configurations, including increased Private Sector Participation (PSP).

Water's value cannot be overstated. Water is not only necessary for living, but also for economic growth. According to the World Bank (2014), 768 million people lack access to safe drinking water around the world. Furthermore, 2.5 billion people, or 36 percent of the world's population, are predicted to live in water-scarce areas (WHO, JMP & UNICEF, 2017). Half of the world's population is expected to be at risk by 2025 due to water scarcity ("Drinking-water", 2019). Water stress could cause a 6 percent drop in GDP by 2050, according to the United Nations (World Bank, 2016). Water is clearly essential to life and prosperity, and as a valuable and rare resource, it deserves more attention.

Globally there has been an increase in private sector participation in water provision primarily led by multilateral institutions enforcing reforms facilitating increased private investment. Evidence suggests that countries representing large markets and that have relatively lower risk have dominated the privatized water landscape (Prasad, 2006). PSP in the water sectors in the United Kingdom and France provide the most empirical evidence from the developed world. While there has been some success in the increased private sector involvement in these countries, there has been some failures as well. In developing countries, PSP in water provision has been limited due to the perception that private water provision is not in the best interest of the citizens and will lead to unequal and costly water services. The exception to this trend has been Latin America, which provides a useful comparison for South Africa due to similarities in the social and economic construct of the countries. While there has been some failure in expanding water services through privatisation, there have been several success stories. In most cases, public stakeholders have maintained oversight over the sector and provided regulation, which is fundamental in protecting the interests of the most vulnerable in society.

Drinking water that is both clean and safe is a global issue that affects both the public and private sectors. The Sustainable Development Goal 6 (SDG 6) of the United Nations captures this common concern, aiming for universal access to clean, safe, and high-quality water by 2030. Furthermore, several of the other SDGs are thought to be dependent on the attainment of SDG 6. There has been significant success in increasing water services globally; nevertheless, this progress has been unbalanced, with a big percentage of the developing world remaining unserved. Between 2000 and 2017, global access to safe drinking water increased from 61 percent to 71 percent, according to research by WHO and UNICEF (2019). Closer to home, there has been substantial progress made by South Africa since the SDG inception in 2015; however, there is still some way to go to realise the goal set by the SDGs.

The aim of this research is to better understand different water configuration models to determine how South African municipalities can ensure adequate water provision for all its citizens. The study will achieve this by conducting an extensive literature review to better understand the challenges that different geographies and municipalities confront when it comes to water configurations, and by employing a mixed method research strategy that will include both quantitative and qualitative data approaches. By comparing water service delivery for the Water Service Authorities (WSAs) in the municipalities of Stellenbosch, Mbombela, Johannesburg Water, and Drakenstein, the study aims to answer the question: How do South African municipalities ensure adequate water provision for all its citizens? And which configuration of retail water supply would work best?

1.2: Problem Statement

In order for the country to improve service delivery and ensure equal and affordable access to clean and safe drinking water, it is necessary to consider whether the current retail water service configuration is still appropriate. While the provincial government is closer to the problem and, by definition, the best positioned to address the concerns, these entities face significant hurdles. Problems of institutional and financial capacity, maintenance of aging infrastructure, legacy spatial planning issues as a result of apartheid, and corruption are among the challenges that municipalities in South Africa face. The citizens of the country have expressed their discontent with municipalities' overall low performance in delivering basic services.

In order for the country to improve service delivery and ensure equal and affordable access to clean and safe drinking water, it is necessary to consider whether the current retail water service configuration is still appropriate.

1.3: Research questions and objectives

The overarching research question in this study is: “*How do municipalities operating in a constrained environment, with limited capacity to enforce regulations ensure adequate water provision for all its citizens?*” In answering this research question, the following sub-questions will be asked:

1. What is the most suitable configuration to ensure adequate water provision in South Africa?
2. How has the public provision configuration performed in terms of South African retail water services?
3. How has the private configuration performed in terms of South African retail water services?

The objective of this study, as highlighted by the research problem detailed in the section above, is as follows:

1. To determine which configuration is the most suitable given the socio-economic context in South Africa.
2. To understand the experiences of the traditional public provision configuration in South African retail water services and to assess the performance of the configuration.
3. To understand how the existing private configurations in South African retail water services have performed and to understand their experiences.

The researcher is convicted that employing a quantitative approach ahead of a qualitative approach is the most suitable in this study. The rationale for this approach is considered in the research design section of the research methodology section.

1.4: Scope and justification for the study

This study intends to contribute to research on the public versus private debate in the South African water sector regarding retail water services. The focus of the research is to establish which configuration is best for municipalities in their quest to increase basic water services and meet the country's water goals. This research will help determine if a public or private configuration is the optimum model for improving water services in South African municipalities.

The output from this study contributes to the empirical evidence of PSP in water supply, and also how public utilities have performed. Finally, this study aims to help improve service delivery in the South African retail water industry in the current constrained environment by determining the most appropriate water supply configuration.

The findings of this study will be useful to policymakers and local government entities in improving service delivery and redressing the current failures within the retail water sector, given the consistent and increasing service delivery protests and the constrained fiscal situation in South Africa. Other players in the South African retail water sector will benefit from this research. Private sector financiers, private multinational and local water companies/operators, and development finance institutes all fit into that category.

1.5: Ethical considerations

The University of Cape Town, Graduate School of Business's code of research ethics was followed in terms of confidentiality and integrity. This ensured that the research was conducted in a respectful, considerate, transparent, and academically professional manner. The quantitative part of this research was done using audited and publicly available annual reports to ensure that the data was credible and rigorously checked. The respondents in the qualitative part of this research, signed clearance forms and their anonymity was guaranteed to ensure that they felt comfortable sharing their deep insights without any consequences.

1.6: Outline of the paper

Chapter one introduces the study by discussing the research opportunity, scope and justification. It outlines the research questions and objectives. Chapter two focuses on the literature review where key concepts and frameworks applicable to retail water provision is covered. In chapter three, the geographical context that the study is situated in will be discussed. Chapter four focuses on the research methodology for this study, followed by Chapter five where the research findings and results of the mixed method research is discussed. Finally, Chapter six offers a discussion on the findings, limitations as well as suggested future research suggestions.

Chapter 2: Literature review

2.1: Introduction

This literature review was conducted using a funnel approach. It starts with a broad overview of the public versus private debate. It explores the theories of transaction economics and principal-agent underpinning the arguments in the public versus private debate. The study then examines empirical evidence in both developed and developing countries. The key moderating factors behind the PSP performance in water services is identified in this empirical review. The literature then seeks to paint the South African context and offers explanation of the public and private sector models most utilised. The different models for water supply are then explored and The Water Scorecard (Tynan & Kingdom, 2002b) is discussed and proposed as a way to evaluate the municipalities studied in this research.

2.2: Public vs private debate

Globally, water services are primarily funded through the public sector. The number of individuals who rely on the private sector for water services in OECD countries is still relatively small. According to Pérard (2009), PSP in water services, accounts for about 17-25 percent of OECD member's population. These figures contrast sharply with what happens in other infrastructure sectors, such as electricity and telecommunications, which are predominantly private in most every OECD country.

Pérard (2009), further substantiates that the scope of PSP varies within OECD countries from short term management contracts to full divestiture. While PSP in water services is present around the world, only five countries have more than half of their population being serviced by private operators. These countries are Chile, the Czech Republic, France, Malaysia, and England. Figure 1 below depicts the level of PSP in the world.

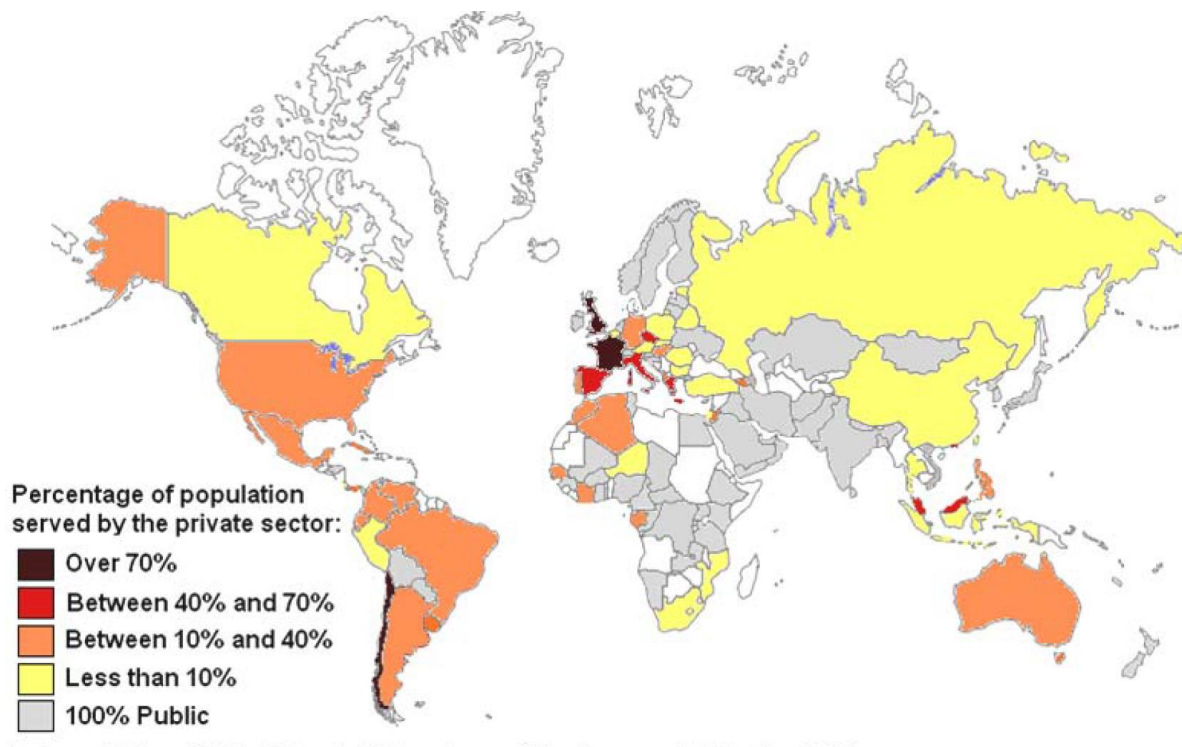


Figure 1 PSP in water supply globally – source Perard (2009)

PSP in water services is one of the most contentious issues in the current development debate (Prasad, 2006). The assumption that water is classified as a public good is the primary reason for this. Public goods are characterised as non-rivalry and non-excludability (Budds and McGranahan, 2003). Accordingly, raw water from ground sources like rivers and lakes are likely to be classified as a public good given the inability to exclude non-payers and the abundant supply. However, treated water often referred to as potable water, is unlikely to be classified as public goods as non-payers can be excluded, and overconsumption can be detrimental to other consumers. There are two sides to the debate on the merits of PSP in water services – the arguments for and against are laid out below.

2.2.1: Proponents of PSP

Proponents of PSP argue that water is a scarce resource and has been mismanaged to date (Prasad, 2006). Prasad (2006) further argues that market principals can be used to solve the concern. Those in favour of PSP, primarily international development agencies, believe that increased efficiency in the private sector will result in improved water access and quality. It is further believed that PSP will attract more capital and thereby relieve already strained government budgets (World Bank, 2010).

PSP's ability to attract more funding is critical to ensuring that current infrastructure is properly maintained through continual reinvestment. This argument is founded on the assumption that public utilities are inefficient in comparison to private entities. According to Anwender and Ozuna (2002), poor and developing countries tend to have low operational efficiency leading to low service quality. However, evidence from the literature is inconclusive as to whether this is indeed the case.

On the one hand, some theories suggest that private ownership improves business performance (Boycko, Shleifer, & Vishny, 1996; Shleifer, 1998; Megginson & Netter, 2001). Others, on the other hand, believe that competition and regulation are more important than privatization in terms of improving a company's performance (Bishop & Kay, 1989; Vickers & Yarrow, 1991; Kikeri & Nellis, 2004). According to Pérard & Pe (2017), in a fully competitive market, private ownership would lead to more efficient outcomes than public ownership. However, given the monopolistic nature of the water sector characterized by few private participants and the contentious nature of the resource, it is difficult to perceive the water sector as being a competitive market. As such, it is difficult to conclude with certainty that increased PSP in water supply will lead to more efficient outcomes

2.2.2: Opponents of PSP

Opponents of PSP believe that water is a fundamental human right, and as such, its value should not be subject to market practices (Prasad, 2006). Water is essential for human survival, and it is the elected government's responsibility to ensure that everyone has access to it. PSP would require water to be treated as a private good with non-payers excluded, thereby raising serious human rights violation concerns.

The opposition to PSP is focused on economic concerns relating to water provision. The perception is that any form of privatisation will increase tariffs charged to users to ensure full cost recovery of the water infrastructure, including the maintenance thereof. Budds and Mcgranahan (2003), argue that increased PSP in the provision of water would result in additional transaction costs, ultimately resulting in higher tariffs than would be the case under public provision. High transaction costs have serious consequences, particularly in underdeveloped nations where water service is not affordable to all citizens.

Furthermore, opponents of private investment have difficulty in rationalising the fact that investment in water, an essential human need, will require a return on investment (Budds and McGranahan, 2003).

The underlying factor supporting this viewpoint is the private operator's mandate, which is to generate a profit for its shareholders. The core of the argument against PSP is the commercial motivation, as opposed to a social motive used by the public sector.

The issue over whether water should be considered a public or private good, according to Budds and McGranahan (2003), is mainly irrelevant. The ease with which water may be treated as an economic good is irrelevant in most markets, and the pressures that both the private and governmental sectors experience in the water sector are the same. There is a case to be made that governmental failure in water service is due to inefficiency, and that the private sector is best positioned for water provision since it is more efficient (Budds and McGranahan, 2003). This, however, appears to neglect the main problem, which appears to be a lack of financial and institutional capability rather than inefficiency in public utilities. While efficiency is lauded as the driving force of PSP in water services, a portion of that efficiency is generally achieved through workforce streamlining, which results in job losses (Budds and McGranahan, 2003).

Affordability and price sensitivity, equality of service provision, efficiency, job losses, quality-of-service provision, reinvestment in existing infrastructure, capacity constraints, and the difference in mandates between a private and public actor are all key factors in the debate over the merits of private and public water provision. It is necessary to investigate the many theoretical frameworks that can help explain these elements in greater depth. The theory of transaction economics (TCE) and the principal-agent theory (PA). are two significant theories discovered in the extant literature that help explain the factors listed.

2.3: Theory of Transaction Economics (TCE)

According to Williamson (1979), TCE is the theory underpinning organisational structures which minimises the overall cost of producing a good or service. The theory suggests that an organisational structure which facilitates a minimal transaction cost is the optimal structure (Williamson, 1979; Williamson, 2008). Transaction costs are essentially the costs paid to external parties for coordination, contracting and regulating a transaction in the market.

This concept of TCE is a critical consideration in assessing water provision, particularly as it relates to the debate around whether the public or private sector is best placed.

According to Pérard & Pe (2017), the main considerations relating to transaction costs pertain to the asymmetry of information between the contracting parties. This unequal access to information results in increased transaction costs as a result of the due diligence and bid evaluation processes to bridge the informational gap. Accordingly, the municipalities have to incur increased monitoring and renegotiation costs which are ultimately borne by the end-user (Pérard & Pe, 2017). According to Guasch (2004), 74 percent of water and sanitation private concessions awarded between 1985 and 2000 in Latin America and the Caribbean were renegotiated with most of the contracts being renegotiated relatively soon after being awarded. Given the underlying economics of water, this theory is particularly applicable to water provision. Water is seen as a human right in many underdeveloped countries, and it is priced appropriately. The sensitivity of water prices makes it more difficult to absorb any additional costs, especially in an unequal society where many citizens are grappling with affordability.

2.4: Principle – Agent Theory (PA)

The PA theory is concerned with the relationship between the principal and the agent, where the latter (agent) acts for the former (principal) (Eisenhardt, 1989; Braun & Guston, 2003). The principal in a typical public water provision scenario would be the citizens who drink the potable water. The agent would be the public utility in charge of water supply, according to this theory.

As stated by Eisenhardt (1989), there are several agency problems inherent in the relationship between a principal and an agent. The first of these agency problems relate to the conflicting interests of the parties. The basis of the PA theory is that contracting parties have asymmetric information (Cantarelli, Flybjerg, Molin, & Wee, 2010). The belief that both parties will behave in their own best interests fuels the conflicting interests. Inherent conflicts in the interests of stakeholders in water services are often believed to result in issues of unequal access to water and water of substandard quality. PSP may result in increasing employment losses as private players seek efficiency, increased poverty as a result of unequal access, and higher tariffs due to its business incentive.

According to McKenzie and Mookherjee (2002), Latin American privatization experiences provide no clear evidence of rising poverty and had a minor influence on unemployment.

In contrast, Bayliss (2002) and Birdsall & Nellis (2003) claim that privatization has harmed access to essential services, job losses, and income levels in the developing countries. As a result, there is no solid evidence that more privatization leads to bad social results.

As highlighted by Quiggin (2005), when parties have unequal access to information, it is necessary to ensure that their interests are aligned. This is usually accomplished by incentivizing the agent to produce specified outcomes that are aligned with the principals' objectives. This is a critical factor in the provision of water, particularly where the private sector is responsible for water services on behalf of the public utility. In this case, the public utility is responsible for improving water quality and increasing access to water. This mandate may or may not be aligned with the profit-making interests of the private actor. As a result, it is critical to align the interests of the contracting parties by incentivizing the agent to behave in the principal's best interests. This objective is typically achieved in large infrastructure projects by providing ownership rights to the agent ensuring that agent bears the ultimate risk of ownership and is therefore incentivised to perform.

2.5: Empirical Literature

2.5.1: Developed Countries

The choice between public and private water provision has been fluid throughout history, with governments switching between the two depending on the circumstances. The major motivations towards greater PSP in water provision, according to Hall and Lobina, (2007) were an ideological shift in the 1980s and strategic contributions from development agencies and donors.

The PSP in water services in the UK sparked the ideological shift by demonstrating the feasibility and economics of doing so. The second motivation was development agencies like the World Bank's planned and deliberate promotion of privatization. The notion was that privatization would solve the problems of inefficiency, investment, and rampant corruption in government organizations. (Hall and Lobina, 2007). The UK and France are the two countries in the developed world that are discussed the most in terms of PSP in water service in the present research.

The empirical evidence from these countries' experiences with PSP in water services will be the focus of the following section.

In 1989, the UK government chose to entirely privatize water delivery as part of an ideological shift and in defiance of the existing quo at the time. Efficiency and the financial clout to reinvest in existing infrastructure were among the arguments for privatization, which were in accordance with those highlighted in the current literature (Dore, Kushner and Zumer, 2004). The ten regional water companies were given monopoly rights in their respective regions for a duration of 25 years. Fundamentally, the UK government established three regulatory agencies to aid in the regulation of service affordability, quality, and environmental concerns (Dore et al., 2004). The Office of Water Services (OFWAT) was in charge of determining the service's price. The Drinking Water Inspectorate (DWI) was in charge of monitoring the water quality of the privatized regional firms, while the Environmental Agency (EA) was in charge of reducing pollution.

The findings, ten years after the privatization was executed, show that the privatization arguments did not pan out as expected. The average water rate in the country had risen by 46 percent, but OFWAT decided to lower it by 12,3 percent in response to complaints that it was too high (Green, 2001). The allegation was that prices were artificially inflated in order to pass on realized savings to shareholders. According to a study comparing Swedish, English, and Welsh utilities, privatized water suppliers in the UK earned three times the rate of return as public utilities in Sweden and two times the rate of return as publicly owned enterprises in Scotland (Dore et al., 2004). These exorbitant profits highlight the concern expressed by opponents of PSP that private actors' profit incentive would lead to exorbitant tariff rises and a concentration on shareholder returns rather than enhancing service performance.

According to Bender (2017), private investment in the water sector has typically received modest returns in developed markets to reflect the perceived low level of risk in the sector as a result of the predictable and stable nature of the return profile. However, research from the United Kingdom suggests that PSP led to excessive yields maximizing shareholder wealth.

Opponents of PSP argued that enhanced efficiency brought on by private sector engagement often resulted in a reorganization of the utility's employees. Increased privatisation has often resulted in job losses, which is a big concern in developing economies where unemployment is already a problem.

During the ten years following the UK's privatisation, 8 of the 10 regional private enterprises reported job losses, totalling a 21,5 percent drop in overall employment in the industry (Dore et al., 2004). Furthermore, it was discovered that the number of non-paying clients who were disconnected increased significantly throughout the first ten years. Consumers who could afford to pay but refused to do so were targeted for service exclusion, according to Dore et al. (2004). Nonetheless, the exclusion of non-payers raises concerns about human rights violations and goes against the resource's shared nature.

On the other hand, following the privatization, the service's quality standards have significantly increased. The number of water sample tests that met the required standards grew tenfold over a ten-year period (Dore et al., 2004). The founding of the DWI, who was in charge of water quality, could also be credited with the improvement in water quality. According to Dore et al. (2004), given the low level of competition among regional water companies, the possibility of competition and efficiency being the primary cause of improved water quality is unlikely.

The privatization of water supplies in France differed from that in the United Kingdom. While the United Kingdom completed a comprehensive privatization of the industry, France left the decision to privatize to the municipalities. In France, local municipalities are responsible for the provision of water, and they have the authority to choose whether the service will be provided by the utility or by a private operator (Dore et al., 2004). An overarching water act governs the French water sector. The country's water supply is separated into six zones, each with its own water agency. The water agency is in charge of managing the area's water resources.

Since public utilities lacked the technical and financial capabilities to maintain and expand the existing network in accordance with European standards, the country began a privatization campaign (Dore et al., 2004).

In a similar vein to the United Kingdom, the country embarked on a PSP expansion in water supply in the hopes of gaining efficiency gains from a competitive private market. PSP accounted for 30 percent of total water supply in the 1950s, and by the late 1990s, it had risen to 75 percent (Dore et al., 2004). Private management contracts, in which the private operator was accountable for service delivery for a certain period, were the most common form of privatization in the country.

Initially, the private operators' financial performance was excellent. Not only did the French government continue to support the poorest citizens, but tiered pricing meant that different levels of consumers were subsidizing one other (Zumer, 2002). Despite the high degree of subsidy in the industry, the price of service did not reflect this. The average water prices for all water services increased between 1994 and 1999. Private and public-private sector partnership concessions charged greater water prices than publicly operated utilities in all years (Dore et al., 2004). The private operators claimed that the increase in rates was due to significant reinvestment in existing infrastructure. The empirical evidence from France backs up the evidence from the United Kingdom, where increasing PSP led to higher water supply bills. Furthermore, tariffs increased despite the French government providing subsidies, which improved the profitability and returns to shareholders

In conclusion, the empirical evidence revealed that, while water quality improved under PSP, water service rates increased in both the UK and France. When an increase in PSP results in tariff increases, proponents of PSP frequently point to the lack of regulation. However, in the situations of the United Kingdom and France, both countries had adequate legislation in place but were still unable to regulate pricing. Worryingly, PSP resulted in a 21,5 percent increase in job losses and an increase in non-payer disconnection in the United Kingdom. This evidence is consistent with the current literature, which cautions against increasing PSP.

2.5.2: Developing Countries

The global statistical data highlight that utilities are not able to supply water to everyone. A large proportion of the global population remains unserved, with the unserved percentage increasing as income levels decrease (Prasad, 2006). Where developing countries have seen an increase in PSP in water services, it has primarily been driven by multilateral or donor pressure as a condition to accessing funding (Bayliss, 2002; Budds and McGranahan, 2003; Hall et al., 2007; Pérard & Pe, 2017). While there has been an increase in PSP in the water sector over the last few decades, evidence suggests that it has been restricted to large markets with relatively limited risk (Prasad, 2006). As a result of this prejudice, those that are most in need remain unserved.

In Africa, privatization in the water sector has mostly been prevalent in the Francophone countries while many other sub-Saharan countries are struggling to implement any PSP in their water sectors. According to Budds and McGranahan (2003), the rationale for the dominant Francophone water sector privatization is perhaps due to their links with the French multinational companies dominating the private water sector investment landscape. They further argue that the main reasons behind African countries' inability to attract private investment are due to the short-term nature of the private contracts, currency devaluation, the bundling of electricity and water and the affordability of a fully cost recovered tariff.

Because of their lower income per capita and hence higher risk profile, most African countries do not meet the profile of typical countries in which a private firm would invest. Despite having a higher per capita income than its African peers, South Africa is one of the world's most unequal countries, with many inhabitants unable to pay for basic services. In 1993, Suez signed a contract to deliver water to Stutterheim, South Africa, on a private basis. Suez was solely to supply metropolitan areas that already had reliable supplies under the terms of the contract. The deal did not include the unproductive peri-urban areas (Hall and Lobina, 2008). This demonstrates the private operators' cautious approach to entering Africa, where the risk profile differs from what they are used to.

The present literature on PSP's impact on African water utilities is contradictory. Private operators are more cost-effective, according to a study by Estache and Kouassi (2002).

Zhang, Parker, and Kirkpatrick (2005), on the other hand, found no substantial cost difference between public and private operators. In general, infrastructure privatization in Latin America has been significant in comparison to the rest of the developing world. While privatization has been most visible in industries such as energy and telecommunications, the continent's water industry has seen substantial PSP (Pargal, 2003). While there have been some gains in terms of enhancing service delivery, they have been accompanied by the expected PSP concerns. The rest of this section discusses the key countries that have participated in PSP during the last few decades.

PPPs in Colombia and Brazil, according to Marin (2009), have improved access to piped water in those nations and are regarded a success. Despite improvements in water availability, there have been a few problematic concerns in Brazil. In 2002, a major scam involving the award of a 30-year concession was revealed (Hall and Lobina, 2002).

It was uncovered that city council members accepted bribes in exchange for the concession being awarded. In the end, 14 people were sentenced to prison for the crime. In addition, a considerable increase in the number of people suffering from renal and gastrointestinal disorders prompted a laboratory investigation of water supplied by one of the PPPs in 2001. (Hall and Lobina, 2002). The water supplied by the PPP was found to be polluted, and legal action was initiated. In Colombia, PSP in the water sector resulted in significant job losses and unequal access to water (Hall and Lobina, 2002).

In Buenos Aires, Argentina, a long-term PSP concession was signed to extend and sustain water services. Access to the neediest communities, who couldn't afford the tariffs, had been limited under the concession (Clarke et al., 2004). The private operator attempted to set up a cross-subsidization scheme, in which existing customers were charged a premium to cover the expense of servicing the most vulnerable clients (Hall and Lobina, 2008). The community as a whole eventually objected to this. The PSP concession lasted from 1993 to 2006, and while access to water improved, the service quality declined (Hall and Lobina, 2008). Furthermore, the concession contract's reinvestment targets were not met by the private operator. The private operator spent only 61 percent of the entire investment needed (Ducci, 2007).

Despite the underinvestment in terms of investment, the average price of water services climbed by 88 percent over the concession period, compared to a 7 percent increase in inflation (Hall and Lobina, 2008). In addition, workforce reductions were implemented in order to increase the efficiency of the private operator. This also allows the company to maintain its good economics in the face of a fluctuating Argentinian market (Hall and Lobina, 2008). In the end, the private operator was able to maximize profitability and shareholder value despite price rises that were substantially higher than inflation and a lack of reinvestment. According to Hall and Lobina (2008), the corporation had a 21 percent return on assets during this time.

The Chilean water sector is an interesting case study since EMOS, the public utility responsible for Santiago's water system, was privatized by Suez and Aguas de Barcelona, two of the largest water sector investors. The justification for privatization was that the government lacked the necessary finances to meet the sector's investment demands (Shirley & Xu, 2000). The privatization in Santiago was widely viewed as a success, with nearly 100 percent access to high-quality water in the region. However, as Hall and Lobina (2008) explained, the World Bank had already deemed EMOS to be the most efficient utility in South America. It was also noted that the utility under EMOS' administration had already achieved near-100 percent water access.

Chile has established a regulatory board that reports to the appropriate minister of water provision. This regulatory body's mission was to set tariffs, negotiate concession agreements, and guarantee that quality requirements were met (Shirley et al., 2000). This duty is especially crucial in developing countries since it is required to defend customers' interests in terms of pricing and service quality while also assuring a return on private investment. According to Shirley et al. (2000), the tariff was determined after taking into account the required capital expenditure, operating and maintenance costs, and a minimum investment return of 7 percent. Furthermore, the Chilean government provided additional subsidies to the neediest households, ensuring that water tariffs were set at an appropriate level to cover service expenses.

There is a lack of empirical evidence from Africa and Asia. Between 1990 and 2005, only over 600,000 households in Sub-Saharan Africa, South Asia, and East Asia (excluding China) received water from a private water operator (Hall and Lobina, 2008).

Private operators, on the other hand, are clearly selective in the contracts they take on in this region to guarantee that their financial motives are met. Latin America has invested a substantial amount of PSP in water services, making it a useful case study for the effects of privatization on water services. The Latin American experience shows that PSP in water services has not been without its challenges. Expansion of access to water services was achieved through PSP, according to empirical evidence.

PSP resulted in job losses to improve efficiency in both Argentina and Colombia by ensuring economic well-being. Finally, it is clear that private operators are motivated to generate a profit and would be willing to forgo any other goal to ensure that the required return for shareholders is satisfied. The case study of Santiago shows how the Chilean government was able to increase access to the community while keeping tariffs low and ensuring that vulnerable communities were not left out. The independent regulatory agency that oversees and regulates the tariffs levied is a major contributor to this accomplishment.

Establishing a regulatory body in a completely competitive system, according to research presented by Zhang, Parker, and Kirkpatrick (2005), leads in greater performance from private players as well as better outcomes for consumers. The Chilean government has also played a key role in directing public monies to be utilized for subsidies to help low-income families pay for water services.

2.6: South Africa

South Africa has been writing its own water story, before 1994, South Africa's water policies had been geared towards the minority white population with minimal regard given to the majority of the country's population. According to Goldin (2005), water supply services were provided to wealthy municipalities across clearly defined racial lines.

MacKay, Rogers and Roux (2003) explained that prior to 1994, black townships had substandard access to water services with a single standpipe often being shared across an entire community. In 1994, at the dawn of the country's democracy, a third of the 40 million South African population at the time did not have access to safe drinking water (Muller, 2007). According to Stats SA (2019), 89 percent of the country's households had access to safe drinking water in 2018.

While there has been substantial improvement in the access to water services, there remains a large contingent of the most vulnerable citizens who are unserved or have access to unreliable water services. South Africa has had to overcome a series of challenges and obstacles as a result of its dark past. The country is one of the most unequal in terms of access to basic services in the world, and the spatial planning during the apartheid regime only exacerbates this. In South Africa, spatial planning as a result of the apartheid regime means that a large proportion of the population is located in remote areas, making the provision of water more challenging.

As a result, providing water to these locations may be unfeasible, and hence would not accord with a private sector participant's profit-making aim. According to Statistics South Africa (2019), just under 33 percent of the South African population lives in rural and peri-urban areas. This implies that a third of South Africa's water supply is located in rural areas where full cost recovery is difficult.

In addition, the country has developed a culture of non-payment for services, which exacerbates cost recovery issues. Despite the affordability of essential utilities, according to Schnitzler (Schnitzler, 2008), the non-payment culture in townships comes from anti-apartheid movement rent boycotts in the 1980s. Non-payment was employed by the country's black majority as a form of civil disobedience against the apartheid administration. According to McDonald (2002), the then-South African government chose to disregard the non-payment issue in order to keep political tensions low. The country's history of non-payment culture is crucial in putting difficulties and political sensitivity around the government's failure to recover the cost of water service from its consumers into context. This culture of nonpayment exacerbates the concept of full cost recovery, which is critical for any utility's financial viability.

South Africa, like other emerging countries, has been affected by water demand and supply dynamics. With regions of the country facing severe droughts, the country's water supply has been in the spotlight. South Africa has been designated as significantly water-stressed due to its position as the world's thirtieth-driest country. It has an arid to semi-arid climate, with an average annual rainfall of 465 mm, which is half that of the rest of the world (Fanadzo, 2012). Droughts have caused substantial problems in the country in recent years, with several sections of the country experiencing water shortages. In 2017, the Western Cape, in particular, was hit by a severe drought, with the region nearly running out of water.

Despite being a water-scarce country, South Africa consumes roughly 233 litres of water per capita per day, compared to the international norm of around 180 litres per capita (Department of Water and Sanitation, 2017). This raises questions about water conservation and if the country recognizes the value of a precious resource.

To solve water scarcity in South Africa, it is estimated that R70 billion in annual water infrastructure investment will be required for the next ten years (Department of Water and Sanitation, 2017). Water and sanitation infrastructure in South Africa is aging, and its state is compounded by a lack of maintenance funding. In 2017, the national allocation to the water sector in South Africa was roughly R43 billion (Department of Water and Sanitation, 2017). As a result, the level of yearly investment necessary (based on 2017 national allocation) is around R27 billion higher than what is already invested, leaving a 38 percent infrastructure funding gap in the South African water sector.

This emphasizes the current water sector's capacity restrictions, creating problems with water service delivery. This is a critical issue since it emphasizes the necessity for large capital investment in the coming years. The main source of concern is how the government will raise this money in light of the government's current tight fiscal position.

Between 2002 and 2018, the population of South Africa increased by 1.3 percent per year. Households, on the other hand, have grown by 48.9 percent over the same time period. The supply of basic services is projected to be hampered as a result of considerable household increase. (Statistics South Africa, 2019). These figures show that, due to the country's urbanisation characteristics, water demand has been expanding faster than population increase. Furthermore, there are growing complaints about the state utilities' service levels. 58 percent of municipalities were unable to achieve the applicable water quality criteria due to a lack of both financial and institutional capacity at the local level (Stats SA, 2018). Given the rising demand for water services, municipalities' ability to meet this need is a critical factor in determining how the country can supply adequate water services.

Water provision in underdeveloped nations has traditionally been financed primarily by public revenues such as taxes, tariffs, and transfers (OECD, 2010). South Africa has a block tariff scheme, with the first 6 cubic meters of use per month being free, and the tariffs increasing with each subsequent block of consumption.

The free basic water policy was introduced in 2001, ensuring that all South Africans have access to the minimum level of water, greatly complicating the supply of water services. To be eligible for the government's free water subsidy, families must register with their local municipality. This particular aspect of the South African water landscape must be taken into account by any private operator when determining the contract's risk profile.

While the majority of water services in South Africa are provided by the government, there have been a few instances of water services being farmed out to private players. Mbombela and Ilembe, two municipalities, have signed 30-year concessions with private companies to supply the whole water service. These agreements were made in 1999 with the primary goal of expanding water service to previously unserved areas. The Johannesburg Water WSA was formed after the City of Johannesburg signed a five-year management contract with Suez, a private operator. Johannesburg Water was rated the best big water utility by the end of the management contract, indicating that the arrangement was a resounding success.

The WSA fulfilled or surpassed contractual targets by more than 90 percent throughout the course of the contract, resulting in major improvements in customer service, environmental compliance, and cost effectiveness. In addition, the management contract was instrumental in ensuring a total financial turnaround, bringing the utility from the brink of bankruptcy to a tiny profit (Marin, Mas & Palmer, 2009).

In the Maluti-A-Phofung municipality, a public-private partnership (PuP) was established with Rand Water to supply retail water services to the population. The municipality was able to increase its institutional capacity as a result of this agreement, as well as the quality of retail water services provided. Ultimately, South African water utilities are battling to retain and increase access to water services in order to meet the UN's Sustainable Development Goals. It is evident that in the current constrained environment, consideration must be given to the configuration of the water sector and whether the existing regime remains suitable.

Evidently the same challenges faced by both public and private operators of water services around the globe are prevalent in South Africa. However, certain uniquely South African factors have been identified in the literature including a deeply entrenched non-payment culture, spatial issues, a lack of water conservation and a largely unequal society.

2.6.1: How water supply works in South Africa

The South African water sector is complex and layered, with the responsibility of different elements within the water sector being transferred to various entities. The responsible water authority is the Department of Water and Sanitation (DWS) within the ministry of Human Settlements, Water and Sanitation. The DWS represents the national government and is responsible for regulation and policies within the water sector.

The Trans-Caledon Tunnel Authority (TCTA) is a state-owned entity responsible for the supply of bulk raw water infrastructure. TCTA sells bulk raw water to either the waterboards for treatment or to municipalities who own treatment facilities. The 13 waterboards in South Africa are responsible for operating the bulk water supply infrastructure and the subsequent sale of treated potable water to municipalities. While national government and these state-owned entities are constrained, these entities, with the aid of government guarantees, can source substantial funding from debt capital markets. This is evidenced by TCTA raising R6.5 billion in commercial financing in 2019 alone (TCTA, 2019).

The responsibility of retail water services has been transferred to the municipalities in South Africa. There are three categories of municipalities in South Africa being metropolitan, local and district each responsible for retail water services within their jurisdiction. These municipalities have varying degrees of institutional capacity and financial resources at their disposal, making the provision of basic water services more challenging for the smaller scale municipalities.

According to Bender (2017), utilities in developing countries are typically small scale and lack the capacity and efficiency for water provision. This characteristic is particularly relevant in South Africa, where local and district municipalities serve mostly rural regions of the country, that are unable to pay for basic services. While decentralization ensures that those closest to the issue are the ones implementing solutions, many municipalities lack the financial and institutional capacity to carry out this mandate. This statement is particularly true for the many rural or non-metropolitan municipalities. A large proportion of the municipalities provide retail water services themselves and rely on public funds and the tariffs charged for the cost-of-service provision. The municipal tariffs charged to consumers are dependent on the consumption levels. This is shown in figure 2 below.

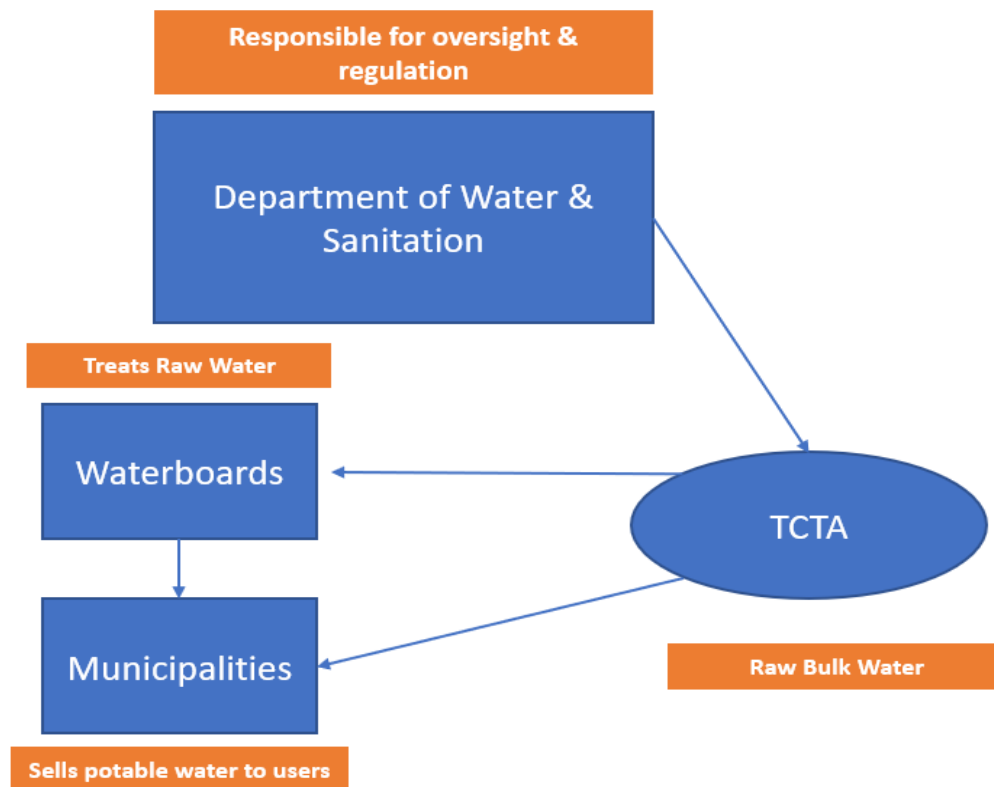


Figure 2 Overview of the South African water sector value chain and stakeholders (author's own)

The Water Services Amendment Act (2004) effectively stipulates that the function of service delivery to consumers are the primary responsibility of municipalities in the South African water sector with the role of water supply and maintenance of existing infrastructure being decentralized from the DWS. The municipality can choose to contract out this responsibility for service delivery. The Municipal System Act prescribes that a municipality can either provide the water services themselves or contract out the services to an external provider such as private water firms. Thus, the legislation enables the ability of privatization of water supply in South Africa.

Due to the supply challenges in South Africa, it provides an interesting and relevant case study for developing countries who have similar challenges. The varying degree of financial and institutional capacities at a municipal level could also provide interesting insight into how configurations perform under different contexts. The municipalities selected for the sample is discussed in more detail in the next chapter.

2.7: Different models of public and private configuration

When it comes to water delivery, there are two common configurations. A public configuration could be used, with water services provided by a utility or government organization. A private configuration, on the other hand, can be used, in which a private organization is contracted to provide some or all of the water services. The most prevalent configuration, known as public involvement, has a municipality taking full responsibility for the water delivery. Alternatively, a few occurrences of PuPs between two public institutions to address capacity and financial difficulties have been documented around the world. However, in the water service sector, there are numerous types of PSP that vary according on the scope and length of the contract.

The private sector's involvement could be temporary, as in service and management contracts, where a private operator is appointed to complete a specific task. A service contract limits the scope of the private operator to technical and administrative responsibilities for one or two years (Pérard, 2009). A management contract typically lasts three to five years and is focused on operational and maintenance obligations (Pérard, 2009). The public sector would still be responsible for the water system's capital investment and upkeep.

A leasing contract, which typically lasts 10 to 12 years, is a longer-term deal. The lease contract is comparable to a management contract in that the private operator's scope is focused on operation and maintenance obligations (Pérard, 2009). However, the lease contract differs in that the private operator bears legal responsibility for the contract (Pérard, 2009).

Alternatively, the private sector could participate in the water sector over the long term in the form of concession contracts. Under these types of arrangements, the private party manages the utility from expansion to the maintenance of the system over a period of 25 to 30 years (Pérard, 2009). Finally, the entire water utility and related businesses can be sold to a private party permanently as was the case in the UK and Chile. Importantly, in a full divestiture the public sector and independent regulatory bodies retain an oversight role (Pérard, 2009).

This study looks into PSP in water services by looking at two municipalities that use private arrangements. One of the municipalities has engaged into a technical and administrative short-term management contract with a private operator.

The other municipality signed a 30-year long-term concession contract, specifically a PPP, with the goal of providing residents with complete water delivery. In the existing literature, there is no clear definition of a PPP. The PPP framework, according to Grimsey and Lewis (2002), can be considered as a method of contracting for infrastructure projects. Others consider public-private partnerships as a system that allows the private sector to participate in the delivery of public goods and services (Grimsey & Lewis, 2002). The purpose of a PPP arrangement, however, is always the same: it is primarily a collaboration between the public and private sectors.

2.8: Performance Scorecard

Regardless of whether water services are provided in a public or private context, a framework must be established to compare the performance of the various configurations used by municipalities. A performance scorecard to measure the performance of water utilities was developed by (Tynan & Kingdom, 2002). The framework is designed to allow utilities from all around the world to be compared and benchmarked. The framework, according to Tynan and Kingdom (2002), encompasses the performance indicators in four main measuring categories:

- Efficiency of investment
- Operational efficiency
- Financial sustainability
- Responsiveness to customers

The efficiency of investment category, according to Tynan and Kingdom (2002), refers to the investment and maintenance of existing water infrastructure. This category is critical in evaluating a utility's performance because sustaining current infrastructure is essential to its long-term operation. Unaccounted for water, as Tynan and Kingdom (2002) point out, is an indirect metric for determining the amount of asset maintenance. This measure represents the difference between the amount of water delivered and the amount of water sold. This is known as non-revenue water in South Africa, and the country's current non-revenue water (NRW) level is estimated to be nearly 37 percent. (Bhagwan & Wegelin, 2016).

According to the top 25 percent of performing developing country utilities, NRW of less than 23 percent should be targeted (Tynan & Kingdom, 2002). A high NRW indicates both improper billing methods and insufficient upkeep. It could also mean there's a lot of wastage and leaks.

A utility that is operationally efficient is one that has the lowest input costs in its daily operations (Tynan & Kingdom, 2002). This metric is critical for evaluating the utility's performance because it indicates expenditure control. Staff per 1000 connections is the most frequent metric for measuring operational efficiency, with a high ratio suggesting operational inefficiency. High operational efficiency ratios, as noted by Tynan and Kingdom (2002), can suggest poor employment practices, but they can also reflect single connections serving multiple households, as is the situation in rural areas. A ratio of 2:1 is considered standard for developing countries as a benchmark (Tynan and Kingdom, 2002).

The ability of a utility to completely recover its costs is critical to its financial health. Failure to fund costs over time might result in a lack of infrastructure reinvestment and a decline in service quality (Tynan and Kingdom, 2002). Utilities that can recoup expenses are more sustainable and can attract more competitive commercial funding, which helps to ensure network expansion and maintenance. According to Tynan and Kingdom (2002), the most widely used metric is the working ratio, which is defined as the ratio of total annual operating expenses to total annual pretax collections. A working ratio of more than one indicates that the utility is unable to recoup its expenses. However, the targeted aim for utilities in developing countries is 0.68. (Tynan and Kingdom, 2002). The proposed target would mean that over time the utility would not have the cash reserves to ensure timely maintenance.

The consumer is the emphasis of the final measurement category, which can be measured using measures like as coverage, affordability, and water quality (Tynan & Kingdom, 2002a). The number of households linked to water access pipes is referred to as the coverage metric. According to the framework, no specific target has been set, but coverage in underdeveloped nations ranges from 18 percent to 100 percent (Tynan and Kingdom, 2002). The affordability score could be calculated by comparing the municipality's connection charge to its GDP per capita (Tynan & Kingdom, 2002a). In underdeveloped nations, affordability is a major concern, and according to the framework, it is not uncommon for fees to approach 60 percent of GDP per capita in some cases.

Water quality is a particularly relevant indicator in South Africa, where municipalities are experiencing poor water quality. Water quality has always been an issue in South Africa, as evidenced by the cholera epidemic in Delma, Mpumalanga, in 2007. As a result, the DWS launched the Blue Drop Certificate program in 2008 in order to improve public confidence in water quality. A Blue Drop Certification is a mandatory annual evaluation that certifies that the municipal drinking water is of acceptable quality and safe to drink. The DWS decided to modify the certification methodology in 2014, hence the Blue Drop Certification program was limited. While the program has yet to be re-established, many municipalities are continuing to follow the evaluation standards to ensure water quality. Independent research organizations are usually in charge of these evaluations.

Tynan and Kingdom (2002) developed a framework that may be used to compare and measure utility performance. While the sample used to benchmark performance includes both developed and developing countries, the sample also includes 44 developing countries. This provides sufficient information to ensure that the benchmarks used to evaluate the findings are relevant.

Figure 3 below is an illustration of the framework depicting the performance scorecard.

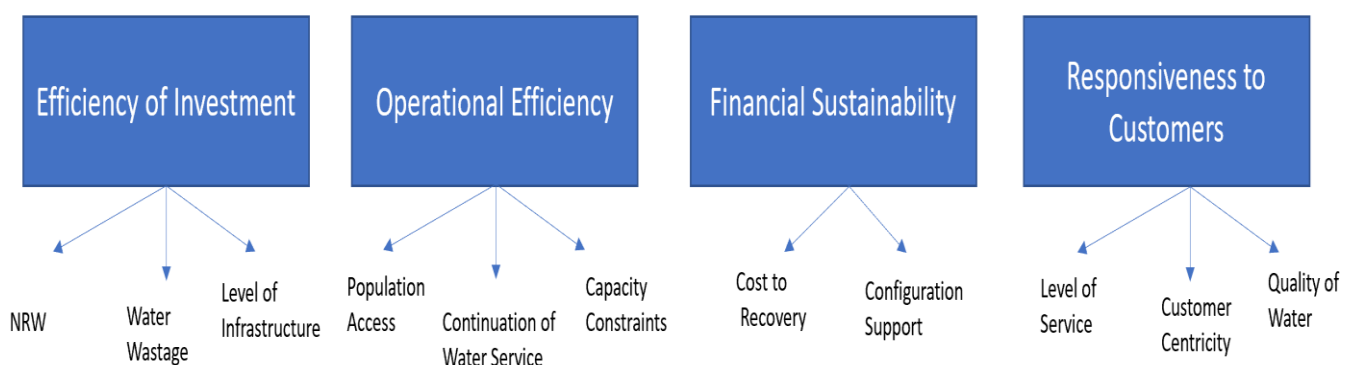


Figure 3 Performance Scorecard Framework (author's own)

This framework has been used as the basis of both the quantitative comparison as well as the qualitative interviews utilised for data collection in this study.

2.9: Conclusion

This chapter started by looking at public and private water configurations. Arguments from both proponents and opponents were put forward. The TCE and PA theories were discussed with emphasis to their relevance in the water supply debate. The chapter then went on to discuss water supply in developed countries, with an emphasis on the United Kingdom and France. The focus then turned to developing countries and South Africa and its water supply was discussed in detail. The different models of water supply were reintroduced and the Performance Scorecard from (Tynan and Kingdom, 2002), which will be used as the framework for the data discussion was discussed. The following chapter will discuss the research methodology in detail.

Chapter 3: Research methodology

3.1: Introduction

This research study is interested in answering the research question: How do South African municipalities ensure adequate water provision for all its citizens? The research methodology and design utilized to investigate the study's specific research questions are presented in this chapter. In this chapter, the research approach that will guide this research and the outline of the research methodology, including the data collection and data analysis methods that will be applied, will be discussed.

3.2: Research approach

Any study can use one of three research approaches: quantitative, qualitative, or mixed methods, which is the mixture of qualitative and quantitative methodologies (Creswell, 2003). The research philosophy that this study follows is one of pragmatism. According to Creswell (2014), actions, situations, and outcomes, rather than prior conditions, are the source of pragmatism as a worldview. Given that this research is about taking different perspectives from multiple stakeholders into account, adopting a pragmatic approach seems most sensible.

Given the pragmatic research philosophy, and multiple perspectives that this research takes into account, a mixed method research approach is followed. A mixed research approach using quantitative and well as qualitative data sources will ensure that the research is rich with insight and data. The main reason for the selection of the mixed methods approach was to ensure the validity of the study findings. By using both quantitative and qualitative methods, a deeper understanding of the research objectives was obtained.

3.3: Research Design

Convergent parallel, explanatory sequential, and exploratory sequential are the three primary study designs for doing mixed methods research (Creswell, 2003). According to Creswell (2003), A convergent parallel design is one where the qualitative and quantitative data are collected simultaneously, where the exploratory and explanatory sequential designs relate to the collection of data in sequential order, with the findings of one approach explained using the findings of another method. This study utilises an explanatory sequential design as shown in figure 4.

According to Hanson, Creswell, Plano Clark, Petska and Creswell (2005), the primary purpose of the explanatory sequential design is to explain relationships or study findings. In this design, the quantitative data is collected first followed by the qualitative data. The qualitative data is mainly used to enhance the quantitative data collected.

The researcher is convinced that employing a quantitative approach ahead of a qualitative approach in this study, ensures that the data collected to populate the performance scorecard would be objective, with no bias from the researcher based on interviews or feelings from the public officials interviewed. This approach also resulted in there being more in-depth conversations in the qualitative section with the respondents, using the quantitative information as a backdrop.



Figure 4 Explanatory sequential research design for the study

The first research objective is aimed at determining which configuration is best suited to improving water service delivery in South Africa. To address this research question, four WSAs employing either a public or private configuration, were compared in terms of the performance indicators identified in the literature review. The data collected to perform the underlying metrics for each performance indicator was obtained from publicly available reports. Quantitative methods were used to analyse the data and produce the comparison.

To address the second two research objectives outlined in chapter 1, a better understanding of the experiences of existing configurations in the South African retail water sector was required. The study involved enquiring about the experiences of chosen WSAs in terms of its performances against measurable indicators. The research required the formulation of a theory based on information collected through interviews with respondents.

Accordingly, a qualitative approach was used in addressing the research problem. Qualitative research allows for the understanding and description of a topic rather than the explanation thereof (Mouton, 2001). Furthermore, a qualitative approach allows the researcher to understand a subject through the eyes of respondents, allowing the researcher to understand issues from the perspective of those closest to the concern. This research study used semi structured interviews as a method in the qualitative section of research.

3.4: Sampling

The setting of this study is the retail water supply sector in South Africa because of the sector's theoretical and practical importance. The study reviewed different models and best practices in provision of water supply services by municipalities. The target population for the study was all municipalities employing a public and private configuration for water provision. For the quantitative component of the study, four WSAs were selected. Two WSAs represented a public configuration with the other two representing a private configuration. Furthermore, the municipalities, except for the City of Johannesburg, are classified as local municipalities, enabling a comparison between municipalities with more or less the same capacity levels. The City of Johannesburg was selected as part of the sample for triangulation purposes and on the basis of it representing a short-term management contract. The municipalities are a mix of urban and rural municipalities, thereby providing a snapshot of the different approaches in varying contexts about water provision in South Africa. A purposive sampling approach was utilised as opposed to a random sampling approach. In this approach sample units are chosen because of their characteristics, enabling the researcher to identify and understand themes in the data collected (Richie & Lewis, 2003).

With respect to the qualitative approach of the study, two of the WSAs each representing a public and private configuration were selected. The qualitative data was collected with the aim of understanding the context behind the performance of WSAs against the performance indicators that were concluded in the quantitative part of this research. The primary reason for collecting qualitative data for only two of the four WSAs selected was due to constraints both from the municipalities' and the researcher's perspectives. The Johannesburg water management contract had been concluded in 2005. As a result, secondary data was the richest source of information on the contract.

Unfortunately, after numerous attempts at trying to schedule interviews with the Drakenstein WSA, the researcher needed to continue the study due to time constraints. Furthermore, the researcher attempted to schedule interviews with other municipalities, but had not been able to do so. As a result, interviews took place with the City of Mbombela and Stellenbosch Local Municipality.

In assessing the suitability of a public configuration for retail water supply, the Director of Infrastructure Services from the Stellenbosch municipality has been interviewed. The director has been in this role for nine years. His role oversees all infrastructure services provided to the communities in the municipality including water, electricity, waste services and sanitation. Water services is further split into reticulation, networks and sourcing functions. All of which forms a part of the ambit of responsibility of the Director of Infrastructure Services.

To determine the suitability of a private configuration for retail water services, the deputy Municipal Manager from the Mbombela local municipality was interviewed. The Deputy Municipal Manager is responsible for ensuring service delivery to the communities is adequate and in line with the integrated development plan. Specifically, the Deputy Municipal Manager is responsible for monitoring the Silulumanzi Concession performance. This is particularly relevant as the interview provided insight into the concession performance through the lens of the municipality.

Table 1 below, shows a synopsis of the interviewees.

Table 1 Synopsis of Interviewees

Stellenbosch Local Municipality	City of Mbombela
Director of Infrastructure Services	Deputy Municipal Manager
Responsible for: Infrastructure Services including Water, Electricity, Waste and Sanitation	Responsible for: Service Delivery including Water, Electricity

3.5: Data Collection Methods

The first research objective of this paper was aimed at determining which configuration is best suited to improving water service delivery in South Africa. The basis of the data collection in this objective used existing literature from four municipalities annual reports and official papers. The Secondary sources such as annual reports and development plans used to collect the quantitative data are publicly available on the official municipal website. The researcher used the publicly available data from 2020 to 2015 to gather the necessary financial information to inform the key performance metrics in the model produced by the researcher. The model used was informed by (Tynan & Kingdom, 2002).

In order to validate and deepen understanding around contextual issues, qualitative semi-structured interviews, providing authoritative knowledge, were conducted in order to collect qualitative data and answer the second and third research objectives, which centred around private or public configurations. The use of semi-structured interviews, as opposed to structured interviews or questionnaires, allowed the interviewer to be more exploratory in questioning given the different experiences and perspectives of the person being interviewed. Given the different contexts in which each municipality operates, it was vital to understand the reasoning behind the performance indicators. The advantage of using the semi-structured interview approach was that data collection could be more flexible and adaptable to new themes found during the research process (Bryman & Bell, 2011).

The interviews had been conducted in English, and audio recordings were taken to provide the researcher with an in-depth understanding of the topics as well as evidence of the interviews. An interview protocol was used to give focus to interviews and ensure that critical issues were addressed. The key points were summarised and confirmed with respondents before use, thereby ensuring the accuracy and validity of the data.

The qualitative semi structured interviews were further used to test accuracy and provide validity to the performance indicators outlined in the quantitative data gathered from annual reports and journals in the literature review. The interview protocol used in the study is presented in Appendix A.

3.6: Data analysis methods

The quantitative part of the research was done to answer the first research objective which was to determine which configuration is the most suitable given the socio-economic context in South Africa. Here the researcher used the empirical data collected from the secondary sources to quantify and compare the performance metrics. The key performance metrics are captured in four broad categories, namely (Tynan & Kingdom, 2002):

- Efficiency of investment
- Operational efficiency
- Financial sustainability
- Responsiveness to customers

The performance of the WSAs were compared and ranked according to the performance metrics. The performance metrics were then compared against the top performing developing country utilities benchmarks highlighted in the literature review and by Tynan & Kingdom, (2002). To provide further description and to highlight the performance of the public and private configurations, the mean score and standard deviation were calculated for each of the WSAs over the assessment period.

The qualitative part of the research, which answered the second and third research objectives around whether public or private configurations were better, was done using semi-structured interviews. Qualitative analysis is primarily concerned with the study of interviews and conducting content analysis (Welman, Kruger, & Mitchell, 2005). The analysis involved the transfer of raw data into themes which in turn were used to achieve the research objectives.

The researcher utilised an inductive approach to the thematic analysis, thereby allowing the themes to be identified as a consequence of the data collected. Furthermore, the researcher's judgement was an important consideration in determining themes and these were not solely based on the frequency of responses (Braun & Clarke, 2006).

Whilst the frequency of themes was valuable in analysing the performance of WSAs, additional information collected through the interview process was vital in providing a more in-depth understanding behind the themes and frequencies highlighted.

The following steps, shown in Table 2 below, adopted by Braun and Clarke (2006) were undertaken in analysing the data:

Table 2 Data analysis steps (adopted from Braun and Clarke (2006))

1.	Familiarising oneself with the data	This step involved studying the responses from the interviews conducted with the WSAs and converting the collected data into a single body of the text. Since the interview was based on the performance metric model produced in the quantitative section of this research, the information collected from WSAs, in the interview, was compared for validity and insight.
2.	Coding the data by highlighting vital information	This step required the researcher to identify and highlight vital information from the interviews that was instrumental in the research. Key amongst this information were the performance metrics that were highlighted in the quantitative model. The context and deeper insights were mapped to each performance criteria.
3.	Searching for themes from highlighted information	The next step was to sort the highlighted information from the previous step into clear themes based on similarities. Here the researcher looked for common themes across the public and private configurations in the different WSAs.
4.	Reviewing the themes identified	This involved a review of the themes identified for both accuracy and consistency. The information was further reviewed to identify any themes missed from the first review.
5.	Defining the themes identified	The themes were then defined for clarity, and frequency distribution of the identified themes was created.
6.	Reporting on the results after comparing themes with relevant literature	The results were explained using the themes identified from the data collected. Through thematic analysis as well as descriptive statistics, the qualitative data collected was analysed. Furthermore, additional information relating to the context of the WSA was used to provide an understanding of the emerging themes. The synthesized results, coupled with relevant literature, were used to compare the WSAs and the configurations they represent to address the research sub-questions.

3.7: Reliability and validity

According to Welman et al. (2005), the reliability of a qualitative study relates to the credibility of the outcomes. In this regard, the researcher is responsible for ensuring the credibility of the information collected before utilising it in the study. One of the concerns with utilising a semi-structured interview approach is the non-standardisation of responses from interviewees, as such, the reliability of the data could be of concern (Saunders, Lewis & Thornhill, 2012). To mitigate this concern, the use of an interview protocol was used to focus the interview. Furthermore, the interview protocol ensured that each interview was conducted in the same manner, facilitating consistency and ease of theme collection. The research supervisor reviewed the protocol prior to using it to further enhance internal validity.

In quantitative research, the validity of the research refers to how accurate a concept measured (Heale & Twycross, 2015). A key component of validity is content validity, which speaks to the ability of the measurement instrument to fully capture what is being measured (Heale & Twycross, 2015). The performance metrics adopted from the study conducted by Tynan & Kingdom, (2002) were developed and derived from the assessment of a large number of water utilities across both developing and developed countries enhancing content validity. External validity is defined as the generalisability of the research findings beyond the scope of the study (Creswell, 2014). The purposively selected sample and authoritative nature of the study impedes the generalisability of its findings to another situation.

The validity of qualitative research is concerned with the accuracy of the data collected. In order to ensure this accuracy, data collected in interviews was compared to secondary data from the literature review for validity. Additionally, to ensure the accuracy of the data collected, the researcher provided a summary of the key discussion points to the interviewees for confirmation and validation before use in this research paper. Finally, the recordings of the interviews allowed the researcher to transcribe and review the content, further ensuring accuracy.

Generalizability and a lack of saturation are two fundamental principles to consider when assessing the data validity of a qualitative study. Saturation in research is viewed as the point at which no new data can be discovered. Accordingly, saturation in qualitative research is achieved by increasing the number of interviews conducted (Morse, 2003).

The concept of generalizability is also concerned with extending research findings on a sample population to the entire population when the findings are not a true reflection of the population. This study aimed to understand the experiences of the various configurations in the South African retail water sector to ascertain which configuration was the most viable solution to expand water provision. The configurations were represented by the case studies selected for the study.

Due to the limited number of PPPs prevalent in the South African retail water sector, the sample selected in terms of the private configuration represented a large proportion of the population alleviating concerns around generalizability and a lack of saturation. Concerning the public configuration for retail water services, two WSAs representing very different contexts were chosen to understand the performance of WSAs using public provision from both urban and rural municipalities. While there were specific challenges within each municipality, assessing two municipalities from opposite ends of the spectrum provided a good base from which to analyse the general issues constraining retail water supply.

Interview biases were mitigated applying the following interview techniques as advised by Saunders et al. (2012, p. 383):

1. Level of Knowledge: The interviewer was required to be well versed on the topic. This is achieved through the literature review and reading of secondary data on the research topic.
2. Level of information supplied to the interviewee: The interviewer is required to brief the organisation on what the interview is intended to address and the topic that will be discussed. This allows the organisation to send the appropriate individual to partake in the interview.
3. Approach to questioning: The appropriate number of open-ended and probing questions is asked by the interviewer to extract the interviewee's perspective.
4. Demonstration of listening skills: The semi-structured interview approach lends itself to an engaging conversation where the researcher is required to listen to ask the appropriate questions.

3.8: Limitations

This qualitative component of the research was conducted with two municipalities, and whilst consideration in choosing them considered the different models that they employed, interviewing more municipalities may have provided more insight or confirmation of insights extracted. While the researcher attempted to increase the sample of municipalities interviewed, it was ultimately limited to the two selected. However, the triangulation with secondary data and existing literature provides some mitigation to this limitation. Given that the interviews were conducted during the COVID pandemic, they were held online and via the telephone. The obvious limitation here is that the researcher did not have the opportunity to form a natural rapport with the interviewee and body language was difficult to see. Fortunately, the interviewees were open, and dialogue was free flowing. None of the limitations highlighted posed a significant threat to the feasibility of the study.

3.9: Conclusion

This chapter outlined the research philosophy as pragmatism, given that this research is concerned with action and outcomes considering multiple perspectives. The research approach was discussed as being a mixed method study using both quantitative and well as qualitative methods. Purposive sampling was used in this study as the individuals interviewed were required to have deep knowledge about the WSAs that they represented. The data collection for the study was discussed. The data analysis steps followed were outlined. Finally, the reliability and validity of the study was discussed. The following chapter will discuss the geographical context and explain in more detail the four municipalities selected for this study.

Chapter 4: Geographical Context

4.1: Introduction

This chapter provides geographical context to the four municipalities in South Africa that this study looked at. It provides background information on the various municipalities and discussing the water configuration in each. The figures below depict maps showing four WSAs locations a) Mbombela, b) Stellenbosch & Drakenstein and c) City of Johannesburg.

4.2: City of Mbombela

4.2.1: Introduction

The City of Mbombela Local Municipality is a Category B municipality in the Ehlanzeni district in the province of Mpumalanga (City of Mbombela, 2020). The municipality, which was established in 2016, is relatively large and makes up about a third of the entire district (City of Mbombela, 2020).

Mbombela means 'a lot of people together in a small space' in siSwati, with a population of over 700 000 people in an area covering just over 7140km² (City of Mbombela, 2020). A significant proportion of the municipality is made up of rural land with the municipality mandated to cater to the development of its people. The city of Mbombela, previously known as Nelspruit, is the capital of the Mpumalanga province, the predominant language spoken is siSwati followed closely by isiZulu and the ANC is the ruling political party in the municipality. Figure 5 below shows a map of Mbombela Municipality regions.

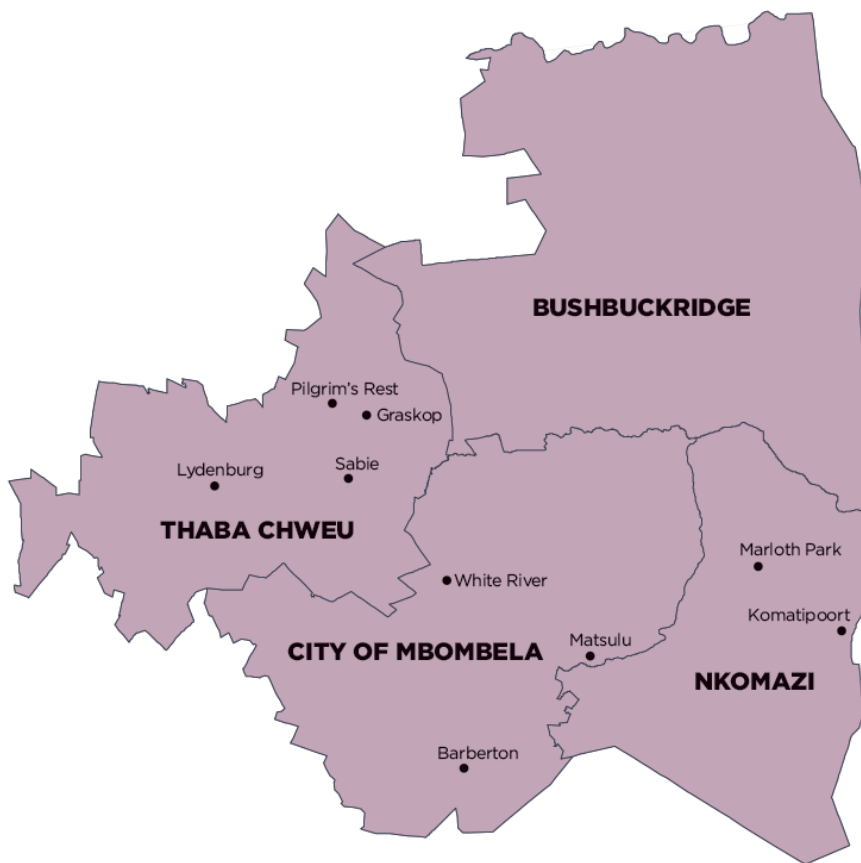


Figure 5 A map of the City of Mbombela Municipality regions – source City of Mbombela (2020)

4.2.2: Challenges

Over the years, the borders of the City of Mbombela have grown as a result of the transformation of local government. However, the areas serviced by the concession has remained the same further exacerbating the financial and human constraints inherent in the municipality. According to municipality's estimates, the concession covers over 50 percent of the entire municipal region in terms of water provision. The municipality is characterized by summer rainfalls in which water production is increased. However, given recent changes in climate patterns, summer rainfalls had been relatively sparse, resulting in the municipality introducing water conservation measures such as drought tariffs penalizing increased usage.

4.2.1: Water supply

In terms of water services, the municipality entered into a 30-year concession, in 1999, with a private entity called Biwater to provide retail water services to the municipality. An entity called Silulumanzi was formed to provide these services to the municipality over the 30-year concession period. The rationale for entering into this PPP between the City of Mbombela and Silulumanzi was to alleviate the financial human capital constraints that were being experienced.

The initial intention of the PPP was to improve service delivery in the peri-urban areas. The urban areas were excluded on the basis that they were well covered by the municipality itself. However, the introduction of the free basic services in the country, resulted in the concession no longer meeting the private entity's return requirements due to the lack of cost recovery in terms of the free basic services. Consequently, the concession was restructured to include certain urban areas, which would not be subject to the free basic services, allowing the private entity to meet its return requirements.

4.3: Stellenbosch Local Municipality

4.3.1: Introduction

The Stellenbosch Local Municipality is a Category B municipality in the Cape Winelands District in the Western Cape Province (Stellenbosch, 2020). The municipality is relatively small, making up only 4 percent of the provinces geographical area (Stellenbosch, 2020). The area is famously known for agriculture and wine production, with the main town being Stellenbosch around 50km from Cape Town. It is a wealthy municipality and covers a modest area of 831km² servicing a population of circa.180 000 (Stellenbosch, 2020). Figure 6 below shows a map of Stellenbosch Local Municipality regions.



Figure 6 A map of the Stellenbosch Local Municipality regions – source Stellenbosch (2020)

4.3.2: Challenges

The municipality is characterized as having winter rainfalls in which water production is increased. However, given recent changes in climate patterns as evidenced by the Western Cape drought in 2017, the predictability of rainfall has become increasingly challenging. During the drought crisis, the municipality spent a substantial portion of its capital expenditure on setting up bore holes within the municipal region. The water sourced from these bore holes was purified and introduced into the network.

In terms of the level of demand within the municipality, the drought had a significant impact on usage of water as a result of increased consumer knowledge around this precious resource. While the water usage is still relatively high, the average usage per household has almost halved since the water restrictions were lifted.

This is indicative of a behavioural change as a result of the severe water restrictions put in place at the height of the drought and perhaps more awareness from residents to be more mindful around usage.

4.3.3: Water supply

In terms of water services, the municipality is responsible for providing the service. It provides useful context into the experience of urban municipalities being able to provide retail water services financed by the end-users. The municipality sources water from three main points being a quota received from the Eerste River, water sourced from the Theewaterskloof Dam and water purchased from Cape Town and Franschhoek. The cheapest water is sourced from the Eerste River as the municipality receives an allocation at no cost, the second cheapest is the Theewaterskloof sourced water, with the most expensive water being the water purchased from Cape Town and Franschhoek.

4.4: Drakenstein Local Municipality

4.4.1: Introduction

Drakenstein Local Municipality is a Category B municipality in the Western Cape's Cape Winelands District, some 60km east of Cape Town's Central Business District (Drakenstein, 2019). The municipality is strategically positioned on national road and railway networks leading to the rest of South Africa, effectively serving as the city's gateway. Paarl, Wellington, Saron, Gouda, Hermon, Mbekweni, and Simondium make up the Drakenstein Municipality, which spans 1,538 square kilometres (Drakenstein, 2019).

It is the region's economic hub, having a strong agricultural, tourist, light manufacturing, and business services foundation. In the Cape Winelands District Municipality, the Drakenstein Municipality has the highest proportion of people. According to current population estimates, the Drakenstein municipal jurisdiction is home to 280,425 people (Drakenstein, 2019). Figure 7 below shows a map of Drakenstein Local Municipality regions.



Figure 7 A map of the Drakenstein Local Municipality regions – source Stellenbosch (2020)

4.4.2: Challenges

The municipality is also known for having heavy winter rainfall. Due to the Western Cape drought, the municipality has had to consider alternative sources of water to satisfy demand. One such avenue explored by the municipality, is the use of grey water for acts such flushing the toilets and gardening. The municipality, together with developers, have begun to implement systems for purifying grey water across the municipality to prepare itself for the inevitable future impacts of climate change.

4.4.3: Water supply

The municipality, like the Stellenbosch Municipality, is responsible for water provision in the area. The Municipality sources water from various points. The bulk of the water servicing the Paarl and Wellington regions is bought from the City of Cape Town's Wemmershoek Dam.

The remaining water is sourced from the Antoniesvlei scheme in Bainskloof within the municipality itself. The Leeu River services the Saron region, while Gouda's water demand is supplied with water from the Voëlvlei Dam.

4.5: Johannesburg Water

4.5.1: Introduction

The City of Johannesburg Metropolitan Municipality is a Category A located in the Gauteng Province. Johannesburg is widely considered as the economic hub of Africa and is the business and commercial centre of the South African economy. While the city is considered one of the wealthiest cities in Africa, it is characterised by substantial inequality and has a large peri-urban population. As the largest city in South Africa, the city is home to almost five million people, accounting for about 36 percent of Gauteng's population and 8 percent of the national population (City of Johannesburg, 2020). Figure 8 below shows a map of Johannesburg Municipality regions



Figure 8 A map of the City of Johannesburg Municipality regions – source City of Johannesburg (2020)

4.5.2: Challenges

At the time of entering into the management contract, the water service delivery in the Johannesburg Metropolitan was substandard. “Employee motivation was weak, with poor customer service as the norm. Capital investment projects ran into recurrent delays and cost overruns, and operational problems of the sewerage system had become a growing environmental concern” (Marin, Mas & Palmer, 2009).

The main rationale behind this was a lack of cohesion stemming from a consolidation of multiple service areas into one large metropolitan service area. According to Marin et.al (Marin et al., 2009), this was not unique to the City of Johannesburg and was a function of the end of apartheid in South Africa. Consequently, the consolidation meant major administrative reorganisation resulting in fragmentation and distinct lack of accountability. Ultimately, the Municipality decided to corporatize and enter into a short-term management contract with a private entity to overcome these challenges.

4.5.3: Water supply

The City of Johannesburg entered into a five-year management contract with the international operator, Suez, to form the Johannesburg Water WSA. The management contract between the Johannesburg Water WSA and Suez extended from 2001 to 2005. The arrangement was deemed a resounding success, with Johannesburg Water being ranked the best large water utility by the end of the management contract. Over the term of the contract, the WSA met or exceeded contractual targets by more than 90 percent, resulting in significant gains in customer service, environmental compliance, and cost effectiveness. In addition, the management contract was instrumental in ensuring a total financial turnaround, bringing the utility from the brink of bankruptcy to a tiny profit (Marin et al., 2009).

4.6: Conclusion

The four municipalities chosen, as discussed in this chapter, follow either a public or private retail water configuration. Three of the four are classified as local municipalities responsible for a similar capacity level. The challenges faced by these municipalities include, population growth and migration, climate change and overall lack of service delivery. The following chapter will detail the results of this research.

Chapter 5: Research findings and analysis

5.1: Introduction

This chapter presents the research findings obtained following the methodology explained in Chapter three. The first part of this chapter focuses on the quantitative component of the study, where a comparison was conducted across the municipalities employing public and private configurations. The data here was collected from annual reports as discussed in chapter three.

To note, four WSAs are considered in the quantitative component of this study. The City of Mbombela and Johannesburg Water represent privately configured municipalities in the sample, while Stellenbosch and Drakenstein represent publicly configured municipalities.

The rest of the chapter unpacks the key findings from the interviews conducted with the Stellenbosch and Mbombela local municipalities, with the aim of unearthing a deeper understanding of the results attained in the quantitative analysis.

As discussed in the literature review, the efficiency of investment, operational efficiency, financial sustainability, and customer responsiveness are the four-performance metrics used to evaluate each WSA's success in terms of water service delivery.

5.2: Comparison across configurations in the South African context

The performance of four WSAs, employing varying degrees of public or private configurations, have been compared across a five-year period. The period under review extends from 2015 up until 2019. For comparison, the management contract between the Johannesburg Water WSA and Suez from 2001 to 2005 has been included in the sample as this would strengthen the triangulation of the data and also provides insights into short term management contract as opposed to the long-term concession with Mbombela municipality. The purpose of this section was to identify which configuration performed the best in terms of water services based on the comparison.

5.2.1: Efficiency of investment

The efficiency of investment performance indicator is a measure of the level of ongoing maintenance of existing infrastructure within the municipality. The indirect measure of efficiency of investment can be viewed by taking a look at non-revenue water (NRW).

Looking at Stellenbosch Local Municipality, the data over the five-year period reviewed for this metric shows, in 2019, the level of NRW was at 20.8 percent. For 2018, the level of NRW was 21.7 percent. For 2017, the level of NRW was 21.8 percent.

For 2016, the level of NRW was 24.4 percent. For 2015, the level of NRW was 22.3 percent. This shows a downward trend in the level of NRW in the municipality. It is indicative of less water loss as a result of more maintenance effort. Over the 5-year period, Stellenbosch Municipality had a mean NRW of 22.2 percent, which places it firmly in the top 25 percent of developing countries utilities, as outlined in chapter 2. The standard deviation over the same period was 1,34 percent indicative of a stable performance in those years.

The City of Mbombela Local Municipality, from the data over the five-year period reviewed for the NRW metric shows, in 2019, the level of NRW was 50 percent. For 2018, the level of NRW was 47 percent. For 2017, the level of NRW was 42 percent. For 2016, the level of NRW was 42 percent. For 2015, the level of NRW was 41 percent. This shows an upward trend in the level of NRW in the municipality. It is indicative of more water loss as a result of less maintenance effort. Over the 5-year period, The City of Mbombela Municipality had a mean NRW of 44.4 percent, which places it outside of the top 25 percent of developing countries utilities, as outlined in chapter 2. The standard deviation in that time was 3,91percent highlighting some variability in performance in those years.

Johannesburg Water, whilst the data is over a different period (2001-2005), the findings are still relevant as a comparison. The data shows, for 2005, the level of NRW was 35.8 percent. For 2004, the level of NRW was 33 percent. For 2003, the level of NRW was 35.9 percent. For 2002, the level of NRW was 40.7 percent. For 2001, the level of NRW was 36.3 percent. This shows a slight downward trend in the level of NRW in the municipality. Over the 5-year period, Johannesburg Water had a mean NRW of 36.3 percent, which places it outside of the top 25 percent of developing countries utilities, as outlined in chapter 2. The standard deviation over the same period was 2,77percent indicative of a fairly stable performance in those years.

For Drakenstein Local Municipality, the data over the five-year period reviewed for the NRW metric shows, in 2019, the level of NRW was 16.9 percent. For 2018, the level of NRW was 13.2 percent. For 2017, the level of NRW was 13.8 percent. For 2016, the level of NRW was 10.1 percent. For 2015, the level of NRW was 13.1 percent. This shows an upward trend in the level of NRW in the municipality.

Whilst this is indicative of more water loss as a result of less maintenance effort; it is still well within the top 25 percent of developing countries with a mean of 13.4 percent. The standard deviation over the same period was 2,43 percent highlighting a fairly stable performance in those years.

The graphs below, figure 9 and 10, show how each of the WSAs performed in terms of investment efficiency during the last five years, up to 2019, and 2005 for the Johannesburg Water WSA.

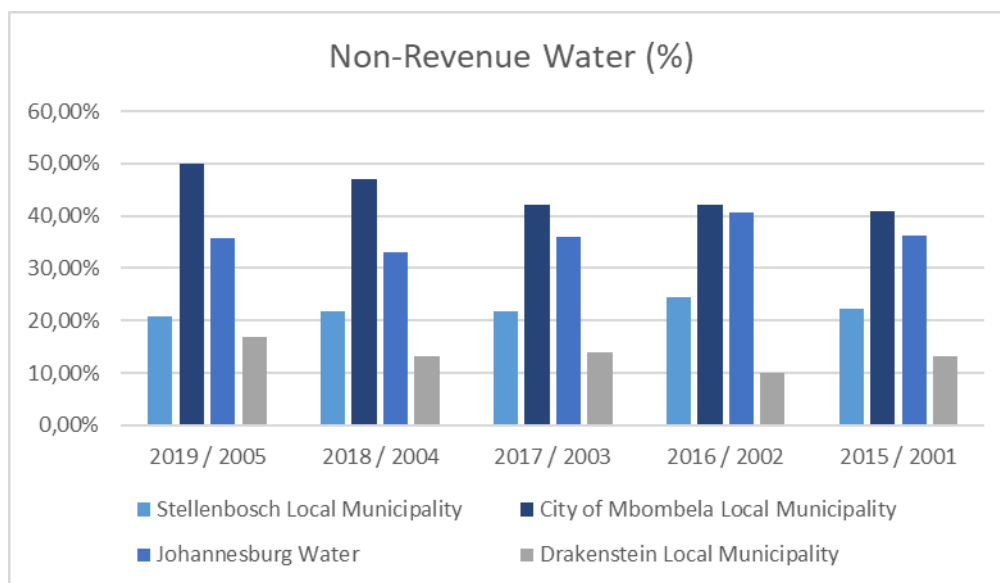


Figure 9 NRW percentage

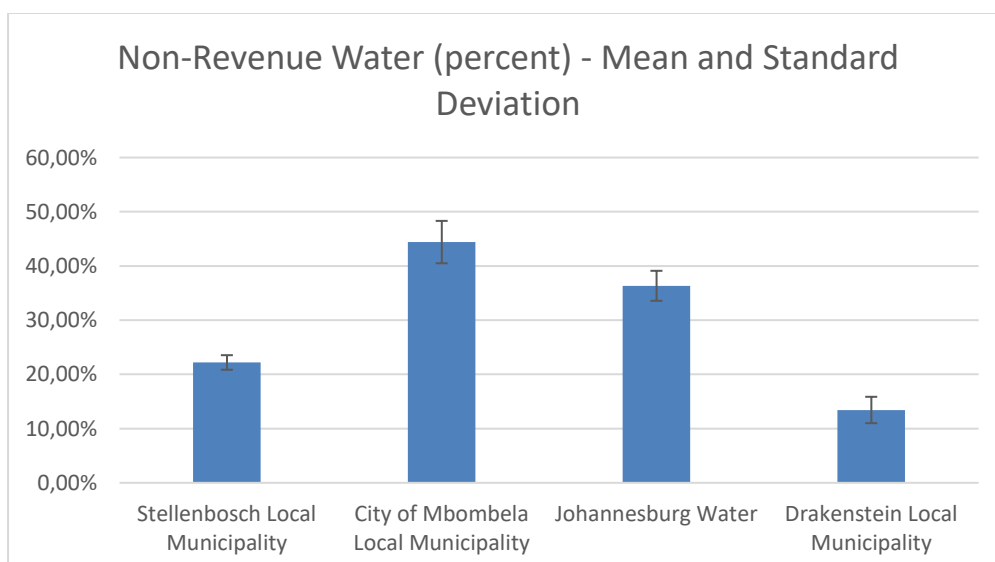


Figure 10 NRW - mean and standard deviation

Linking to the researcher's first research question: *What is the most suitable configuration to ensure adequate water provision in South Africa?* The efficiency of investment performance indicator suggests that publicly configured municipalities have fared better than their private counterparts as demonstrated by the NRW data presented above.

5.2.2: Operational efficiency

The operational efficiency performance indicator is a measure of inputs to produce the level of output in the operation of a utility. It is essentially a measure of the costs incurred to produce the required output of the utility. A common metric used to measure a utility's operational efficiency is the number of staff per 1000 connections, where a high ratio is indicative of inefficiencies in achieving the water connection mandate of the utility.

For Stellenbosch Municipality, the operational efficiency ratio for 2019 was 5.4. For 2018, the ratio was 3.8. For 2017, the ratio was 3.9. For 2016, the ratio was 3.6 and for 2015, the ratio was 3.8. This shows an upward trend indicating operational inefficiencies. The next chapter will discuss the research findings in more detail, but this could be indicative of a bloated staff composition. The mean ratio is 4, whilst a ratio of 2, as discussed in Chapter 2, is considered a targeted benchmark for developing countries. The standard deviation of 75,27 percent indicates significant variability in the performance over the assessment period.

For the City of Mbombela, the operational efficiency ratio for 2019 was 1.4. For 2018, the ratio was 1.5. For 2017, the ratio was 1.6. For 2016, the ratio was 1.6 and for 2015, the ratio was 1.8. This shows a downward trend indicating operational efficiencies expected from private sector involvement. The mean of 1.6 which is within the targeted benchmark of 2. The standard deviation of 15,27 percent shows some variability in the performance over the assessment period.

For Johannesburg Water, the operational efficiency ratio for 2005 was 4.9. For 2004, the ratio was 4.9. For 2003, the ratio was 4.9. For 2002, the ratio was 5 and for 2001, the ratio was 5.1. This shows a consistent trend indicating operational inefficiencies as it is well above the targeted benchmark of 2. The mean of 0,94 is well within the targeted benchmark of 2. The standard deviation of 7,54 percent indicates a small amount of variability in the performance over the assessment period.

For Drakenstein Local Municipality, the operational efficiency ratio for 2019 was 1.1. For 2018, the ratio was 1.2. For 2017, the ratio was 1.3. For 2016, the ratio was 1.2 and for 2015, the ratio was 1.2. This shows a consistent trend indicating operational efficiencies as it is well within the targeted benchmark of 2. The mean of 0,64 is well within the targeted benchmark of 2. The standard deviation of 7,03 percent indicates little variability in the performance over the assessment period.

The graphs below, figure 11 and 12, show how each of the WSAs performed in terms of operational efficiency during the last five years, up to 2019, and 2005 for the Johannesburg Water WSA

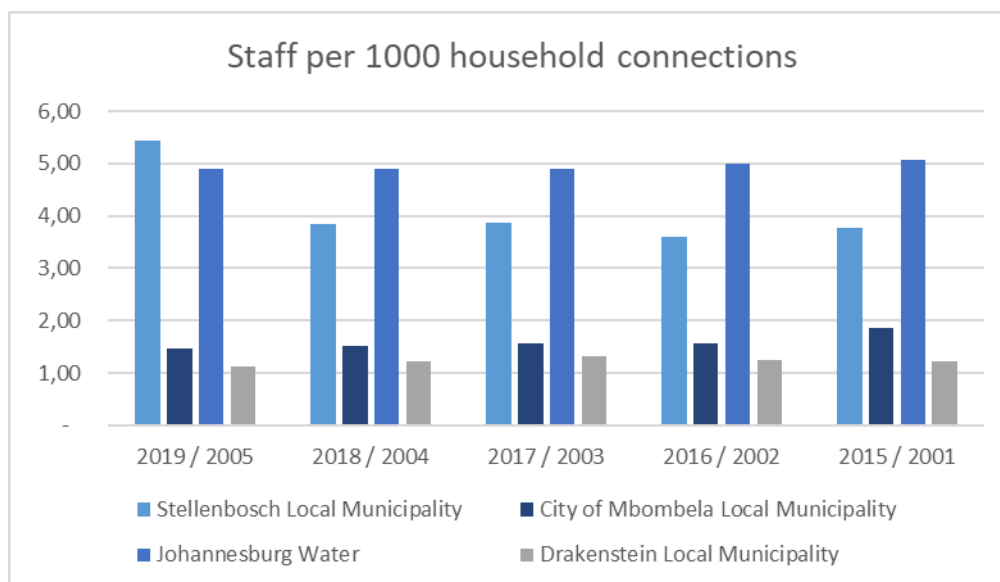


Figure 11 Staff per 1000 Household Connections

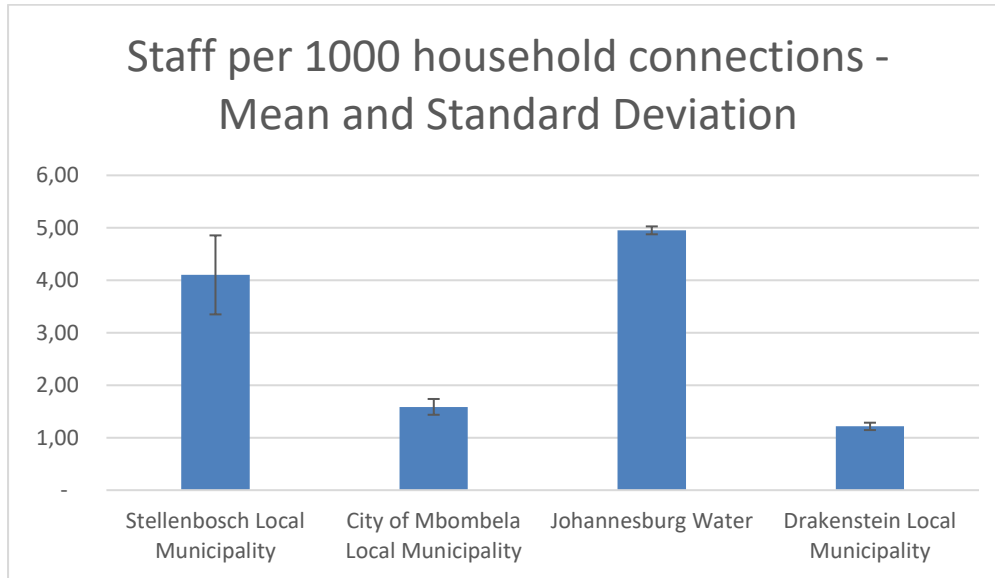


Figure 12 Staff per 1000 Household Connections – Mean and Standard Deviation

Linking to the researcher’s first research question: *What is the most suitable configuration to ensure adequate water provision in South Africa?* The operational efficiency performance indicator, as a standalone measure used to answer the first research question, does not provide conclusive evidence suggests that one configuration has performed better than the other as demonstrated by the data presented above.

5.2.3: Financial sustainability

The ability of a utility to recover the cost of providing a service is referred to as the working ratio. This will be used as the performance indicator for financial sustainability.

For Stellenbosch Municipality, the working ratio for 2019 was 0.77. For 2018, the ratio was 0.59. For 2017, the ratio was 0.48. For 2016, the ratio was 0.64 and for 2015, the ratio was 0.78. This shows consistent trend indicative of the fact that the municipality was able to fully recover all operational costs. At a mean of 0.65 over the five-year period, the Stellenbosch Municipality is within the top 25 percent of developing countries utilities. The performance has shown some variability as indicated by the standard deviation of 12,76 percent.

For the City of Mbombela, the working ratio for 2019 was 1.06. For 2018, the ratio was 1.06. For 2017, the ratio was 1.06. For 2016, the ratio was 0.97 and for 2015, the ratio was 0.98. This shows an upward trend indicating that at a mean of 1,03, the municipality was on average, unable to recover all operational costs. The standard deviation of 4,39 percent is indicative of fairly muted variability in the performance.

For Johannesburg Water, the working ratio for 2005 was 0.83. For 2004, the ratio was 0.86. For 2003, the ratio was 0.95. For 2002, the ratio was 1 and for 2001, the ratio was 1.06. This shows a downward trend indicating that the municipality was able to recover its operational costs, with a mean of 0,94 over the assessment period. More research findings will be discussed in the next chapter, suffice to say the financial stability improved under the short -term management contract. With a standard deviation of 9,57percent in the performance over the assessment period, there appears to be some variability.

For Drakenstein Local Municipality, the working ratio for 2019 was 0.68. For 2018, the ratio was 0.61. For 2017, the ratio was 0.62. For 2016, the ratio was 0.61 and for 2015, the ratio was 0.67. This shows consistent trend indicative of the fact that the municipality was able to fully recover all operational costs. At a mean of 0.64 over the five-year period, the Drakenstein Municipality is within the top 25 percent of developing countries utilities. The standard deviation of 3,54percent is indicative of fairly muted variability in the performance.

The graphs below, figure 13 and 14, show how each of the WSAs performed in terms of financial stability during the last five years, up to 2019, and 2005 for the Johannesburg Water WSA.

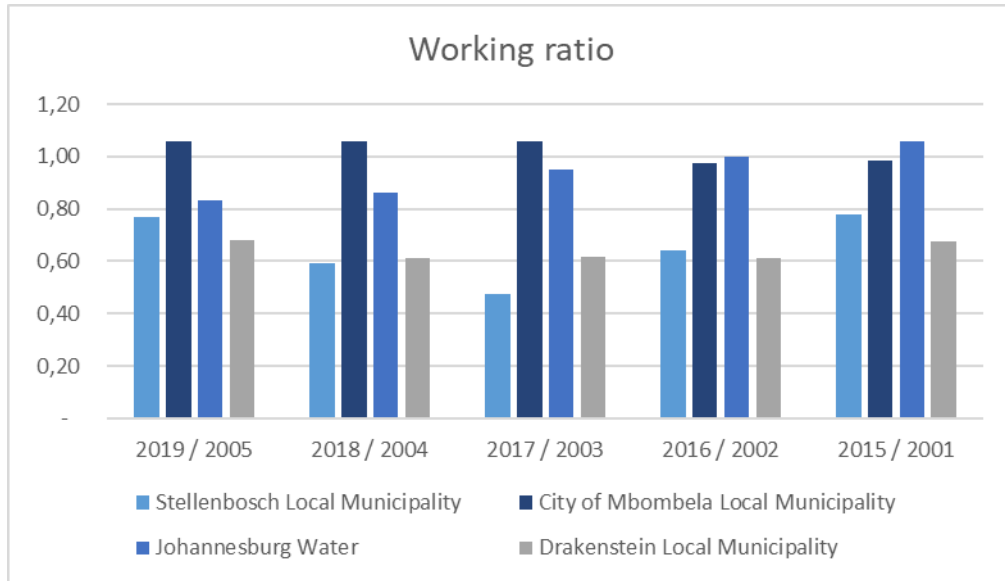


Figure 13 Working Ratio

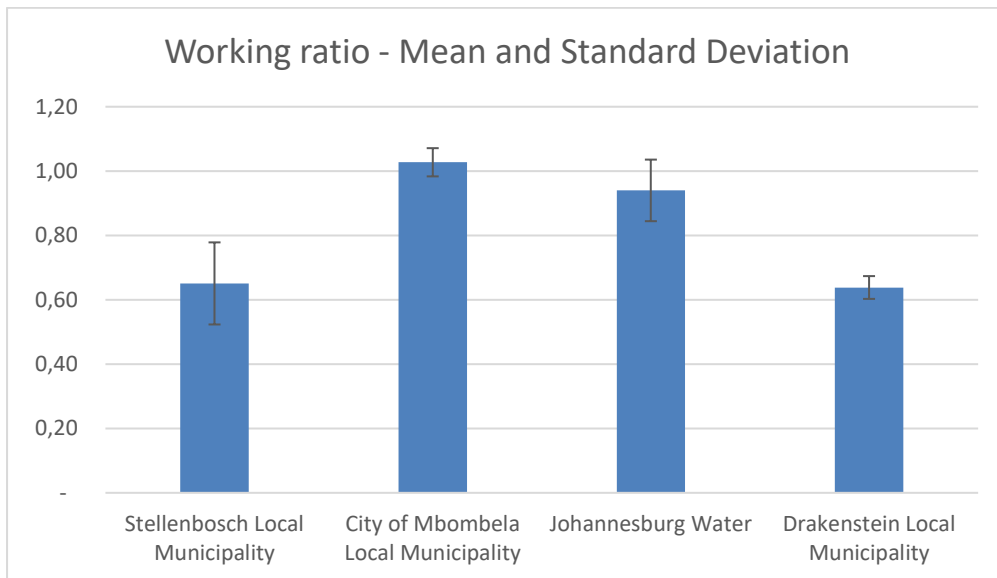


Figure 14 Working Ratio – Mean and Standard Deviation

Linking to the researcher’s first research question: *What is the most suitable configuration to ensure adequate water provision in South Africa?* The financial sustainability performance indicator, as a standalone measure used to answer the first research question, highlights that the publicly configured WSAs have outperformed their private counterparts as demonstrated by the data presented above.

5.2.4: Responsiveness to customers

This category of performance indicators is focused on how the municipality achieves its customer centricity objectives. Here two metrics, water supply coverage and water affordability will be used to compare the performance.

Water Supply Coverage:

For Stellenbosch Municipality, the water coverage for 2019 was 99.8 percent. For 2018, the percentage was 99.8 percent. For 2017, the percentage was 99.8 percent. For 2016, the percentage was 99.8 percent and for 2015, the percentage was 94.9 percent. This shows consistent water coverage aided by the urban demographic, with a mean of 98.77percent. the standard deviation over the same period of 2,19percent highlights a small amount of variability in water coverage over the period.

For the City of Mbombela, the water coverage for 2019 was 82.02 percent. For 2018, the percentage was 81.4 percent. For 2017, the percentage was 79.2 percent. For 2016, the percentage was 78.6 percent and for 2015, the percentage was 68.8 percent. This shows an improving trend indicating more of the population having access to water., with a mean of 77,60percent. The improved water coverage is underpinned by variability of 6,21percent indicating that there has been some variability from the average over the period.

For Johannesburg Water, the water coverage for 2005 was 94 percent. For 2004, the percentage was 93 percent. For 2003, the percentage was 92 percent. For 2002, the percentage was 90 percent and for 2001, the percentage was 93 percent. This shows access to water remained largely the same throughout the five-year period under review at a mean of 92,40 percent. The standard deviation of 1,52percent over the period is reflective of muted variability.

For Drakenstein Local Municipality, the percentage for 2019 was 99.3 percent. For 2018, the percentage was 99.5 percent. For 2017, the percentage was 99 percent. For 2016, the percentage was 99.6 percent and for 2015, the percentage was 99.3 percent. This shows consistent water coverage aided by the urban demographic. This consistent performance is highlighted by a mean of 99,34 percent and a low standard deviation of 0,23 percent.

The graphs below, figure 15 and 16, show how each of the WSAs performed in terms of water coverage during the last five years, up to 2019, and 2005 for the Johannesburg Water WSA.

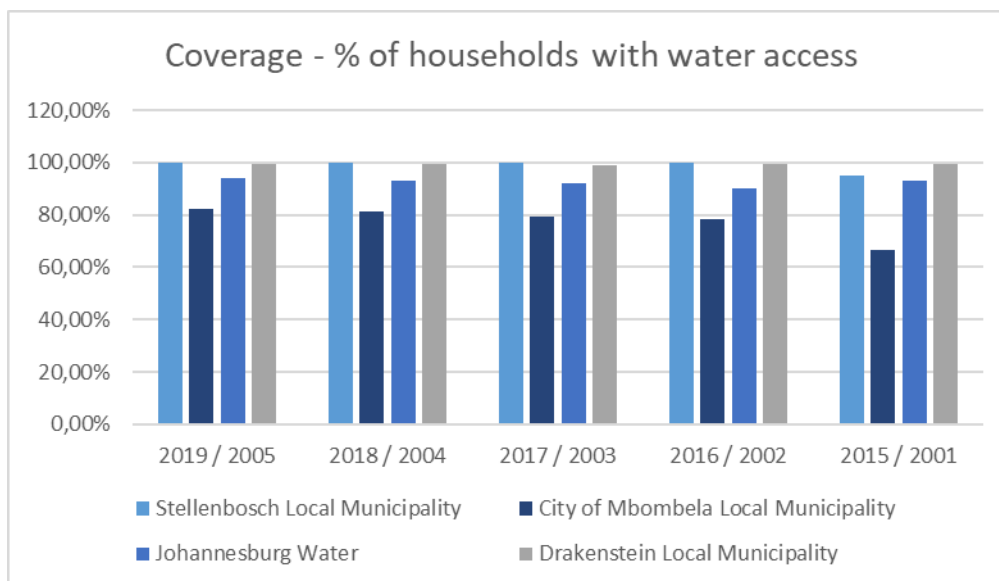


Figure 15 Water Supply Coverage

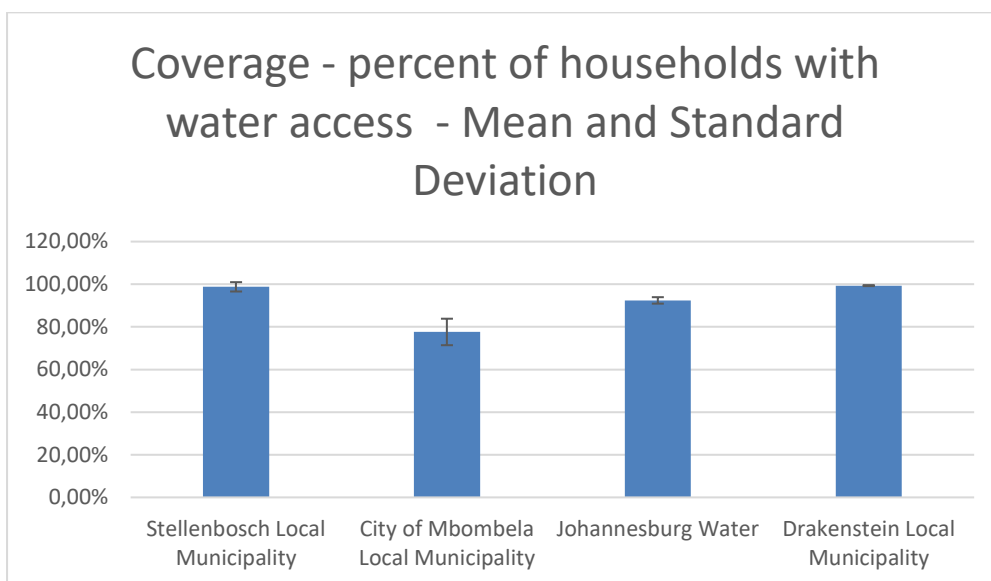


Figure 16 Water Supply Coverage – Mean and Standard Deviation

Water Affordability:

This performance metric is calculated by considering the average tariff per kilolitre as a percentage of the GDP per capita in the municipality. According to the performance scorecard adopted in the literature review, the affordability is assessed by comparing the connection fee as a percentage of the GDP per capita.

The information for the connection fees across the municipalities is not readily available and as such the average tariff has been used instead. While these metrics are not the same, the calculation method used for the purposes of this research provides a useful comparison of affordability across the municipalities.

For Stellenbosch Municipality, the water affordability for 2019 was 0.02 percent. For 2018, the percentage was 0.03 percent. For 2017, the percentage was 0.02 percent. For 2016, the percentage was 0.01 percent and for 2015, the percentage was 0.01 percent. The mean water affordability over the period was 0.02 percent and the standard deviation was 0,01percent. The descriptive statistics calculated are indicative of a fairly consistent performance with respect to the water affordability metric.

For the City of Mbombela, the water affordability for 2019 was 0.04 percent. For 2018, the percentage was 0.03 percent. For 2017, the percentage was 0.04 percent. For 2016, the percentage was 0.02 percent and for 2015, the percentage was 0.01 percent. The mean water affordability over the period was 0.03 percent and the standard deviation was 0,01percent. The descriptive statistics calculated are indicative of a fairly consistent performance with respect to the water affordability metric.

For Johannesburg Water, the water affordability for 2005 was 0.01 percent. For 2004, the percentage was 0.01 percent. For 2003, the percentage was 0.01 percent. For 2002, the percentage was 0.01 percent and for 2001, the percentage was 0.01 percent. The mean water affordability over the period was 0.01 percent over the assessment period.

For Drakenstein Local Municipality, the percentage for 2019 was 0.02 percent. For 2018, the percentage was 0.02 percent. For 2017, the percentage was 0.02 percent. For 2016, the percentage was 0.02 percent and for 2015, the percentage was 0.02 percent. The mean water affordability over the period was 0.02 percent over the period.

In comparing the average water affordability for municipalities over the period, the publicly employed configurations were largely displayed the same affordability, whilst the City of Mbombela and Johannesburg Water as privately employed configurations, showed conflicting results. Having said this, water is still seen as a relatively cheap resource in South Africa when compared to the GDP per capita of the country.

The graphs below, figure 17 and 18, show how each of the WSAs performed in terms of water affordability. during the last five years, up to 2019, and 2005 for the Johannesburg Water WSA.

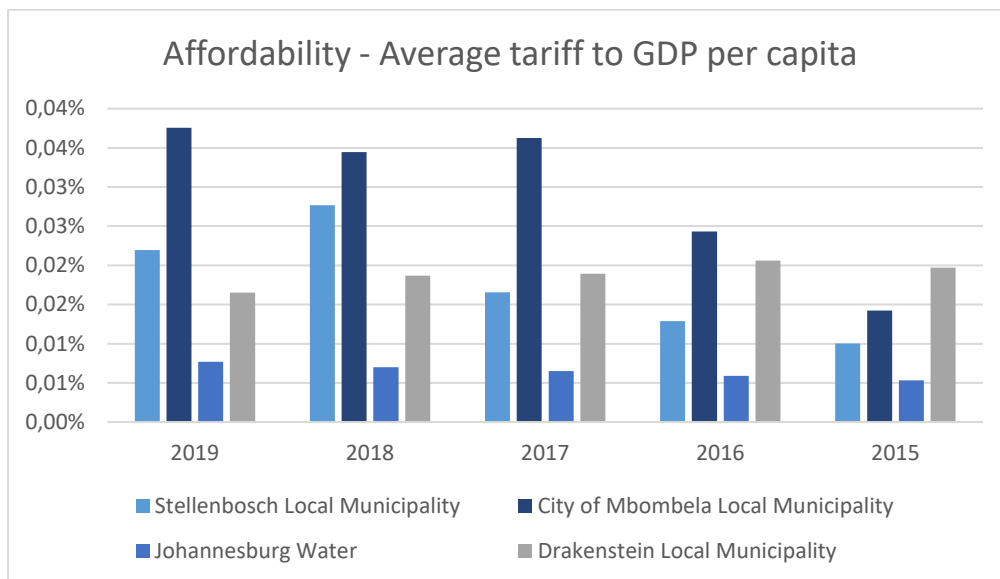


Figure 17 Average tariff to GDP per Capita

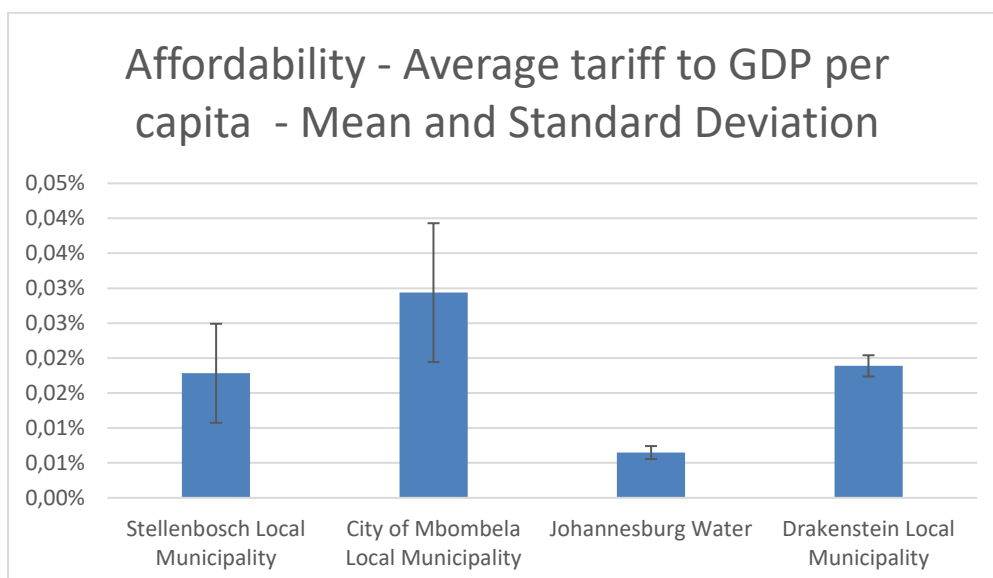


Figure 18 Average tariff to GDP per Capita – Mean and Standard Deviation

Linking to the researcher's first research question: *What is the most suitable configuration to ensure adequate water provision in South Africa?* The responsiveness to customer performance indicator, using both water access and affordability as measures, highlights that both public and privately configured WSAs in South Africa do well on this measure and so this measure cannot be used as a standalone to answer the research question.

5.3: The performance of a traditional public provision configuration

The quantitative component of the study as discussed above has highlighted some interesting data and trends. Looking at the efficiency of investment performance indicator, the public configurations (Stellenbosch and Drakenstein) were in the top 25 percent of developing country utilities, outperforming their private configuration counterparts (Mbombela and Johannesburg water).

From an operational efficiency standpoint, the results were inconclusive. The City of Mbombela and Drakenstein outperformed Stellenbosch and Johannesburg water. All of the municipalities except for the City of Mbombela are financially sustainable and able to fully recover their operating costs.

Finally, with respect to the municipality's responsiveness to customers, the public configurations outperformed the private configurations in terms of both water coverage and affordability.

To understand the reasons and context behind this data unearthed in the quantitative part of the research, a qualitative study was undertaken using purposive sampling. The researcher interviewed the Director of Infrastructure Services from the Stellenbosch municipality and the Deputy Municipal Manager from the Mbombela local municipality.

The responses to the WSA interview are summarized in the table below.

Table 3 Stellenbosch Local Municipality water service delivery performance

Performance metric	Component	Description	Performance	Key moderating factors	Representative Informant Quotes
Efficiency of investment	Non-revenue water	The level of water which is pumped and supplied but subsequently unaccounted for in the billing process	Good	Level of leakages identified Level of urbanisation	“The roll-out of water demand metering solutions have been a success in identifying leakages” (Interviews with Stellenbosch Municipal Council, 2020) “The municipality has a fairly large urban demographic with a water saving culture” (Interviews with Stellenbosch Municipal Council, 2020)
	Water wastage	The level of water which is lost through wastages via leaks or excessive consumption	Low	Level of leakages identified Level of urbanisation	“The municipality has been able to detect and fix leakages in the internal networks through the roll out of water metering solutions.” (Interviews with Stellenbosch Municipal Council, 2020) “Internal leakages are mainly a concern in peri-urban areas, with leakages detected in urban areas being repaired by the homeowners themselves.” (Interviews with Stellenbosch Municipal Council, 2020)

				Impact of climate change	“The Western Cape drought has changed consumer behaviour relating to water savings in the region. The increase in tariffs coupled with the concern of having no water has resulted in consumers using less water” (Interviews with Stellenbosch Municipal Council, 2020)
				View of water as a public good vs level of service exclusion	“Community pushback on the metering solution was based on the abrupt shutdown of water supply.” (Interviews with Stellenbosch Municipal Council, 2020)
	Level of infrastructure	A measure of the water infrastructure available in the WSA	Average	Degree of ageing infrastructure	“While the existing infrastructure is adequate, there is a lack of preventative maintenance resulting in costly breakdowns.” (Interviews with Stellenbosch Municipal Council, 2020)
				Degree of ageing infrastructure	“Stellenbosch has one of the oldest water network infrastructures in the country. Which is good because the network is well routed but at the same time requires more maintenance as it’s reaching the end of its useful life” (Interviews with Stellenbosch Municipal Council, 2020)
Operational Efficiency	Population water access	The percentage of the municipal population with access to water	Good	Degree of access to water	“Every ERF developed has at least one connection point, and more than one where there are backyard dwellers.” (Interviews with Stellenbosch Municipal Council, 2020)

				Degree of capacity constraints	“The water division is currently 50 percent vacant over the past two years.” (Interviews with Stellenbosch Municipal Council, 2020)
				Degree of capacity constraints	“We are unsure of the optimal staffing structure and have undertaken a benchmarking exercise to understand how other successful utilities are staffed.” (Interviews with Stellenbosch Municipal Council, 2020)
Financial Sustainability	Cost recovery	Is the WSA able to recover the cost of water provision entirely from operating income	Good	Level of cost recovery	“The municipality has a policy that services need to have cost reflective tariffs. Tariffs from all services are viewed together to ensure cost recovery and affordability of the basket of services.” (Interviews with Stellenbosch Municipal Council, 2020)
				Level of cost recovery vs cross subsidisation	“The municipality generates a surplus from water services but that surplus, along with surpluses from other services, is used to reduce taxes paid by consumers.” (Interviews with Stellenbosch Municipal Council, 2020)
				Level of pricing	“In tough economic times, such as current times, service tariffs are not high enough for preventative maintenance of existing infrastructure.” (Interviews with Stellenbosch Municipal Council, 2020)

	Configuration support	The level of financial support provided by stakeholders	Low	Level of budgetary constraints	“The municipality receives an equitable grant from National Government to cover the free basic service to indigent people. This grant is very low and accounts for 3 percent of total municipal income.” (Interviews with Stellenbosch Municipal Council, 2020) Level of budgetary constraints “The municipality has to largely fend for itself and therefore needs to be self-sufficient.” (Interviews with Stellenbosch Municipal Council, 2020)
Customer experience	Level of service	The adequacy of water services provided to the consumers	Average to Good	Degree of service provision Degree of service provision	“The urban and formal dwelling receive a good to very good level of service.” (Interviews with Stellenbosch Municipal Council, 2020) “The peri-urban areas receive an average to poor level of service, which is pretty much a national problem.” (Interviews with Stellenbosch Municipal Council, 2020)
	Consumer complaints	The level of complaint received by the WSA relating to water services	High	Degree of education	“Due to the demographic of the municipality, being largely affluent and university students, consumers are very vocal, and a large number of complaints have been received.” (Interviews with Stellenbosch Municipal Council, 2020)

	Quality of water	The quality of water provided by the WSA to the consumers	Good	Level of national policy efficiencies	“While the Blue Drop Certification is being restructured, the municipality continues to assess water quality annually through the CSIR.” (Interviews with Stellenbosch Municipal Council, 2020)
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Looking at the table above, based on the interview with the Stellenbosch Municipality and taking into account the performance scorecard (Tynan and Kingdom, 2002), the following section will discuss each of the performance metrics.

5.3.1: Efficiency of investment

The Stellenbosch Municipality has performed well in terms of its efficiency of investment, as can be seen in the comparative quantitative study where it achieved an average NRW of 22.2 percent, which places it firmly in the top 25 percent of developing countries utilities. This is owing to the fact that the service area is dominated by urban regions. The efficiency of investment, measuring the maintenance of existing infrastructure, can be assessed by looking at the level of NRW, level of infrastructure and water wastage in the municipality.

The level of NRW in the municipality is good and relatively low compared to other municipalities in the country as well as utilities in other developing countries. Excessive consumption is considered one of the biggest factors behind NRW. According to the interviews with the Stellenbosch Municipal Council, on average excessive consumption is lower in urban centres within the municipality. *“The municipality has a fairly large urban demographic with a water saving culture”* (Interviews with Stellenbosch Municipal Council, 2020). Accordingly, the level of water wastage in the municipality is low and mainly concentrated in the peri-urban areas of the municipal region indicating urbanisation as a key moderating factor.

Leakages and illegal connection were found to be the largest contributor to water wastage in the municipality. According to the municipality, *“the roll-out of water demand metering solutions have been a success in identifying leakages”* (Interviews with Stellenbosch Municipal Council, 2020). This approach has been particularly effective in peri-urban regions, where leaks are frequently overlooked and rarely repaired by residents. The expense of discovering and repairing internal leaks is frequently the main cause for leaks recurring. Through this initiative, the municipality was able to identify internal leaks and ensure water wastage was kept to a minimum.

While this initiative has largely been positively received, there has some adverse reaction from residents, owing to the lack of communication about when the water supply will be shut off. According to the municipality, *“community pushback on the metering solution was based on the abrupt shutdown of water supply.”* (Interviews with Stellenbosch Municipal Council, 2020).

Prepaid meters, like those used in electricity supply, is being considered instead of the current water metering solution. While this will resolve the issue relating to a sudden shut off in supply, the municipality still faces challenges identifying multiple family homes and the correct free allocation quantity. Added to this is the belief held by many that water is a public good and therefore service exclusions are not easily acceptable.

Another factor that has bearing on the water delivery in the municipality has been the acceleration of climate change and its effects. This municipality has had first-hand experience of a severe drought in 2017, where the Western Cape had almost depleted all of its water supply. *“The Western Cape drought has changed consumer behaviour relating to water savings in the region. The increase in tariffs coupled with the concern of having no water has resulted in consumers using less water”* (Interviews with Stellenbosch Municipal Council, 2020).

The level of water related infrastructure in the Stellenbosch Municipality received a mediocre rating, mainly due to the age of the network. As discussed in the interview, *“While the existing infrastructure is adequate, there is a lack of preventative maintenance resulting in costly breakdowns.”* (Interviews with Stellenbosch Municipal Council, 2020). According to the municipality, *“Stellenbosch has one of the oldest water network infrastructures in the country. Which is good because the network is well routed but at the same time requires more maintenance, as it’s reaching the end of its useful life”* (Interviews with Stellenbosch Municipal Council, 2020). The municipality employs a maintenance policy that complies with the Auditor General's maintenance guidelines. In practice, this is a fixed sum based on the age of the network, the quality of the infrastructure, and the level of preventative maintenance performed.

The municipality's human resources capacity constraints hinder it from assessing the state of its infrastructure and doing preventative maintenance. *“While the existing infrastructure is adequate, there is a lack of preventative maintenance resulting in costly breakdowns.”* (Interviews with Stellenbosch Municipal Council, 2020). Instead of ensuring that the current infrastructure is maintained to continue performing adequately, the municipality has focused on increasing the amount of water available. Ultimately, as a result of the ageing infrastructure, there have been delayed, costly repairs and water losses owing to leaks.

5.3.2: Operational efficiency

The operational efficiency performance within the Stellenbosch Municipality is good albeit with some capacity constraints. The average operational efficiency ratio was relatively higher than the targeted benchmark of 2 being 4. This performance is underpinned by the access and continuity of water services in the region. The WSA has close to 100 percent household coverage in terms of access to water. As stated by the municipality, *“Every erf developed has at least one connection point, and more than one where there are backyard dwellers.”* (Interviews with Stellenbosch Municipal Council, 2020).

In the peri-urban areas, typically a challenge for municipalities with respect to water coverage, is sufficient access to water for all residents. *“Currently, peri-urban areas have water points within a reasonable distance, with the medium-term objective to reduce the distance travelled.”* (Interviews with Stellenbosch Municipal Council, 2020). However, each peri-urban home does not have its own water supply system. The WSA stated that its goal is to maintain 100 percent population coverage while reducing the distance residents must travel to reach water distribution sites.

The WSA also boasts a good track record in terms of the continuity of water services. As highlighted in the interview, *“There have never been water cuts as a result of excessive consumption but there are a few instances of water cuts as a result of breakdown and maintenance.”* (Interviews with Stellenbosch Municipal Council, 2020). In general, the region's communities have had constant access to water. However, there have been cases where services have been disrupted because of routine repair, owing to pipe bursts and leaks. The number of pipe bursts in the municipality has increased in recent years. According to the municipality, *“As a result of old infrastructure and a lack of preventative maintenance increased breakdowns over the last few years have materialised. Also, the increase roll out of fibre optics in the area has exacerbated this issue. Ultimately, these issues have contributed to consumers not having continuous access to water”* (Interviews with Stellenbosch Municipal Council, 2020).

The operational performance needs to be considered in the context of the staffing constraints at the WSA. As disclosed by the municipality, *“The water division is currently 50 percent vacant over the past two years.”* (Interviews with Stellenbosch Municipal Council, 2020). The consequence of this is limiting its capacity to deliver an effective service.

The WSA believes they have been understaffed in recent years but understands how difficult it is to achieve full employment at a public institution. The WSA understands that if the municipality fills these employment openings, it will have to raise expenditures, which will necessitate an increase in revenue. According to cost recovery principles, this would need an increase in water tariffs, making the water delivered unaffordable.

One of the most serious effects of being understaffed, according to the WSA, is a lack of planning and forethought in terms of preventative maintenance. As discussed with the municipality, *“there isn’t enough capacity within the water services department to monitor the condition of infrastructure” (Interviews with Stellenbosch Municipal Council, 2020)*. While the municipality now has a 50 percent vacancy rate, it remains to be seen whether a 100 percent employment rate is the best structure. The WSA is now analysing similar WSAs in other regions of the world that provide a similar level of service to determine the optimal level of employment.

5.3.3: Financial sustainability

The Stellenbosch Municipality is a financially stable WSA, as it is able to fully sustain itself from revenue generated from water provision. The municipality achieved an average working ratio of 0,65 ranking the WSA in the top 25 percent of developing country utilities.

The WSA not only recovers the cost of water provision from the proceeds of service provided, but also generates a surplus. This allows the municipality to cross-subsidize regions where full expenditures are not recoverable. According to the WSA, *“the municipality generates a surplus from water services but that surplus, along with surpluses from other services, is used to reduce taxes paid by consumers.” (Interviews with Stellenbosch Municipal Council, 2020)*.

The municipality’s policies provide protection against financial instability. As stated by the WSA, *“the municipality has a policy that services need to have cost reflective tariffs. Tariffs from all services are viewed together to ensure cost recovery and affordability of the basket of services.” (Interviews with Stellenbosch Municipal Council, 2020)*.

The WSA did however caution that in perilous economic times, to ensure the financial stability of the municipality, the preventative maintenance is sacrificed to ensure that other operating costs are still recovered from the operating income.

As discussed in the interview, *“In tough economic times, such as current times, service tariffs are not high enough for preventative maintenance of existing infrastructure.”* (Interviews with Stellenbosch Municipal Council, 2020). As discussed in 5.2.4, the price of water in South Africa is relatively cheap in comparison to the GDP per capita of the country.

As a publicly configured municipality, the Stellenbosch WSA receives an equitable grant from the South African Government to cover the indigent families registered to receive the 6 kilolitres of free water each month. This grant accounts for around 3 percent of the municipality's total revenue only. According to the WSA, *“the municipality has to largely fend for itself and therefore needs to be self-sufficient.”* (Interviews with Stellenbosch Municipal Council, 2020)”. Due to the already constrained fiscal situation in the country, no additional budget for further subsidies is possible. Service tariffs and property taxes are used to recoup the remaining expenditures.

Because the municipality does not get any additional funding from the government, it must ensure that all costs are met by revenue earned. In this regard, the municipality considers all services to be part of a single basket. As a result, it can examine the affordability of the consumer's basket of services and, consequently, raise or lower tariffs to control affordability. By boosting the rates for such services, this strategy has helped to ensure that preventative maintenance can be performed where it is most needed.

5.3.4: Responsiveness to customers

The two measures used to assess this performance indicator were the water supply coverage and the water affordability. In that regard, the Stellenbosch municipality performed well relative to the other municipalities in the study. Despite containing a large number of vocal residents and consequently receiving a large number of complaints, the Stellenbosch WSA has performed well with respect to this performance metric.

The adequacy and quality of water services has been at a satisfactory level in recent times. The Stellenbosch WSA, like the rest of South Africa, faces issues of inequality. There are a large number of very wealthy and very poor families in the municipality, with only a modest number of middle-class families. According to the WSA, *“the urban and formal dwelling receive a good to very good level of service. The peri-urban areas receive an average to poor level of service, which is pretty much a national problem.”* (Interviews with Stellenbosch Municipal Council, 2020).

Due to a reasonable level of preventative maintenance on the relevant network, the urban areas in the Stellenbosch WSA normally enjoy unrestricted service from a delivery point within the household, with relatively few breakdowns experienced. Peri-urban areas, on the other hand, have substantially lower service levels, with families often having to go to a community delivery point to get water. As discussed by the WSA, *“The peri-urban areas receive an average to poor level of service, which is pretty much a national problem.”* (Interviews with Stellenbosch Municipal Council, 2020).

Prior to the revamping of the Blue Drop Certification, the Stellenbosch WSA had met all applicable standards and received certification in each of the years preceding the overhaul. However, the municipality is still required to be assessed on an annual basis and this assessment is done by the Council for Scientific and Industrial Research (CSIR). The WSA has continued to achieve and surpass all requirements related to the quality of water as previously determined by the Blue Drop Certification. While it is admirable that the WSA has continued to undertake independent water quality assessments, the consistency as a result of non-uniform testing and monitoring is sub-optimal for stakeholders.

In summary, the Stellenbosch Municipality has performed well in water services under a public configuration as benchmarked by the performance scorecard. The level of NRW, measuring the efficiency of investment is within the top 25 percent of developing country utilities. The efficient control of wastage and leakages is evidence of this. Despite the capacity constraints in the WSA, the municipality has been able to maintain close to a 100 percent water supply coverage with only a few instances of service delivery. The working ratio of 0,65 highlights the ability of the WSA to fully recover costs mainly driven by the urban demographic makeup of the region. Finally, in terms of the municipality’s customer centricity objectives, Stellenbosch performed well by providing good service provision despite its challenges.

5.4: The performance of a private configuration in retail water services.

The responses to the WSA interview are summarized in the table below.

Table 4 Mbombela Local Municipality water service delivery performance

Performance metric	Component	Description	Performance	Key moderating factors	Representative Informant Quotes
Efficiency of investment	Non-revenue water	The level of water which is pumped and supplied but subsequently unaccounted for in the billing process	Poor	Level of consumption Level of consumer behaviour Level of leakages	“The municipality faces significant challenges of illegal connections and consequently a substantial overuse of water in the rural areas in particular.” (Interviews with Mbombela Municipal Council, 2020) “There are also issues of meter tampering and credit control in many of the informal areas within the municipality.” (Interviews with Mbombela Municipal Council, 2020) “Over the past few years, the level of leakages has increased contributing to the non-revenue water issues in the region.” (Interviews with Mbombela Municipal Council, 2020)
	Water wastage	The level of water which is lost through wastages via leaks or excessive consumption	High	Lack of education	“There is a lack of education within many of the informal areas concerning the preservation of water.” (Interviews with Mbombela Municipal Council, 2020)

				Level of consumer behaviour Level of institutional power	“There is a tendency for water abuse in the informal areas, where consumers are not paying for these services.” (Interviews with Mbombela Municipal Council, 2020) “The private party does not have the authority to enforce any legal ramifications for illegal connections and tampering with the system.” (Interviews with Mbombela Municipal Council, 2020)
	Level of infrastructure	A measure of the water infrastructure available in the WSA	Good	Degree of planning and funding	“The level of water related infrastructure is adequate enough to service the municipality, however there is insufficient funding to cover maintenance.” (Interviews with Mbombela Municipal Council, 2020)
Operational Efficiency	Population water access	The percentage of the municipal population with access to water	Average	Degree of urbanisation Level of competition	“An increase in unplanned settlements has made it challenging for the municipality to improve water supply as it would have liked to.” (Interviews with Mbombela Municipal Council, 2020) “Commercial water suppliers have further exacerbated our coverage issues by purposefully sabotaging the municipality’s water infrastructure.” (Interviews with Mbombela Municipal Council, 2020)

				Degree of urbanisation vs profit motive	“The concession area covered by the private party remains fixed regardless of the increase in settlements, ultimately this becomes the responsibility of the municipality.” (Interviews with Mbombela Municipal Council, 2020)
	Continuity of water services	A measure of water service delivery in the WSA	Poor	Level of urbanisation vs view of water as a human right	“There are people getting water once a week and this has become a way of life to which they are now accustomed.” (Interviews with Mbombela Municipal Council, 2020)
	Capacity constraints	The capacity constraints experienced by the WSA.	High	Degree of capacity constraints Degree of capacity constraints Degree of capacity constraints vs level of institutional power	“There is adequate capacity at the municipality in terms of the number of people. However, there is a shortage of competent employees.” (Interviews with Mbombela Municipal Council, 2020) “Not only does private party have an adequate number of employees, but they also have competent, experienced people within the organisation.” (Interviews with Mbombela Municipal Council, 2020) “The private party has less bureaucracy than government, allowing them to outsource certain technical workstreams.” (Interviews with Mbombela Municipal Council, 2020)

Financial Stability	Cost recovery	Is the WSA able to recover the cost of water provision entirely from operating income	Poor	Level of cost recovery Degree of urbanisation Level of cost recovery	“The municipality is only able to recover costs in 30 percent of the entire area, with the remaining 70 percent being peri-urban and very challenging to recover the cost of water provision.” (Interviews with Mbombela Municipal Council, 2020) “The continuous increase in informal settlement has further exacerbated the level of cost recovery.” (Interviews with Mbombela Municipal Council, 2020) “The challenge of cost recovery is also felt by the private party. They are able to fully recover costs in urban areas and are largely dependent on government’s equitable grant for the rural areas.” (Interviews with Mbombela Municipal Council, 2020)
	Configuration support	The level of support provided by stakeholders	Poor	Level of reinvestment vs profit taking	“The private party has only been able to make a marginal return by delaying the level of re-investment and maintenance of the infrastructure.” (Interviews with Mbombela Municipal Council, 2020)
Customer experience	Level of service	The adequacy of water services provided to the consumers	Adequate	Degree of urbanisation	“The level of service varies within the area. It is good in urban areas and average in the more informal areas.” (Interviews with Mbombela Municipal Council, 2020)

				Degree of affordability	“The service is affordable, with a level of public participation in the decision-making relating to the setting of water tariffs.” (Interviews with Mbombela Municipal Council, 2020)
	Consumer complaints	The level of complaint received by the WSA relating to water services	High	Level of service provision	“There have been a few instances of service delivery protests in the area as consumers are not satisfied with the level of service. The main reason behind this being the rapid increase in informal settlements.” (Interviews with Mbombela Municipal Council, 2020)
	Quality of water	The quality of water provided by the WSA to the consumers	Average	Degree of health hazard Level of national policy efficiencies	“There was one instance of an illness outbreak in the last few years. Upon investigation it was found that the outbreak stemmed from bacteria in a container as opposed to the original water source.” (Interviews with Mbombela Municipal Council, 2020) “The municipality and private party undertake annual assessments performed by an independent party and have largely complied with the water quality tests.” (Interviews with Mbombela Municipal Council, 2020)

Looking at the table above, based on the interview with the City of Mbombela Municipality and taking into account the performance scorecard (Tynan and Kingdom, 2002), the following section will discuss each of the performance metrics.

5.4.1: Efficiency of investment

The Mbombela Municipality has performed relatively poorly with respect to the efficiency of Investment performance criteria. As evidenced by the comparative quantitative study conducted in section 5.2.1, the level of NRW in the municipality averaged 44,4 percent, which is significantly higher than top performing developing country utilities. A major driving factor behind this inferior performance is the large and increasing rural demographic makeup of the WSA. The efficiency of investment, measuring the maintenance of existing infrastructure, can be assessed by looking at the level of NRW, level of infrastructure and water wastage in the municipality.

The level of NRW in the WSA is higher than other South African and developing country WSA's. According to the WSA, *"the municipality faces significant challenges of illegal connections and consequently a substantial overuse of water in the rural areas in particular."* (Interviews with Mbombela Municipal Council, 2020). As a result of these challenges, the municipality has a large degree of overconsumption and wastage. This finding appears to be in line with consumptions levels in the country, which are higher than international norms.

Furthermore, the WSA identified meter tampering in the informal areas as another factor exacerbating the NRW. As highlighted by the WSA, *"There are also issues of meter tampering and credit control in many of the informal areas within the municipality."* (Interviews with Mbombela Municipal Council, 2020). These challenges are predominantly contained in the peri-urban areas within the municipality. The WSA believes that at the core of this issue is a fundamental misunderstanding, where consumers believe that water should be free of charge.

Another contributing factor to the poor NRW performance over the period under review is the increasing level of leakages. As discussed in the interview, *"Over the past few years, the level of leakages has increased contributing to the non-revenue water issues in the region."* (Interviews with Mbombela Municipal Council, 2020). The WSA believes that the leakages can be directly linked to the ability of consumers in repairing these leakages. The extent of these challenges is mostly apparent in the rural areas, where consumers don't have the financial capacity to repair them.

Considering the municipality's population size and present water supply sources, the WSA believes that the municipality should be able to easily service the population. Abuse of water provided to individuals who do not pay for the service poses considerable issues to water supply. According to the WSA, *“there is a tendency for water abuse in the informal areas, where consumers are not paying for these services.”* (Interviews with Mbombela Municipal Council, 2020). The WSA has an elevated level of water wastage driven primarily by the lack of education in the area relating to water conservation.

As noted during the interview, *“There is a lack of education within many of the informal areas concerning the preservation of water.”* (Interviews with Mbombela Municipal Council, 2020). As highlighted previously, these issues are prevalent in the peri-urban areas and stem from a lack of understanding of the complexities surrounding the water sector. The municipality has launched a war on leaks initiative focused on educating, detecting, and repairing leaks at the household level inside the municipality. This is especially important in peri-urban regions, where there is a lot of water waste due to leaks.

Furthermore, in regions where water abuse is prevalent, the municipality has implemented educational programs focusing on water conservation. While the concession has been able to assist the municipality with the implementation of initiatives, the private entity's capacity to prevent illegal connections and water wastage is restricted to its mandate. The prosecution of households connected illegally is outside the jurisdiction of both the municipality and the private organization. The illegal connection of households to the water network is typically considered at a national level, by the DWA. However, given the social aspect of water resources, prosecution of any sort is frequently regarded as a grey area.

In terms of the adequacy of the existing water infrastructure in the WSA, the network is fit for purpose. According to the WSA, *“The level of water related infrastructure is adequate enough to service the municipality, however there is insufficient funding to cover maintenance.”* (Interviews with Mbombela Municipal Council, 2020). The WSA believes that, notwithstanding the increase in informal settlements, there is a sufficient supply of water in the network to service the municipal areas requirements. However, due to funding challenges within the municipality, there is a lack of preventative maintenance on the existing infrastructure often leading to increased and prolonged breakdowns.

5.4.2: Operational efficiency

Assessing the operational efficiency of the Mbombela WSA in terms of the comparative quantitative study in section 5.2.2, the operational efficiency ratio improved in the last five years. The average ratio of 1.6 over the period under review, was within the targeted benchmark of 2. This is in line with the general expectation of the efficiencies unlocked after PSP, where the workforce is streamlined to improve the operational efficiency of the entity.

The Mbombela WSA noted that the rise in new informal settlements has posed a significant problem in estimating the amount of water required to meet demand. The WSA's planning procedure revealed that if unplanned settlements were not considered, there would be a substantially higher degree of water supply coverage in the area. The WSA noted that, *“An increase in unplanned settlements has made it challenging for the municipality to improve water supply as it would have liked to.”* (Interviews with Mbombela Municipal Council, 2020). Consequently, the continuous increase in settlements has meant that improving the access to water in the municipality has been challenging.

Another big challenge for the WSA has been sabotage by commercial water suppliers, who deliberately damage the WSA's infrastructure to limit coverage in order to enhance their own sales. According to the WSA, *“Commercial water suppliers have further exacerbated our coverage issues by purposefully sabotaging the municipality's water infrastructure.”* (Interviews with Mbombela Municipal Council, 2020). The increase in competition from external suppliers has not only had an impact the revenue generated by the WSA, but also poses a significant threat to the WSAs infrastructure. This is particularly concerning given the lack of funding in the municipality to repair and maintain the existing infrastructure.

While the concession has helped with attempts to overcome the issues created by private water suppliers, the responsibility for supplying unplanned settlements has mostly fallen on the municipality because these regions are outside the concession's scope of work. As highlighted during the interview, *“The concession area covered by the private party remains fixed regardless of the increase in settlements, ultimately this becomes the responsibility of the municipality.”* (Interviews with Mbombela Municipal Council, 2020). The private party is currently contracted to service a certain area, which is a mixture of urban and peri-urban areas. The increase in settlements does not fall within the scope of the private party.

Furthermore, it would be challenging for the private party to consider taking on these areas, as they are peri-urban areas where issues surrounding full cost recovery is at play.

The Mbombela WSA continues to experience significant challenges with respect to service delivery. Due to the lack of maintenance and related funding issues, the quality of service has deteriorated to an extent where residents do not receive water daily. According to the WSA, *“there are people getting water once a week and this has become a way of life to which they are now accustomed.”* (Interviews with Mbombela Municipal Council, 2020). The municipality elaborated that this is particularly relevant in peri-urban areas, where access to water is so scarce, that residents are satisfied with being able to receive water once a week only. This development is concerning as water is considered an essential resource for living, where significant sacrifices are made in order to access this fundamental resource.

From a resource capacity standpoint in the WSA, it was recognised by the municipality that the Mbombela Concession is adequately staffed both from a capacity perspective and based on the number of competent employees in the organisation. As discussed in the interview, *“Not only does private party have an adequate number of employees, but they also have competent, experienced people within the organisation.”* (Interviews with Mbombela Municipal Council, 2020). The WSA feels that the concessionaire has many capable employees who can help it negotiate the difficult water provision terrain. The WSA also stated that, *“The private party has less bureaucracy than government, allowing them to outsource certain technical workstreams.”* (Interviews with Mbombela Municipal Council, 2020). The private party is subject to fewer constraints than the municipality, and therefore has the ability to outsource functions and maintain an elevated level of service in emergency situations. This allows the private party to always maintain a quality level of service.

The concessionaire's staffing status was contrasted to the municipality's own water division. According to the municipality, *“there is adequate capacity at the municipality in terms of the number of people. However, there is a shortage of competent employees.”* (Interviews with Mbombela Municipal Council, 2020). It is recognized that the WSA requires a higher degree of expertise to deliver a more efficient level of service.

5.4.3: Financial sustainability

The financial stability performance of the Mbombela WSA has been poor in recent years. As highlighted in the quantitative comparative study in section 5.2.3, the Mbombela WSA was the only municipality in the study that on average was not able to fully recover costs. The Mbombela WSA is dominated by peri-urban communities, consequently recovering the expenditures totally from the tariffs charged has proven difficult. The WSA may fully recover the cost of delivering the service from the tariff in the urban areas, which account for 30 percent of the overall territory. However, the remaining 70 percent of the territory is peri-urban, where the WSA primarily receives the government's equitable grant for free water.

The challenge for the WSA is the diverse clientele present in the region. Not only does the WSA have to provide services for the urban centres but also to remote and densely populated peri-urban parts of the region. This challenge is compounded by the continuous increase in unplanned settlements, which as discussed previously, is solely the responsibility of the municipality. As noted during the interview, *“The continuous increase in informal settlements have further exacerbated the level of cost recovery.”* (Interviews with Mbombela Municipal Council, 2020). Ultimately, this deterioration in the utility's financial sustainability impacts the level of water services provided.

As stated by the WSA, *“the challenge of cost recovery is also felt by the private party. They are able to fully recover costs in urban areas and are largely dependent on government's equitable grant for the rural areas.”* (Interviews with Mbombela Municipal Council, 2020). Accordingly, support from the concessionaire has been limited with respect to the financial stability of the entire municipality, given its own financial concerns.

According to the municipality, *“the private party has only been able to make a marginal return by delaying the level of re-investment and maintenance of the infrastructure.”* (Interviews with Mbombela Municipal Council, 2020). The private party believed that the economics of the long-term concession would be substantially different when it executed the contract in 1999. Given the developments in the municipality and the South African water landscape, it has needed to reduce the level of reinvestment to ensure that shareholders are still able to realise some value.

5.4.4: Responsiveness to customers

The two measures used to assess this performance indicator were the water supply coverage and the water affordability. In that regard, the Mbombela municipality was the worst performing WSA relative to the other municipalities in the study. While the water supply coverage improved over the period under review, it remained substantially below the other WSAs. The price of water for all WSAs was highlighted as relatively low in comparison to the GDP per capita. However, in comparison to the other WSAs, the City of Mbombela had the worst affordability metrics.

The degree of service in the Mbombela WSA varies depending on the region's demographics. According to the WSA, *“The level of service varies within the area. It is good in urban areas and average in the more informal areas.”* (Interviews with Mbombela Municipal Council, 2020). In urban regions, the municipality provides an elevated level of service to each family with generally constant access. The peri-urban areas, on the other hand, receive an average quality of service, with frequent breakdowns. Fundamentally, the rationale behind this is the quality of the existing infrastructure prevalent in the urban areas coupled with the ability to recover costs in those areas.

While the affordability of service provision is a function of the country's economic conditions and employment levels, the Mbombela WSA considers that water service as affordable in the region. As highlighted during the interview, *“The service is affordable, with a level of public participation in the decision-making relating to the setting of water tariffs.”* (Interviews with Mbombela Municipal Council, 2020). The tariffs charged for water services are evaluated on an annual basis. The tariff reviews are part of a larger procedure that includes public input. The goal of this approach is to educate the public about cost recovery concepts and the issues that the WSA has due to its limited resources. There have been no substantial public objections voiced about high water tariffs during this process, leading the WSA to feel that the tariffs are set at a reasonable level.

In the last five years, the Mbombela WSA has had a few instances of service delivery. The WSA noted that *“There have been a few instances of service delivery protests in the area as consumers are not satisfied with the level of service. The main reason behind this being the rapid increase in informal settlements.”* (Interviews with Mbombela Municipal Council, 2020).

The increase in unplanned settlements and the lack of maintenance have both exacerbated problems relating to water access.

The quality of water provided by the WSA is seen as being average, with a few notable instances of quality breaches. In 2018, the Mbombela WSA saw an outbreak of an unknown illness linked to the drinking of water in the area. As stated by the WSA, *“There was one instance of an illness outbreak in the last few years. Upon investigation it was found that the outbreak stemmed from bacteria in a container as opposed to the original water source.”* (Interviews with Mbombela Municipal Council, 2020). The Mbombela WSA, as well as the concessionaire, continue to conduct independent water quality examinations to assure compliance.

While the Blue Drop Certification is no longer required, the WSA continues to conduct annual independent assessment to ensure that the water quality is satisfactory. *“The municipality and private party undertake annual assessments performed by an independent party and have largely complied with the water quality tests.”* (Interviews with Mbombela Municipal Council, 2020). The issue surrounding the discontinuation of the national water quality assessment is a lack of consistency, because of non-uniform testing and monitoring, is sub-optimal for stakeholders. The main concern arising from the discontinuation of the Blue Drop Certification is further drops in quality standards and associated significant health risks.

In summary, the City of Mbombela WSA has shown mixed results with respect to water services as highlighted by the performance scorecard. The WSA performed poorly in terms of the efficiency of investment, with NRW levels well above the top performing developing country utilities. The level of NRW in the WSA has in fact increased over the period under review, driven by significant challenges of leakages and wastage in the large peri-urban contingent in the municipality.

The WSA showed good results in terms of its operational efficiency ratio, with an average ratio of 1,6 which is within the targeted benchmark of 2. The improvement in operational efficiency came about as a result of streamlining the workforce. However, the level of service in terms of access and continuity did not show the same improvement. This result was mainly driven by the diverse clientele in the region and the increase in unplanned settlements.

From a financial sustainability standpoint, the WSA on average had working ratios above 1, indicating that the inability to recover costs. The large and increasing proportion of rural areas making up the municipal area makes cost recovery challenging in the municipality. Ultimately, the level of reinvestment in existing infrastructure has suffered as a result of this financial sustainability deterioration. The customer experience in the WSA varies according to the demography. There has also been issues with respect to service delivery and water quality, which is because of a culmination of financial and capacity constraints.

Chapter 6: Research findings and discussion

6.1: Introduction

The conclusions and a summary of the research investigation are presented in this chapter. First, the findings from chapter five are discussed in more detail with reference to the existing literature on the subject. Secondly, each research objective's key findings are laid out, and a proposal for the most suitable water service delivery model in South Africa is made. Finally, avenues for future research linked to this study are highlighted.

6.2: Discussion of Findings

The purpose of this section is to dissect the data that has resulted from the research findings and analysis section. The data was collected using secondary data from four WSAs that has used both public and private configurations to compare water provision performance based on the set of performance criteria. These findings were substantiated by information gathered through semi-structured interviews with relevant municipal officials at the WSAs in the sample. The focus of the discussion will be on each of the performance metrics, leading to a debate on whether a public or private configuration is best suited for the data collected.

6.2.1: Efficiency of investment

According to data collected on the efficiency of investment metric, public configurations outperformed the benchmark for top performing developing country utilities. The private configurations, on the other hand, performed considerably worse than the same benchmark. The low level of wastage and leakages in the municipal region was attributed to the degree of urbanisation, according to an interview with the Stellenbosch Municipality. Consumers in urban areas, according to the WSA, usually repair leaks promptly. In addition, the municipality has actively implemented metering and educational programs to aid in the detection and prevention of excessive consumption.

On the other side, the Mbombela WSA has a significant amount of wastage and leakages. Illegal connections and meter tampering pose considerable issues for the municipality. In addition, a lack of water conservation education, has resulted in overconsumption and a penchant for water abuse in the municipality's peri-urban areas.

The City of Mbombela's overconsumption is in line with the country's overall overconsumption, according to the Department of Water and Sanitation (2017). To help communities realize the need for water conservation, the WSA conducted educational programs. While the municipality's infrastructure was enough to meet demand, the WSA felt that a lack of maintenance due to funding constraints has resulted in extended outages.

While the private configurations performed worse on average than the benchmark, the Johannesburg Water WSA improved marginally during the management contract, indicating that the private party was becoming more efficient. Despite the improvements seen under the Johannesburg WSA's management contract, this study contradicts the conclusions of the World Bank (2010), which suggested that increasing PSP would attract more capital, allowing for better maintenance of existing infrastructure through reinvestment. However, this study reveals that the PSP has not really made more funding available for reinvestment; rather, WSAs with private configurations have faced the same reinvestment issues as WSAs with public configurations. This finding is consistent with Ducci's observations from Argentina, where PSP did not result in the expected reinvestment expectations (2007).

6.2.2: Operational efficiency

In terms of operational efficiency, the WSAs produced a mixed bag of results. The Drakenstein and Mbombela WSAs delivered strong results, with average operational efficiency ratios exceeding the norm for top-performing developing-country utilities. In terms of utility operational efficiency, the WSAs in Stellenbosch and Johannesburg delivered somewhat weaker results. The City of Mbombela saw operational efficiencies but the Johannesburg Water management contract did not. Budds and McGranahan (2003) found that PSP efficiencies often result in job losses, therefore the reduction in staff complement to extract efficiencies is in keeping with their findings. Several studies, as well as empirical evidence from Argentina, Colombia, and the United Kingdom, support this conclusion (Hall and Lobina, 2008; Hall and Lobina, 2002; Dore et al., 2004).

The Stellenbosch WSA has one of the oldest networks in the country requiring substantial maintenance to ensure no prolonged breakdowns. Consequently, the WSA has employed a large complement of staff to ensure the adequate water services in the region. This study validates Budds and McGranahan (2003), findings that a lack of capacity and resources at public institutions is a major hindrance in achieving their water provision objectives.

Based on the interview with the Stellenbosch Municipal Council, it was apparent that the municipality was undertaking an exercise to determine the optimal staffing structure level. Furthermore, it had been experiencing capacity constraints impacting the preventative maintenance procedures the municipality can implement.

The interview with the Mbombela Municipal Council revealed that the public sector faces similar capacity difficulties. The Silulumanzi Concession, on the other hand, appears to be adequately staffed, according to the Mbombela municipality, with the ability to outsource key functions as required. It was also mentioned that the concession was able to attract the right level of expertise needed to provide a high-quality service. This conclusion backs up Budds and McGranahan's assertion that capacity limits are the most pressing issue at public utilities (2003).

6.2.3: Financial sustainability

The study highlighted that all four of the WSAs except for the City of Mbombela had working ratios below 1x, indicating that full cost recovery was present during the assessment period. The public configurations, represented by the Stellenbosch and Drakenstein WSAs, performed the best in this category, with working ratios reflecting those of a top performing developing country utility. The private configurations had, on average, considerably higher working ratios.

The municipality was able to ensure cost recovery by evaluating all services as a basket of services, based on interviews with the Stellenbosch WSA. This approach allowed the municipality to take a more comprehensive approach to affordability and cross-subsidize with other services. Cost recovery was ensured across the WSA's basket of services thanks to the capacity to cross-subsidize. Because the municipality was in charge of all services in the region, it was able to cross-subsidize all of the services that fell within its scope. Unfortunately, a private operator solely responsible for water services would need to have the ability to cross subsidise.

Despite the relatively higher working ratio, the Johannesburg WSA showed substantial improvement during the management contract. During this period, the private party was able to reduce expenditure and improve collection rates, turning around a financially unsustainable WSA to a sustainable one. The Mbombela WSA averaged a working ratio of 1,03x over the assessment period, indicating that the WSA was not profitable over the assessment period.

Accordingly, the evidence from this study is inconclusive and discounts the findings from several studies that private ownership improves the performance of firms (Boycko, Shleifer, and Vishny, (1996); Shleifer, (1998)).

Based on the interview with the Mbombela WSA, it was evident that the exposure to a larger peri-urban demographic and increasing unplanned settlements in the municipality was the key reason behind the lack of cost recovery. While the increasing unplanned settlements has increased the municipal area and thereby the service area, the Silulumanzi concession area remained the same as originally contracted. Consequently, the Mbombela Municipality has taken responsibility for water provision in the unplanned settlements. The Silulumanzi Concession would not be able to consider taking on the unplanned settlements due to the impact on its profitability and return to shareholders. This finding supports the views of Budds and McGranahan (2003), who highlighted the profit motive of a private entity being different from the social mandate of the public sector.

6.2.4: Responsiveness to customers

The coverage of the service provided, the affordability of the service provided, and the quality of the service provision were all factors in determining responsiveness to customers. All four WSAs did relatively well in terms of coverage of service provided, either enhancing or maintaining access to water throughout the assessment period. In general, the cost of water in South Africa was found to be low when compared to the country's GDP per capita. Despite the fact that Blue Drop certification is no longer required, all WSAs continue to conduct independent water quality tests.

The Stellenbosch and Drakenstein WSAs both maintained their close to 100 percent household coverage. The private configurations have also shown improvement over the assessment period with an expansion in households with access to water services. These performances have highlighted the effectiveness in improving access to services under a private regime. This finding is supportive of the arguments put forth by the World Bank (2010), who advocates for PSP in water services due to the expected improvement in water access. Further support of this finding is in the empirical evidence from Brazil, Colombia and Chile, highlighted by Marin (2009) and Shirley et al. (2000), where access to water improved under a private regime.

According to the interviews with the WSAs in Mbombela and Stellenbosch, the degree of service varies based on the demographic make-up of the municipalities. The urban areas have a decent level of service, but the peri-urban areas have a low level of service. The gap in service levels is mostly caused by a rise in unplanned settlements and a low degree of cost recovery in peri-urban areas. The situation in some peri-urban areas of the Mbombela WSA emphasizes this point even further. Residents in vulnerable areas were found to obtain water only once a week in these areas. As a result, the findings on service disparity are consistent with empirical evidence from Argentina showing unequal access based on income levels, as highlighted by Clarke et al (2004).

In both public and private configurations, the affordability performance measures yielded inconclusive findings. In comparison, the publicly employed configurations mainly exhibited the same levels of affordability. On the other hand, as privately employed configurations, the City of Mbombela and Johannesburg Water produced conflicting results. The City of Mbombela had the worst affordability measures, while Johannesburg Water had the best. In general, the cost of water appears to be low when compared to the GDP per capita.

During the interview with the City of Mbombela, the WSA expressed their belief that water provision in the municipality is affordable given the feedback from extensive public participation. It was further highlighted, that had it not been for severe droughts and the implementation of higher tariffs, affordability would have reflected more favourably.

Increased PSP in water provision is likely to be followed by a predicted increase in cost, according to Budds and Mcgranahan (2003), driven by cost recovery and a required return on investment principles. This notion is supported by empirical evidence from the UK, France, and Argentina, as indicated by studies from (Green, (2001); Dore et al. (2004), and Hall and Lobina, (2008). This study, on the other hand, has shown that PSP does not always result in a rise in tariffs. The Johannesburg Water management contract, for example, demonstrated that Suez was able to maintain tariffs during the contract period while also improving the WSA's financial sustainability.

It's been difficult to assess the quality of water performance similarly across WSAs since the Blue Drop Certification was discontinued and restructured. The Stellenbosch and City of Mbombela WSAs, on the other hand, have continued to test the water quality on a regular basis through an independent body. However, it's unclear whether these assessments adhere to the same exacting standards as a standardized national assessment program would.

The City of Mbombela had one notable instance of illness outbreak, which had a relatively subdued impact on the community and was well contained in the main. There have been a few instances of water service delivery protests in the Mbombela municipality, with the municipal officials indicating that service delivery has been significantly affected by the constant increase in unplanned settlements. The findings from the study are inconclusive on whether increased PSP improves the quality of water. This is mainly due to the lack of a uniform standardised assessment framework. Accordingly, it is difficult to consider the empirical evidence in the UK of improving water quality under PSP, put forth by Dore et al. (2004).

6.3: Summary discussion of findings

When comparing the four municipalities in terms of specific performance measures, it was evident that both public and private configurations had advantages and disadvantages. Because of the degree of urbanisation in those regions, public configurations fared better in terms of investment efficiency. The expected reinvestment from PSP as a result of access to capital did not materialise as anticipated.

The private configurations showed signs of operating efficiency, although this was accompanied by an increase in job losses, which was to be expected given the increased PSP. However, operational efficiency does not always translate into better water service delivery. The public configurations brought up concerns about capacity restrictions. The lack of necessary skills and ability has had a direct influence on the quality level of service. As a direct result of capacity constraints, the identification of preventative maintenance has been identified.

Except for the City of Mbombela, all WSAs were able to fully recoup operational costs from revenue generated, which is encouraging. The Stellenbosch municipality leveraged their position as the municipality's sole provider of all services to execute a cross-subsidization of a basket of services.

The municipality was able to achieve complete cost recovery for all services thanks to this strategy. The City of Mbombela was unable to recoup costs on average for the period under study, owing to the huge and growing peri-urban population. However, Johannesburg Water's performance is an example of PSP using cost recovery concepts to improve a utility's financial performance.

The public configurations outperformed their counterparts in terms of the customer experience. The coverage of water, affordability and number of service delivery protests were all better than the private configurations on average. While there was one minor issue relating to water quality in the City of Mbombela, the discontinuation of the Blue Drop certification makes it challenging to determine the impact of PSP on water quality.

6.4: Conclusions

As judged by the performance scorecard, the public configurations did well in water services, according to the study. The interview with the Stellenbosch WSA highlighted the performance's strength in the face of serious capacity constraints. The degree of urbanisation, the ability to cross-subsidize, and the demography of the region are all factors in the region's strong investment efficiency, financial sustainability, and water coverage.

However, the WSA's operating efficiency fell short of the top performing developing country norms. The interview brought up issues such as capacity and financial constraints, both of which have an impact on the level of preventative maintenance performed on existing infrastructure. Overall, the WSA's social mandate has been crucial in enhancing the municipality's water provision.

The private configuration yielded mixed results in terms of the performance scorecard. The operational efficiency ratios improved on the back of a restructure of the workforce in line with PSP expectations. While the loss of jobs is not ideal, the positive impact on financial sustainability is important, particularly in smaller municipalities. The performance in efficiency of investment was relatively poor as result of a large peri-urban demographic. Additionally, financial and capacity constraints are the main drivers behind a lack of maintenance. Looking at the experience of the City of Mbombela, the private party elected to make a return at the expense of maintaining the existing infrastructure.

From a financial sustainability standpoint, the performance of City of Mbombela was disappointing because of increasing and unplanned peri-urban exposure. Encouragingly, Johannesburg water provided some evidence of the positive impact PSP can have on the financial situation of a utility. The municipality's largest issue is the growing number of unplanned settlements, which has landed fully on the municipality's shoulders, as this is outside the scope of the original concession. Due to the private party's profit motive, taking on the unplanned settlements would result in a reduction in shareholder value.

This research established that public configuration WSAs outperformed privately configured WSAs in terms of efficiency, financial sustainability, accessibility, affordability and customer centricity. Private configurations produced better operational efficiency outcomes and there was evidence of PSP improving the financial prospects of a utility. That said, South Africa's municipal challenges are centred on the country's inequalities. As a result, the quality of service supplied varies depending on one's financial situation. The study shows that PSP has not addressed service inequity and improve service delivery, due to the impact of undertaking these issues on shareholder value.

In conclusion, while the results show that water service delivery in South Africa is best improved by the public sector, components of the private configuration need to be considered in water service delivery. Ultimately there is no one size fits all solution in water service delivery. The complex nature of the sector requires a tailored solution which borrows key principles from both configurations.

With that in mind, the researcher proposes certain key principles, which based on the paper's key findings and analysis, should be used to construct the appropriate configuration to match the demands of the country. Due to South Africa's substantial inequality issues, a public configuration where the utility's mandate is to improve service delivery rather than make a profit is better suited. To extend water services to all citizens, a social mandate needs to be at the forefront.

The configuration needs to combat excessive consumption as a result of leakages and wastage. Educational programs focused on water conservation and highlighting the scarcity of the resource could assist in reducing the amount water wastage. To ensure that network breakdowns are kept to a minimum, regular preventative maintenance is required. The funding and capacity challenges currently hindering this will need to be addressed.

The financial sustainability of the WSA is key in addressing the current funding challenges at hand. The configuration will need to completely adopt the cost recovery principles, fundamental to private participation. By ensuring that the WSA can fully cover operating costs from its tariffs, long term sustainability will be achieved. The operating costs of the WSA should ideally consider a component of preventative maintenance. The preventative maintenance can be considered over a long horizon, ensuring that only a small provision is required each year. This approach will require additional capacity within the WSA for planning and foresight.

The municipalities should all adopt a cross subsidisation across all services, where possible. The affordability of all services to a consumer can be framed by looking at each service and its affordability as a basket of services. This will provide the municipality with some flexibility in considering which tariffs it can increase in the basket of services. Ultimately, this will lead to improving the financial health of the whole organisation.

By improving the long-term financial health of the WSA, the possibility of attracting grant and other concessional funding is greater. The funding raised will go a long way in assisting the country in improving the network and thereby extending services to the most vulnerable.

To address the municipal capacity issues, a public collaboration should be investigated. Where the WSA lacks certain competencies, a partnership with another public institution can be formed to supply such expertise. Given the high levels of youth unemployment in the country, government could implement national graduate or learnership programs at municipalities around the country, thereby promoting youth employment while alleviating capacity issues.

The customer should be at the heart of the WSA's strategy. The municipality should make customer service a top priority. Formal communication channels should be established in this regard to ensure that citizens are always informed about the status of water services. Service delivery protests would be kept to a minimal when these essential principles are implemented, and communication is improved. Each municipality should be forced to do a national, standardized water quality evaluation every year. If the WSA fails the assessment, it will be considered non-compliant, and the DWS will issue sanctions.

6.5: Future research

Whilst the findings of this research provide rich insight and add to the existing body of literature addressing different water configurations available, it was limited to four South African Municipalities. To acquire a better understanding of their varied experiences, two of the four municipalities were interviewed. In order to gain better perspectives on the country as a whole, and to gain a clear picture of how the choice of configuration affects service delivery in municipalities across diverse wealth groups, more research in other municipalities spanning all demographics is suggested as future research. The author of this study also believes that a similar experiment, conducted across Africa to determine how different configuration choices influence different countries would be beneficial to stakeholders grappling with how to give every citizen access to this very important resource in an equitable way.

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APPENIDX A: SEMI-STRUCTURED QUESTIONNAIRE FOR MUNICIPAL OFFICIALS

TITLE: ASSESSING THE SUITABILITY OF A PUBLIC OR PRIVATE CONFIGURATION IN THE PROVISION OF WATER SERVICES IN SOUTH AFRICA

A CASE STUDY BETWEEN THREE MUNICIPLAITIES REPRESENTING DIFFERENT CONFIGURATIONS

The purpose of this research is to assess the effect of different water provision configurations on water service delivery in the municipality.

Dear Sir/Madam

You are asked for to answer all questions sincerely and accurately. Your responses are crucial for the dependability of the research in answering the ultimate research questions. Your name will stay mysterious in the report from this examination and the accumulated data may not be connected to you as a person.

Section A – Profile of the respondent, municipality and understanding the water provision landscape

What position do you hold within the municipality?

- Can you describe the extent of your responsibilities in your role?
- How long have you been employed in the role described?
- Can you provide an overview of the organisational structure of the municipality and the unit you are employed in?

What is the municipality's role with respect to water service delivery?

- Does the municipality provide the service or is it outsourced / commercialised?
- What is the level of demand and supply for water in the municipality?
- How much water does the average person consume daily in the area?

- What are the range of sources of water in the region?
- Can you provide a detailed breakdown of the water production in the region?
- What are the main challenges experienced with respect to the supply and demand dynamic of water provision?

What is the typical climate in the municipality? When is the rainfall season typically?

- How has climate change impacted the municipality's ability to provide water to its citizens?
- What measures has the municipality taken to combat this impact on water provision?

What configuration does the municipality operate under with respect to water provision?

- Can you provide the details of the configuration (term, roles, responsibilities, and stakeholders)?
- How does this configuration facilitate an improved water service delivery? How does this configuration impede water service delivery?

Section B - Efficiency of investment

What is the level of non-revenue water in the municipality and how has this changed over time?

- What is the main reason behind the level of non-revenue?
- Can you break down the level of non-revenue water into components relating to physical losses, excessive consumption and lack of cost recovery etc.,?
- What approach has the municipality undertaken to combat non-revenue water?
- How does the current configuration of water provision in the municipality enable or hinder progress with respect to improving non-revenue water within the municipality?

Does the municipality have the necessary infrastructure to provide water to consumers?

- What is the maintenance policy of the municipality with respect to water infrastructure?
- How is the maintenance of water infrastructure funded within the municipality?

What is the current level of water wastage and excessive consumption in the municipality?

- How does the municipality combat excessive consumption or water wastages in the municipality?

Section C – Operational Efficiency

What is the current percentage population covered in terms of water provision?

- What is the number of households that have access to basic water services? What is the breakdown of these delivery points (i.e., inside the yard vs distance from yard)?
- How long has this coverage been in place?
- What is the reasoning behind the coverage?
- What is the municipality's objective with respect to household connections and delivery points?
- How will the current water configuration enable or hinder the realisation of these objectives?

What is the continuity of the water services like in the area?

- Is there a history of water cuts?
- Can you provide a breakdown of number of hours of service per day in the various regions making up the municipality?

How many staff do the municipality have with respect to the water provision unit?

- What percentage of total staff is employed in the water unit, and do you believe that this is sufficient?
- Does the municipality have any capacity issues, and can you elaborate further on this?
- How has the municipality configuration impacted the capacity issues at the municipality?

Section D – Financial stability

How is the municipality's day to day operations funded?

- Does the municipality receive support from government / private concessionaires financially?
- If so, to what extent is financial support received and what are the terms and conditions of such support?

Is the municipal unit financially sustainable - I.e., can the municipality operate entirely out of its own earnings without any external financial support?

- What is the municipality's history in terms of audit opinions – Has the municipality always received unqualified opinions in recent times?
- Can you provide historical data relating to the municipal financial stability i.e., history of earnings?
- How has the municipality configuration impacted the financial stability at the municipality?

Can you provide historical and current details of the total operating expenses and total annual collections?

- Can you please provide details as to the rationale behind the fluctuations in these numbers?

How does the current configuration relating to water provision within the municipality impact the financial standing of the municipality?

- Is cost recovery vital paramount in terms of the service provided?
- What measures have been put in place to ensure cost recovery?

Section E – Customer experience

What are the basic services a consumer can expect in terms of water provision in the municipality?

- Can you provide a detailed breakdown of the tariff structure of the municipality?

- What is the average monthly tariff for a typical consumer in the municipality?
- What are the connection fees in the municipality?

Do you believe that the communities within the municipality are receiving adequate services with regards to water provision?

- How are complaints dealt with in the municipality? What is the process?
- How many complaints have been received on average per month in 2020? How have these been resolved (Percentage of resolved vs unresolved)? How long does it take to typically resolve a complaint?
- Has there been any instances of service delivery protests with respect to water service delivery in the last 5 years or during the term of the concession?

How would you rate the quality of water provided to consumers?

- Has the municipality received the blue drop certification for the water provided? Can you provide a history of certification with respect to the water quality?
- What is the reasoning behind not achieving certification where relevant?
- Has there been any major instances of diseases or health issues related to the quality of water in the area?

How has the choice of configuration impacted the customer service in the municipality?

- What is the configuration's stance on customer experience?
- What measures have been put in place to ensure good quality customer service?

Section F – General

What is the relationship like between the municipality and its service provider concessionaires?

How has the service fared under the relevant configuration?

How can service delivery be improved? How can this be supported by the relevant institutional partner in terms of the configuration?

If you could improve one thing in terms of water provision in the municipality what would this be? How would you achieve this and what tools would be necessary to see this realised?