An improvement plan for water services management in the Sol Plaatje Local Municipality

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DECLARATION

I, Grant Solomons, hereby declare that the dissertation: “An improvement plan for water services management in the Sol Plaatje Local Municipality” submitted in fulfilment of the requirements of the degree Master of Arts in Public Management and Governance at the North-West University, Potchefstroom Campus is my own work and has not previously been submitted by me to any University. I further declare that all material and sources used in this study has been duly acknowledged by means of complete in-text source references.

I understand that the copies of this dissertation submitted for examination will remain the property of the North-West University.

Signature: Grant Solomons Date: 27 November 2024

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First and foremost, to God be all the glory and all the honour. I praise God Almighty for the opportunity, strength, and guidance He has provided me to complete this journey. Without His hand over my life, none of this would be possible. To God be all the glory and all the honour.

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ABSTRACT

Access to the correct quantity and quality of water is essential for human life; without it, society would not function properly. Due to water's vital role in all aspects of society, governments worldwide must manage water resources effectively, efficiently, and sustainably for current and future generations. Resilience coupled with effective and efficient water services management in water systems can aid in preserving this precious commodity for humankind's continued survival and development.

The study examined the resilience of the water systems of The Sol Plaatjie Local Municipality. In addition to the state of water supply infrastructure, the study also examined the quality of water services provided to the residents of the greater Kimberley area. In this regard, the roles and responsibilities of municipalities as water services authorities and providers were also examined to determine whether sustainable strategic plans were in place to ensure prolonged water resilience and improve water services management.

This study was qualitative in nature, and it employed a case study and cross-sectional research design. Semi-structured interviews, questionnaires, observations, and document analysis were among the methods and instruments used for obtaining data. The research sample comprised residents who experience water shortages and disruptions, specifically those who live in Carters Glen, Hadison Park, Galeshewe, Roodepan, New Park, and Southridge within the boundaries of Sol Plaatjie Local Municipality. The research sample also included three ward councillors and two municipal officials.

After conclusive research, the study found that the Sol Plaatjie Local Municipality had little to no water resilience as residents of Kimberley experienced severe water cuts -and shortages, including low water pressure regularly. In addition to this, residents also raised concerns regarding the quality of water services management.

Recommendations of the study are to take an active approach to improving and or replacing dilapidated existing water infrastructure; to prioritise adequate training and development of technical staff responsible for maintenance of water infrastructure; to involve residents in water services management; and to emphasise planning for crucial municipal operations and functions.

An improvement plan for resilience of water services management in the Sol Plaatje Local Municipality

Keywords: Resilience, Sol Plaatje Local Municipality (SPLM), Water conservation Practices, Water Services Authority, Water Services Providers.

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CHAPTER 1 :
ORIENTATION AND PROBLEM STATEMENT

1.1 CONTEXT / BACKGROUND TO THE STUDY

The right of access to sufficient water is accorded to everyone in section 27(1) (b) of the South African Constitution (1996)[1], which states that everyone has the right to access sufficient water. Section 27(2) of *The Constitution* requires the State to take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of this right. Without water, all life on earth would cease to exist. Its importance is evident in environmental and socio-economic development. However, natural water supplies are increasingly becoming scarce, and with increasing global consumption intensifying the situation, a global water crisis is a realistic threat (Van der Bruggen, Borghgraef & Vinckier, 2010:1886).

The lack of volumetric abundance of water supply is referred to as water scarcity, and it is calculated as the ratio of human water use to available water supply in a specific location (Mnisi, 2020). Water scarcity can be categorised into physical- and economic scarcity. The former refers to a situation where there are not enough natural water sources to satisfy the needs of an area (Mnisi, 2020). At the same time, the latter refers to a situation where there is a lack of investment in water infrastructure used to supply water and a lack of human capacity to satisfy water needs (Mnisi, 2020). The above can occur in areas where water is scarce or abundant (Mnisi, 2020). Thus, water scarcity is attributed to various factors, including poor water resources management and related water management strategies (Dungurmaro, 2007:1142). These factors can be man-made or natural. Man-made factors include, but are not limited to, the failure of services and maintenance of water infrastructures like reservoirs.

Water scarcity is a problem faced by numerous countries around the globe, including South Africa. Water is still unavailable to many people in sub-Saharan Africa, South Asia, and East Asia (Dungurmaro, 2007). To support the statement above, the World Economic Forum (WEF) identified the water supply crisis as the number 1 high-impact risk for our current times (Liu, Yang, Gosling, Kummu, Flörke, Pfister, Hanasaki, Wada, Zhang,

[1] Hereafter referred to as *The Constitution*

Zheng, Alcamo & Oki, 2017:545). Population growth, economic development, and animal product-based diets have all increased the water demand, placing strain on water resources (Liu *et al.,* 2017:545). Jiménez-Cisneros, Oki, Arnell, Benito, Cogley, Doll, Jiang, Mwakalila (2014), Rockström and Falkenmark (2015, cited by Damkjaer & Taylor, 2017:514) states that one of the world's most pressing concerns is ensuring enough freshwater supplies to support people's health and well-being, and the ecosystems which they live in.

In Africa, most countries in the near East, North Africa, and Southern Africa regularly or permanently suffer from acute water scarcity (Dungurmaro, 2007:1142). Seckler, Barker and Amarasinghe (1999) state that a third of the world's population in developing countries will experience some form of water scarcity within the next century. After thousands of years of human development in which water has been a plentiful resource in most areas, amounting virtually to a free good, the situation is now changing. Water scarcity has become the single greatest threat to food security, human health, and natural ecosystems (Seckler *et al.,* 1999:29). Tzanakakis, Paranychianakis, and Angelakis (2020:1-2) continue and state that globally, millions of families remain vulnerable to water scarcity or do not yet have access to clean and adequate drinking water. More specifically:

- Over 2 billion people live in regions experiencing high water stress, which is expected to increase.
- Over 1 billion people cannot access clean and safe drinking water.
- About 3.4 million people die each year due to the use of contaminated water.
- Millions of women and children spend several hours each day collecting water from an average distance of 6km.
- At any given time, half of the world's hospital beds are occupied by patients suffering from diseases associated with lack of access to clean water.

He, Liu, Wu, Pan, Fang, Li, and Bryan (2021:2) contribute to the abovementioned with their study, stating that globally, in 2016, 933 million urban residents lived in water-scarce regions, with 359 million and 573 million experiencing perennial and seasonal water scarcity respectively.

Regarding South Africa, droughts have become a frequent occurrence, posing a serious threat to urban water supply (Pamla, Thondlana & Ruwanza, 2021). Therefore, the country is considered semi-arid and dire need of freshwater resources. Drought

conditions in the 2010s were widespread and registered critically in the Eastern Cape, Northern and North-western Cape, and Gauteng, Limpopo, up to as late as 2018-19. The outlier was the Western Cape, where the City of Cape Town faced a critical Day Zero event. Drought conditions have also been persistent in Gqeberha – up to recent times because of insufficient water resources and lack of rainfall. South Africa experienced a prolonged drought between 2014 and 2016 and still faces the consequences. However, this was not a severe drought and did not cause complete water scarcity. The drought followed three years of below-average rainfall, making it the most severe and long-lasting drought since the 1940s (Donnenfeld, Crookes & Hadden, 2018:2). This period caused the country's average dam levels to decrease from 93% in March 2014 to 48% in November 2016. The year 2017 brought with it recovery, but national water levels were still recorded as moderately low at 59% in 2018. According to the Department of Water and Sanitation (DWS), National Integrated Water Information System (NIWIS), 146 of South Africa's 565 rivers have 'very low' flows. At the same time, a further 105 are 'low' and another 88 'moderately low' (Donnenfeld *et al.,* 2018:3).

Due to persistent droughts in the past decades, various provinces have been declared drought disaster zones, most notably the Eastern Cape, Western Cape, and Northern Cape, which was the focus of this study (Pamla *et al.,* 2021:2; Sgqolana, 2021). The statement above is supported by Sgqolana (2021), who states that Dr Mmaphaka Tau, the head of the National Disaster Management Centre of the Department of Cooperative Governance and Traditional Affairs (CoGTA), at the time, issued a notice in the Government Gazette on July 20, 2021, declaring the drought in the three Cape provinces a national disaster.

Thus, water scarcity is a pressing issue in South Africa. The country is currently over-exploiting its renewable water sources (Donnenfeld *et al.,* 2018:1). Further if the above issue is not adequately prioritised, the country will face dire consequences because when water is placed out of reach of those individuals who need it, a range of complications can arise. These include dehydration, inadequate meat, and crop production, causing severe strain and bringing forth the possibility of shortages in these commodities. Local and regional economies can be seriously affected. Individuals can also find it challenging to participate in societal activities, such as going to school or work, due to personal hygiene reasons. The lack of water is unconstitutional. It compromises the basic needs of individuals (*The Constitution, 1996*). Due to the crucial role water plays in all aspects of the day-to-day lives of individuals, water security is essential.

Water security is ‘the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against waterborne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability goals (UN-Water (2016, cited by Meissner, Funke, Nortje & Steyn, 2019:3). To ensure the realisation of water security in the country, considerable efforts by the private sector, national, and local government are evident (Dungurmaro, 2007). For instance, all water-related matters are delegated to the National DWS and Water Services Authorities (WSAs) at the local government level. The Department of Water Affairs and Forestry (DWAF), now known as the Department of Water and Sanitation (DWS), states that the sole responsibility of the department is to serve the people of South Africa by conserving, managing, and developing the water resources in a scientific and environmentally sustainable manner, to meet the socio-economic needs of South Africa (DWAF, 2002/2003:2).

The collaborative efforts of the entities mentioned above utilise specific approaches to achieve their goals, and one such approach is the Integrated Water Resources Management (IWRM) approach, which strives to ensure the conservation of water resources and the accessibility of water by the residents of South Africa (Dungurmaro, 2007:1142). According to the then DWAF (2004, cited by Jonker, 2007:1258), IWRM is “a process which promotes the coordinated development and management of water, land and related resources to maximise the resultant economic and social welfare equitably without compromising the sustainability of vital ecosystems.” South Africa is widely acknowledged as one of the leading countries in adopting an IWRM system (Jonker, 2007:1257).

Furthermore, the South African government, at the national level, formulated and implemented water-related policies and programmes to ensure water security in the country. These policies and programmes include the National Water Act No. 36 of 1998, the Water Services Act No. 108 of 1997, and Sections 4 and 27.1 in *The Constitution* (1996), which provide for the right of every citizen to a healthy life, access to food and water and to have the environment protected. Also included is the National Water Policy (NWP) (DWAF, 1997), the National Water Resources Strategy (NWRS) of 2004, 2013 and currently 2022-3, the Strategic Framework on Water Services (SFWS) (2003) and the White Paper on a National Water Policy for South Africa.

Besides policies, the Blue and Green Drop programmes were implemented to improve water quality and municipal management in 2008-2012. These programmes came to a standstill in 2014 due to under-performance; however, both programmes have been resurrected. The Blue Drop programme was implemented to maintain and improve the quality of drinking water in South Africa; this was done through a compulsory annual assessment of water services authorities (WSAs) management and service rendering of the potable water supply in their respective geographical areas of responsibilities (Nealer & Mtsweni, 2013:37). The Blue Drop programme ensures that water is safe for consumption through assessing and identifying risks within the water supply systems (Kelly, 2021:53). In addition, Kelly (2021:53) emphasises that the three key areas evaluated for risks are: water treatment infrastructure, people who are appointed to operate and manage said infrastructures, and water risk and quality compliance. The Blue Drop Watch report (2023) provides a deeper insight into the current state of municipalities. A total of 151 Water Supply Systems (WSS) were inspected, and the findings offer a representative overview of systems owned and operated by 140 municipalities and 26 water boards and bulk water service providers. For the 151 systems evaluated, an average TSA (Technical Site Assessments) of 69% was attained, meaning that processes and infrastructure are, on average, partially functional with an average performance (DWS, 2023:ix). A total of 38 (15%) of the 151 WSS are classified as poor and critical, and 128 (85%) as average, good or excellent (DWS, 2023:ix). Gauteng, the Western Cape, and the Eastern Cape have the best water supply system overall, while the Northern Cape, North West, Limpopo, and the Free State are home to WSSs that are in poor or critical condition (DWS, 2023:ix). The associated VROOM (The Very Rough Order of Measurements) costs needed to restore and refurbish dysfunctional systems amount to R1 498 614 377, with the bulk of investment required for Free State and KwaZulu-Natal (DWsS, 2023:13).

In conjunction with the Blue Drop programme, the Green Drop programme aims to improve water services. The programme essentially compares and assesses the performance of Water Services Authorities (WSA); it then awards or penalises WSAs based on how they performed compared to DWS's baseline criteria or requirements (Ntombela *et al.,* 2016:705). Burges (2016:2) states that Green Drop status is awarded to municipalities with a 90% or above score on the Green Drop assessment criteria. Green Drop scores are assigned per individual wastewater system within the municipal area for the following: process control, maintenance and management skills; wastewater

quality monitoring; credibility of wastewater sampling and analysis; submission of wastewater quality results; wastewater quality failures; storm-water and water demand management; by-laws; capacity and facility to reticulate and treat wastewater; and publication of wastewater quality performance and wastewater asset management. As with the Blue Drop Watch report, the Green Drop Watch report (2023) also provides a deeper insight into the current state of municipalities. According to the Green Drop Report 2022, 344 (39%) municipal wastewater systems were found to be in a serious condition in need of immediate attention and restoration (DWS, 2023:3). This was particularly troubling because it confirmed a worrying trend of decline over an eight-year period, with 248 (29%) of the systems showing decline in their Green Drop score when compared to the 2013 baseline (DWS, 2023:3). Both the treatment and sewer collecting systems showed signs of degradation. Wastewater systems in critical condition were more likely to be found in WSIs (Water Services Institutions) with low levels of infrastructure investment and inadequate capacity for competent workers, according to the Green Drop audit procedure (DWS, 2023:3). The associated VROOM costs needed to restore and refurbish dysfunctional systems amount to R2 827 982 140 (DWS, 2023:139).

Alongside legislation and programmes to ensure water security, the collaborative efforts between the South African government and the private sector led to the construction of massive dams to ensure water security, and these include, amongst others,

- The Gariep Dam and its extensive reservoir on the Orange River which supplies, water to the Eastern Cape, as well as parts of the Northern Cape.
- The Hartbeespoort Dam supplies water to the Hartbeespoort Irrigation Scheme, Hartbeespoort, and the town of Brits.
- A weir on the Olifants River supplies water to irrigation farmers near Marble Hall in Sekhukhune.
- The Hereford Irrigation Board’s weir on the Olifants River supplies the privately owned Hereford Irrigation Scheme near Groblersdal in Sekhukhune.
- The Inanda Dam on the uMngeni River supplies water to the eThekwini Metropolitan Municipality and its economy.
- The De Hoop Dam on the Steelpoort River in Sekhukhune supplies water to chrome and platinum mines in the Burgersfort and Steelpoort areas (Meissner *et al.,* 2019:6).

- The Lesotho Highlands Water Project (LHWP), built in Lesotho's Maloti Mountains to convey water from the Senqu River to South Africa's economic heartland in Gauteng Province via the Upper section of the Vaal River, is the most well-known example (Meissner *et al.,* 2019:7).

The commendable efforts above led to improvements in South Africa's drinking water (Edokpayi, Enitan-Folami, Adeeyo, Durowoju, Jegede & Odiyo, 2020:192), and a range of initiatives to provide those who still struggle to access water resources. These initiatives include communal boreholes dug in several communities to meet water demands and trucks and tankers providing potable water (Edokpayi *et al.,* 2020:192). However, the protection and development of water resources remains a challenging task. Hence, this study's motivation is to join the global fraternity in seeking long-term alternatives to standard measures, like supply augmentation and water restrictions (Blackmore & Plant, 2008). A system is required to be resilient. Resilience refers to the ability of systems, or societies, to cope with shocks, stresses, and change, whether by persisting, or by adapting and transforming to counteract environmental and man-made threats (Rodina, Baker, Galvin, Goldin, Harris, Manungufala, Musemwa, Sutherland & Ziervogel, 2017:143).

1.2 PROBLEM STATEMENT

Municipalities countrywide exhibit signs of the collapse of water services. These include failing infrastructure, non-payment for water services, mismanagement, and corruption, all of which compromise the operations and maintenance of water systems (Mail & Guardian, 2021).

Some recent occurrences helped to draw attention to municipal financial management issues, which include but are not limited to: the 2018 collapse of VBS Bank, which caused significant losses to municipalities that had invested in the mutual bank; the record number of service delivery protests (237 of which took place in 2018 and 218 in 2019); and, unfavourable reports from the Auditor-General, which showed that fruitless and wasteful expenditure cost municipalities R2,07 billion in the 2018/19 financial year (Glasser & Wright, 2020:414). The downward spiral in municipal performance has been well documented in the press. However, the sheer extent of the rot remains alarming, with unconditioned, irregular, unauthorised, fruitless and wasteful expenditure amounting to a whopping R189bn (Nxumalo, 2022).

Zybrands (2012, cited by Reddy, 2016:4) emphasises several additional issues that have had an adverse impact on service delivery since the advent of the post-1994 local government dispensation, specifically unfunded mandates, where municipalities are not funded or receive very little funding for services; financial viability; legal compliance, meaning that there is a compliance-driven governmental approach as opposed to a service delivery one; and sound fiscal discipline which is not compatible with deficient political leadership.

Political interference can also be viewed as one of the woes faced by many municipalities in South Africa. According to Reddy (2016:5), the politicisation of local government or political participation is not a problem in and of itself, but primarily a particular component of that participation. The Mayor of Umtshezi Municipality in KwaZulu-Natal, Councillor B Dlamini, in an interview on 27 March 2015, identified the challenges experienced in local government relative to the political-administrative interface: delays due to political interference that led to massive service delivery backlogs; lack of accountability and poor communication with communities as the ‘big man syndrome’ kicks in due to local leaders thinking that they have political protection and have become untouchable (Reddy, 2016:5). In addition, there is corruption and fraud, with political ‘mandates’ that are illegal and have obscure origins leading to, among other things, negative audit opinions due to poor financial management, violent service delivery protests, scarcity of skills leading to limited municipal capacity; political issues, both within the municipality and also intergovernmental engagements. These issues negatively impact governance and service delivery (Reddy, 2016:5).

The challenges outlined above apply, also to Sol Plaatje Local Municipality (SPLM) under the Francis Baard District in the Northern Cape Province. Water supply systems are failing and may become deficient due to the rising demand caused by population growth, exacerbated by ageing equipment and maintenance issues (Monte & Morais, 2019:4835). Regarding population growth, a projected rise of up to 1 265 450 people was expected in 2023 in the Northern Cape (Northern Cape Provincial Government, 2022:4). Kimberley is the primary urban node and the capital of the Northern Cape Province. It is also the province’s leading hub for shopping, financial services, education and trade. As the population grows, more water services issues will arise, while equipment and infrastructure will continue to age and deteriorate, placing more pressure on water services management.

Numerous protests were recorded in the municipality, and water provision was the leading cause (Edokpayi *et al.,* 2020:192-193). Edokpayi *et al.* (2020:192) contend that residents voiced their complaints regarding water services delivery and expressed their dissatisfaction regarding water shortages and a lack of flowing potable water for over a decade. SPLM's water seems unfit for human consumption, and there are shortfalls of inadequate water supply. The Blue and Green Drop percentages of the local municipalities, including Sol Plaatje, have fluctuated over the past few years to support the notion that the water provided is unfit for human consumption. None of the water supply systems or wastewater treatment systems have achieved the Blue or Green Drop (Northern Cape Provincial Government, 2022:47). In terms of the Blue Drop Watch Report, the Ritchie water treatment facility is categorised as a Class C plant and is registered on the IRIS.

Nonetheless, a serious cause of concern is that the WSA does not adhere to legal specifications for personnel in charge of process control (DWS, 2023:413). The plant was in fair condition, and all treatment processes were functional. However, the lack of standby dosing equipment and operational monitoring equipment is of concern (DWS, 2023:413). The DWS (2023:413) also states that the municipality must complete and revisit its water safety plan to be more specific concerning identified hazards, risks, and control measures. Additionally, the report states that drinking water quality does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is 96.39% (poor) for microbiological compliance and 85.38% (bad) for chemical compliance. The Green Drop report on SPLM states that 59 systems were found to be critical by the Northern Cape provincial chapter and the Green Drop 2022 study, as opposed to 33 in 2013 (DWS, 2023:116). Between 2013 and 2021, the province's treatment plant risk ratio regressed significantly, from 78.4% to 89.7%. The most significant hazards were identified at the treatment level, where they were associated with WWTWs that exceeded their design capacity, defective equipment and procedures (particularly in the area of disinfection), and non-compliance with sludge and effluent regulations (DWS, 2023:116). The Green Drop Watch report estimated the VROOM cost for SPLM to be R31 270 000 (DWS, 2023:139).

Residents in Kimberley have continually experienced unreliable water supplies from SPLM since December 2020 and even earlier (Mafata, 2021). Mafata (2021) also states that the water supply in SPLM was stopped in the evenings and only restored in the mornings. Water had also been cut off for two weeks in February 2021 to repair a

damaged pipe, and after restoration, the water appeared to be discoloured (Mafata, 2021).

A trend of inconsistent water provision plagued residents in 2022. Recorded on the Kimberley city portal and news and media outlets, residents experienced water disruptions on 22 different occasions. These disruptions ranged from total water supply cuts to low water pressure due to pipe bursts. Residents were also fore-warned to experience water supply cuts when maintenance and repairs had to be performed on water supply reservoirs. The duration of maintenance and repairs were expected to be varied, leaving residents unsure of when they will have water in their taps (Kimberley City Info, 2024).

On 10 September 2022, residents of Kimberley were left without water following a pipe burst (Mothibi, 2022). Sol Plaatje Municipality responded by switching off the two main reservoirs to proceed with repairs. However, it was delayed due to the repair team having to wait for the return flows of water in the pipelines, to subside (Mothibi, 2022). Residents were also informed of a scheduled temporary water interruption from 06 October to 10 October 2022.

According to a political leader within SPLM, a former councillor had sounded the alarm bells in 2009 regarding the maintenance, reparation, and replacement of municipal infrastructure (Radebe, 2022). The then mayor of SPLM stated that the scheduled water interruption was necessary to replace old infrastructure (Radebe, 2022), that improvement would henceforth be evident, and Kimberley would move in the right direction concerning available and adequate water services (Radebe, 2022).

Even if efforts to alleviate the persisting challenges mentioned above are in place, the maintenance and management systems still need to be improved by the municipality and the district (NCPG, 2022:46). Maintenance backlogs have become a systemic concern, despite ambitious policies, legislation, and infrastructure investments. Repairs have become costly. Hove, D'Ambruoso, Mabetha, van der Merwe, Byass, Kahn, Khosa, Witter, and Twine (2019:2) report that non-functional and poorly maintained infrastructure, along with empty or inadequately filled reservoirs, contributed to significant costs for municipalities nationwide. By 2012, outstanding repairs amounted to $1.4 billion, leaving many households without essential services and experiencing water supply interruptions. To improve the overall functioning of municipal services, the DWS and the Water Trading Entity have been allocated a combined budget of R111.256 billion over

the medium-term expenditure framework (Mchunu, 2022). The Main Account and the Water Trading Entity are the two parts of the Department's budget. Conditional infrastructure funds for municipal water services totalling R37.439 billion are included in the central account budget for the medium-term expenditure framework (Mchunu, 2022.). The Regional Bulk Infrastructure Grant, worth R19 billion, and the Water Services Infrastructure Grant, worth R14 billion, are also included (Mchunu, 2022). The Water Trading Entity received an allocation of R9.55 billion over the medium-term expenditure framework to augment its budget for developing and managing national water resources infrastructure (Mchunu, 2022).

The lack of essential services is unconstitutional, and the ripple effect of poor service delivery does not stop at service delivery protests. If the issue of water provision persists, countless more problems will arise. The social and personal consequences are immense, aside from preventable death. Studies revealed that carrying water poses a risk of physical impairment, a burden borne disproportionately by women and children who are tasked with the collection of water (Hove *et al.,* 2019:2). Hove *et al.* (2019:2) state that a lack of water has also been linked to shame and mental suffering, the deterioration of social cohesiveness and community engagement abilities. Thus, a lack of water infringes on basic human rights, including the right to life, human dignity, and freedom of association (*The Constitution,* 1996).

SPLM is responsible for ensuring efficient service delivery, cost reduction, water and effluent quality optimisation and environmental protection (Makropoulos*,* Nikolopoulos, Palmen, Kools, Segrave, Vries, Koop, Van Alphen, Vonk, Van Thienen & Rozos*,* 2018:316). The municipality must know how their systems are likely to behave when faced with changing conditions (climatic trends, asset deterioration, behavioural patterns, etc.), accidents/incidents and/or extreme events (e.g. black swan effects in the physical, social, or economic spheres) (Makropoulos *et al.,* 2018:316). The broader the system boundaries and the longer the thinking, the more crucial and difficult it is to formalise the distinction between options (Makropoulos, 2017, cited by Makropoulos *et al.,* 2018:316). From those mentioned above, it is evident that SPLM is failing to provide quality water services to the residents of the Northern Cape because the water systems are failing to adapt to current demands. The municipality exhibits little to no resilience in the water supply systems. Pipe bursts occur regularly, and repairs range from 2 to 4 hours. In some instances, the time of water restoration was unknown.

On 19 July 2023, the following announcement was made on the Kimberley city portal:

> *"The levels at the Newton Reservoir are running low as a result of loadshedding in surrounding areas that causes a voltage increase at Riverton plant resulting the tripping of high lift pumps. Coupled with loadshedding, there are also two major leaks on the bulk pipelines contributing to the deteriorating water levels. To ensure continuous water supply, nightly shutdowns will be implemented from this evening (Wednesday, 19 July 2023) at* ***20:00pm-04:00am*** *daily until we have reached full capacity. This is an interim intervention until the situation normalises* (Kimberley City Info, 2024).

Considering the above, the motivation of this study was to develop an improvement plan that would ensure the resilience of water services management within SPLM. Emerging, or unexpected threats, to water availability and security have been experienced in the municipality (Mugume, Diao, Astaraie-Imani, Fu, Farmani & Butler, 2015). Resilience in water systems is becoming increasingly indispensable, and the move towards resilient water systems is becoming more prominent.

Resilience thinking takes forms, ranging from resistance to water-related hazards, like droughts or floods, to social-ecological system resilience to different chronic and emerging hydrologic shocks (Rodina *et al.,* 2017:145). Hence, resilience can potentially be built into the municipality's Urban Water System (UWS) by implementing a range of strategies, such as embedding redundancy and flexibility in a system design or rehabilitation to increase their ability to maintain acceptable customer service levels during unexpected failures (Mugume *et al.,* 2015).

Hence, the intended purpose of this study was two-fold: first, to explore the resilience of the water systems and processes in SPLM to deal with water shortages among its residents. Second, to investigate the water use practices of residents in selected areas and how to improve water resilience and conservation from a communal perspective. The problem to be investigated was, thus**, *how can more resilient water services management ensure adequate water availability within Sol Plaatje Local Municipality?***

1.3 RESEARCH QUESTIONS

The study aimed to answer the following questions.

1.3.1 General research questions

In consideration of the primary focus of the study and to investigate the research problem, the following general research question guided the study:

- How could water services management be enhanced within the Sol Plaatje Local Municipality to ensure adequate water availability to residents?

1.3.2 Specific research questions

- What does the worldwide shift towards water-resilient sustainable cities entail?
- What constitutes the legislative and regulatory framework, including strategies to ensure resilient water management services within a municipality?
- What are the theories, principles and practices of water services management?
- What are resilient water services management challenges in Sol Plaatje Local Municipality?
- How could an improvement plan enhance water services management within the Sol Plaatje Local Municipality?

1.4 RESEARCH OBJECTIVES

The study aimed to achieve the following objectives.

1.4.1 Main research objective

In consideration of the primary focus of the study and to investigate the research problem, the following general research objective guided the study:

- To analyse water services management within the Sol Plaatje Local Municipality to develop an improvement plan for adequate water availability.

1.4.2 Specific research objectives

The following specific research objectives guided the study to achieve the general research objective:

- Explore the shift worldwide towards water-resilient sustainable cities.
- Analyse the existing legislation and regulations, including strategies to ensure resilient water management services.
- Expound the theories, principles and practices of resilient water services management.
- Determine the resilience of water services management challenges in the Sol Plaatje Local Municipality.
- Provide recommendations through an improvement plan for resilient water management services in the Sol Plaatje Local Municipality.

1.5 CENTRAL THEORETICAL STATEMENTS (CTS)

The DWS (formerly DWAF) and the related water suppliers are responsible for maintaining a safe drinking water quality in South Africa. A report by DWAF in 2013 revealed that only 13% of water treatment systems had active water safety planning processes in place, with an alarming 52% of systems having no water safety planning at all (Naidoo, Rodda, Schmidt, Dent, Buckley, Stenstorm, Bux, Hanke & Fennemore, 2016:458). Naidoo *et al.* (2016:458) identified the following issues as being at the core of all service delivery protests. These included the incapacity of decision-makers and skills deficits within the water sector, unrealistic political promises vs expectations vs reality (concerning finance and infrastructure) and dysfunctional infrastructure.

South Africa is facing a significant water crisis that will only worsen if action is not taken. Factors aggravating the situation include but are not limited to the available amount of clean water, unequal distribution and access to clean water, the quality and state of water infrastructure, droughts causing towns to run dry, and corruption affecting multiple municipalities (Adam, 2021). South Africa's water resources are of critical importance. The country will experience its worst water crisis by the onset of the 2030s. The country's water consumption is expected to surpass availability by 2030, resulting in a 17% water deficit (Adam, 2021; Carnie, 2022).

South Africa's national government has been subject to a lot of negative criticism regarding its municipal agencies and local government's capacity to deliver basic services, i.e. water provision and sanitation to the population (Brettenny & Sharp, 2016:11). The failure to provide these services resulted in several violent service delivery

protests around the country (Brettenny & Sharp, 2016:11). There has been a total of 189 service delivery protests between the years 2004 and 2009 (Alexander, 2010:28).

The central theoretical argument of this study was thus: *if SPLM continues to experience major issues with delivering sustainable water services to its residents, it may become catastrophic unless resilient systems are explored.* Action must be taken by SPLM and by the residents of Kimberley before they experience their own day zero.

1.6 THEORETICAL VANTAGE POINT OF THE STUDY

This study found its theoretical grounding in the Social Contract Theory (SCT). Friend (cited by Snyder, Carpenter & Slauson, 2007:4) defines SCT as the belief that individuals' moral and/or political duties are contingent on a contract or agreement to establish a society. SCT is, by all accounts, the rules by which we live and work in a society and the consequences of non-compliance (Snyder *et al.,* 2007:4).

The SCT is based on the principles of legitimate political power through a rational and materialistic approach (Seabright, Stieglitz & Van der Straeten, 2021:5). Furthermore, two types of contracts are encountered within the SCT. Namely, the ‘contract of association’ and the ‘government contract’. The ‘contract of association’ is defined as the contract of individuals among themselves when they decide to unite to confer on a single person or an assembly the task of making decisions in such a way that these decisions are considered to be the will of all (Seabright *et al.,* 2021:5). Additionally, the ‘government contract’ is defined as the voluntary surrender of some individual liberty and the promise to obey the government (Seabright *et al.,* 2021:5).

For this study, the SCT was initiated when the residents of Kimberley voted to elect their representatives in the council of the local municipality (contract of association) and agreed to pay for their services (government contract), such as water provision. However, SPLM does not always uphold their end of the contract, as the water cuts and shortages in the jurisdictive area of the municipality persist. This could lead to dire consequences for SPLM, such as a rise in service delivery protests, as is the case in many local municipalities in South Africa.

Alongside the SCT, this study also found its theoretical grounding in the theory of Communicative Rationality and the theory of Positivism.

Communicative Rationality refers to the interaction of two or more agents to find a mutual understanding regarding a specific topic (Niemi, 2005:516). Communicative Rationality emphasizes the application of knowledge through language and action. According to this theory, the planner's primary function is to listen to different individuals and establish consensus among various viewpoints (Fainstein, 2000:454). Rather than providing technocratic leadership, the planner is an experiential learner, at most giving information to participants but primarily being sensitive to points of convergence. Leadership consists of not bringing stakeholders around to a particular planning content, but of getting people to agree and ensuring that whatever the position of participants is within the socioeconomic hierarchy, no group's interest will dominate (Fainstein, 2000:454). This theory can aid in improving communication between SPLM and residents regarding water service delivery, i.e. SPLM will clearly explain to all residents affected by water restrictions why and when these restrictions will occur. This will also provide SPLM the platform to engage with residents as to what they, as residents, can do from their side to relieve the pressure experienced by SPLM. This theory lays the foundation for mutual understanding. Therefore, it can also improve the functioning of SPLM in terms of the delivery of water services to residents; this can be achieved by all relevant stakeholders of SPLM coming together and engaging in discussion to establish a mutual understanding of the challenges faced by SPLM and the best course of action to follow.

The paradigm of Positivism argues that knowledge is inherently neutral and that human values can be kept out of research and decision-making (Khandekar, Agrawal, Kulranjan & Krishnan, 2020:17). Water resource planning implicitly advocates this approach. The Positivist approach can be viewed as conventional and has immediate application in the evidence-based, legally sound policy arena (Sharp, McDonald, Sim, Knamiller, Sefton & Wong, 2011:501). Positivists employ ideas such as good ecological status and water scarcity as benchmarks or goals. Positivists frequently employ large quantitative data sets to generate broad "truths" that can be verified and applied to forecasting (Sharp *et al.,* 2011:501). Positivist demand forecasts are usually driven by the consideration and/or maintenance of socioeconomic water needs. The high cost of infrastructure, regulatory demands to assure water affordability and leakage reduction, demand satisfaction, watershed management, and service-level attainment (risk minimisation) are some of the key factors influencing the provision of water (Sharp *et al.,* 2011:505). These and the threat of climate change impacting future supply and demand have driven the need for optimised forecasting (Sharp *et al.,* 2011:505). The theory of Positivism emphasises the

use of evidence to aid in forecasting and preparation; therefore, it can help improve the level of resilience exhibited by SPLM. This can be achieved by collecting evidence from the past and present on the causes behind water disruptions. For example, if pipe bursts commonly occurred over the last two years in a specific area, SPLM should collect evidence on what caused the pipe burst. If the reason is lack of maintenance or damage caused by residents, SPLM should typically be able to develop solutions specifically intended to resolve these issues.

1.7 RESEARCH APPROACH AND DESIGN

This section explores the research methodology, commencing with the research approach.

1.7.1 Research approach

There are three research methodology approaches: quantitative or structured, qualitative or unstructured, and mixed methods. The main distinction between the three is the amount of freedom accorded to the researcher during the study (Kumar, 2019:16).

According to Kandel (2020:2), quantitative research is a controlled, obstructive, objective, and product-oriented approach to analysing numerical data to quantify the variations of a particular situation, issue, event, or phenomenon. It is used to explain phenomena through mathematically based methods, particularly statistics. For Boeren (2018:66), quantitative research refers to data gathered using predetermined instruments such as questionnaires and may even include a variety of experiments. Furthermore, Boeren (2018:68) states that this research approach is characterised by the fact that the collected data are subjected to statistical analyses. Edwards (2020:31) forms a similar definition of quantitative research and provides that after being converted into numerical quantities, observations are submitted to various statistical analyses. These analyses might include multivariate methods like multiple regression, factor analysis, structural equation modelling, and descriptions of raw data.

Quantitative research is concerned with cause and effect, which is expressed in terms of variables (Jopling, 2019:57). Here, a variable refers to a construct or characteristic being observed, measured, or manipulated. Qualitative research also differentiates between independent and dependent variables. Jopling (2019:57) defines the former as the input,

treatment or predictor variable and is often a stimulus, intervention, or treatment. Jopling (2019:57) describes the latter as the outcome or criterion variable and can be regarded as the effect or consequence of using the independent variable. Additionally, Cathala and Moorley (2018:99) argue that the data analysis varies between studies depending on the type of design used. The authors continue and distinguish between descriptive research (a topic's pattern concerning one or more variables is described), a correlation study (examines the relationship between two variables and focuses on how one will respond to a change in the other), and experimental studies (researchers manipulate variables looking at the different outcomes) (Cathala & Moorley, 2018:99).

When studying human phenomena, qualitative researchers employ a variety of systems of inquiry, such as ethnography, grounded theory, historical analysis, discourse analysis, biography, case studies, and phenomenology, as opposed to logical and statistical processes (Ahmad, Wasim, Irfan, Gogoi, Srivastava & Farheen, 2019:2828). It is an exploratory, unstructured research strategy that looks at highly complex phenomena that quantitative studies cannot explain (Ahmad *et al.,* 2019:2829). According to Turale (2020:289), this method is well suited to studies that involve mixed methods or questionnaire design, or where there is a need to develop a straightforward and first-hand description of the facts of the phenomenon under investigation. Turale (2019:290) continues and states that this method should be utilised prior to developing an intervention and when a description of the phenomena under investigation is required. Haven and Van Grootel (2019:232) provide that qualitative research aims to answer questions such as "how", "why", and "what". Although images, videos, and other forms of behavioural records may also be used, written or spoken language is the primary data source for qualitative research (Haven & Van Grootel, 2019:232).

Furthermore, Haven and Van Grootel (2019:232) state that qualitative data are often collected via observation, focus groups, or interviews and seek to clarify the viewpoints of the subjects that the research topic pertains to. For Campbell (1997:123), the primary understanding of qualitative research is that it is an investigative method centred on developing a comprehensive, intricate comprehension of a social issue. It is characterised by data collection in a natural setting where the researcher acts as a key instrument. Generally, the data sets are analysed in an inductive process to provide deeper meaning (Campbell, 1997:124). Another definition is provided by Busetto, Wick, and Gumbinger (2020:1). They explain that qualitative research is the study of the nature of phenomena, including their quality, different manifestations, the context in which they

appear or the perspectives from which they can be perceived. Qualitative research can be considered as the opposite of quantitative research.

To achieve a broader understanding, a researcher or team of researchers may employ mixed-method research, which integrates aspects of qualitative and quantitative research approaches (Onwuegbuzie & Turner, 2007:206). Examples include using quantitative and qualitative viewpoints, data collection, analysis, and inference techniques. During mixed method studies, researchers apply the quantitative approach at one stage of research and then the qualitative approach at another to gain a deeper understanding of the research problem (Creswell, 2005, cited by Migiro & Magangi, 2011:3757). Furthermore, Migiro and Mangangi (2011:3759) provide that the approach broadens the scope of investigation by recasting results from the qualitative approach to examine the results from the quantitative approach.

According to Creswell, Fetters, and Ivankova (2004:7), mixed-method investigations take place when there is an integration of quantitative and qualitative data collection methods and the analysis thereof within a single study. The author continues by stating that in combination, the quantitative and qualitative data provide more thorough research and enhance one another (Creswell *et al.*, 2004:7). Cronholm and Hjalmarsson (2011:88) assert that a mixed method study can be conducted in a parallel manner or a sequential manner. Sequential mixed method research describes an inquiry where the stages of study take place one after the other, either developing from or succeeding each other (Cronholm and Hjalmarsson, 2011:88). The research questions which will be addressed and procedures used in one stage depend upon the previous stage. During a parallel mixed method approach, stages of research take place at the same time or with some time-lapse (Cronholm and Hjalmarsson, 2011:88). Denscombe (2008:272) provides a list of rationales for adopting a mixed method approach, which includes:

a) Improving the accuracy of data.
b) Providing a more complete picture by combining information from both the quantitative and qualitative approaches.
c) Compensation for specific strengths and weaknesses associated with both quantitative and qualitative approaches.
d) Expanding and strengthening of the conclusions.
e) Enhancing the sampling.

This study employed the qualitative research approach. The unstructured or qualitative method gave the researcher total flexibility in all aspects of the process (Kumar, 2019:16). Consequently, the qualitative method was the best way to view phenomena from different perspectives, and it provided the researcher with various methods to conduct the study and deliver the best results.

1.7.2 Research design

The main focus of this study was to research the water shortages and disruptions faced by the residents of Kimberley, more specifically, those who live in the areas of Carters Glen, Hadison Park, Galeshewe, Roodepan, New Park, Southridge within the boundaries of SPLM. Therefore, the study utilised a case study and cross-sectional research design. The case study method is a prominent type of qualitative analysis that entails observing a social unit in detail, whether that unit is a person, a family, an institution, a cultural group, or even an entire community (Kothari, 2004:113).

According to Baxter and Jack (2008:544), the case study approach facilitates the exploration of a phenomenon within its context using various data sources. This makes it possible for the phenomenon under investigation to be examined through different lenses, revealing a deeper understanding of other aspects of the phenomenon. The case study approach should be considered by a researcher or a group of researchers when: the focus of the study is to answer “how” and “why” questions; it is not possible to manipulate the behaviour of those involved in the study; there is a need to cover contextual conditions as they might be relevant to the study, and: the boundaries are not clear between the phenomenon and context (Yin, 2003, cited by Baxter & Jack, 2008:545). Heale and Twycross (2017:7) define this approach as an intensive and systematic investigation of a single individual, group, community or some unit in which the researcher examines in-depth data relating to several variables. Furthermore, the authors state that case studies are helpful when investigating complex phenomena in their natural setting, which in turn increases the understanding of phenomena (Heale & Twycross, 2017:7). Kaarbo and Beasley (1999:372) are in agreement with this definition as the authors define the case study method as a procedure for acquiring a case or several cases through an empirical analysis of a real-world phenomenon in its naturally occurring environment, without the phenomenon being directly manipulated. Becker (1970, cited by Fidel, 1984:274) asserts that the case study approach refers to a detailed analysis of an individual case, supposing

that it is possible to acquire the necessary knowledge of the phenomenon from an intensive exploration of a single case. This approach provides researchers with a comprehensive understanding of the phenomena and assists with developing more general theoretical statements about regularities in the observed phenomena (Fidel, 1984:274). For Tasci, Wei and Milman (2020:2), a case study is a story about something unique, special, or interesting about individuals, organisations, processes, programmes, institutions, destinations, etc. According to the authors, case study research is preferable as it can incorporate both quantitative and qualitative data, a variety of cases, and research methodologies ranging from deductive to inductive and inductive to deductive (Tasci e*t al.,* 2020:2). As a result, it can comprehensively contribute to theory creation.

Case studies allow for an in-depth examination of a phenomenon, a once-off event in a specific location or span over a period and space. Case studies also attempt to understand better a phenomenon of which little is known. The case study research design was adopted because it thoroughly examines a small number of events or situations and their interrelationships. Therefore, the units of analysis were the residents of Kimberley affected by water shortages and disruptions across SPLM.

1.7.3 Research methods

The following section will elaborate on the literature review of the study and the empirical research methods, including observations, questionnaires and interviews, population and sampling, and how the data analysis of the study was conducted.

1.7.3.1 Literature study

Kumar (2019:58) states that a literature review is the process of exploring the existing literature about the research topic to establish a theoretical and conceptual framework for the study. According to Snyder (2019:333), conducting accurate literature should be a priority for all academics, regardless of their disciplines. By performing a literature review, the researcher will become better acquainted with the field of study and gain additional insight by reviewing work on the same topic of interest in other fields (Snyder, 2019:333). By not restricting the research to one body of knowledge, a literature review can address research topics with a power that no single study can match by combining findings and viewpoints from various empirical findings (Snyder, 2019:333).

For Onwuegbuzie, Leech, and Collins (2012:1), the literature review can be considered the most critical step for all researchers regardless of the approach they take (quantitative, qualitative, mixed method) as it is the foundation and inspiration for substantial, valuable research. The steps of conducting a literature review are to; define the research problem as accurately as possible; examine relevant secondary sources; select and peruse one or two appropriate general reference works; formulate search terms pertinent to the problem or question of interest; search the general references for relevant primary sources; and, ; acquire and read relevant primary sources, and note and summarise key points in the source (Fraenkel & Wallen, 2006, cited by Onwuegbuzie *et al.,* 2012:2). Rowley and Slack (2004:31) state that researchers need to be well informed by the existing body of knowledge within the area of interest, which is made possible by conducting a literature review as it identifies and organises the concepts in the relevant literature. The authors are of the view that this is also important for students writing their dissertation and that they are expected to conduct a literature review in the early stage of the development of their research (Rowley & Slack, 2004:31).

Furthermore, Rowley and Slack (2004:32) list several reasons why conducting a literature review is essential, these include the fact that itsupports the identification of a research topic, question or hypothesis; identifies the literature to which the research will contribute, and contextualises the research within that context; builds an understanding of theoretical concepts and terminology; facilitates the building of a bibliography or the list of sources which have been consulted; suggests research methods that might be useful, and; assists with analysing and interpreting results. According to Knopf (2006:127), a literature review can be an end in and of itself, a preliminary stage in a larger research project, and a component of a finished research project. In the first context, literature can be used to determine the current state of a specific subject or problem. Secondly, a literature review is often required for a thesis, dissertation or research grant, thus making it part of a larger research project. Lastly, the literature review can also be the final component of a completed research project by showing how the researcher’s final conclusion relates to the prior literature on a specific subject matter (Knopf, 2006:128). According to Denney and Tewksbury (2012:218), a literature review is a vital tool necessary for achieving academic success. Denney and Tewksbury (2012:219) continue by stating that a literature review forces a writer to educate themselves on as much information regarding their topic of interest, assists in the learning process, and strengthens writing as it will be based on prior knowledge, which in turn will also increase the credibility of the writer, and

expose weaknesses and shortcomings of previous literature. The gap in the researched literature focused on the resilience of water services management. If water services are sustainably managed, scarce resources would be adequately available.

The locus of this study was SPLM. The official municipality website was consulted to gain more information on the issue of water shortages and explore resilience. The following sources of information were also consulted to gain a better understanding of the current predicament the residents of Kimberley find themselves in, to gain a better understanding of resilience:

- The Internet (social media covering the issue at hand), e.g. Facebook, X (formerly Twitter), and WhatsApp.
- Newspaper reportage on the relevant topics under investigation in the study.
- Journal articles covering relevant topics.
- Official government documentation covering water-related topics.
- Library books are from the Ferdinand Postma Library at the NWU, Potchefstroom Campus, and other local and international libraries.

The consulted databases included Google Scholar, EBSCOhost, and SA ePublications, and databases for theses and dissertations. Besides the literature review, empirical research was also conducted and is further explored in the following section.

1.7.3.2 Population and sampling/choice of study material

Population (=N) in research refers to the entire group/population from which the researcher attempts to draw a conclusion, and the sample refers to the specific group within the population from which the research collects data (Bhandari, 2020). Population, as defined by Etikan and Babatope (2019:51), is a group of individuals, objects, items, or entities with common characteristics or attributes. Furthermore, Etikan and Babatope (2019:51) break down populations into finite and infinite populations. The former refers to instances where all members, objects, or items are countable and exhaustible. In contrast, the latter refers to instances where the members, objects, or items cannot be exhaustively counted.

Majid (2018:3) defines sampling (=n) as the act of selecting a statistically representative sample of people from a population of interest is known as sampling. Since the community of interest typically consists of too many people for any research endeavour to involve as

participants, sampling is a crucial tool for research investigations. A good sample can be characterised as one that statistically represents the target population and is sizable enough to provide an answer to the research issue (Majid, 2018:3). Additionally, Etikan and Babatope (2019:52) assert that sampling is beneficial in that it can minimise the timeframe of data collection and minimise the financial resources necessary in data collection as the whole population will not be included in the study. Singh and Masuku (2014:3) share a similar view and state that sampling is when a subset of individuals within a population is selected for a study, which allows for faster data collection and lower costs related to data collection. A practical example is that the researcher saves time as they do not have to interact or include the whole population, and travelling expenses are minimised as the researcher does not have to reach individuals who are not part of the study. Through sampling, the researcher or team of researchers can identify which elements of the entire population are necessary to complete their research. For Mweshi and Sakyi (2020:180), sampling is the process by which a researcher carefully selects several individual items from a broader population of interest for further investigation using probabilistic and non-probabilistic methods. During this process, researchers should identify inclusion and exclusion criteria to set boundaries on which individual items should or should not form part of the sample (Mweshi & Sakyi, 2020:181). The principal objective of sampling is to generate a representative sample, which is comprised of a limited number of units or instances selected from a much larger group or population (Rahman, Tabash, Salamzadeh, Abduli & Rahaman, 2022:43). As a result, by studying the smaller group, the researcher can draw reliable conclusions about the larger group from its findings (Rahman *et al.,* 2022:43). In qualitative research the selection of participants depends on the purpose of the study and the resources such as time, money, and the availability and willingness of participants to participate in the research (Shaheen & Pradhan, 2019:25). Shaheen, Pradhan & Ranajee (2019:26) states that there are no strict sample size constraints, qualitative inquiry works best for researchers who can operate well under ambiguity. It relies on the researcher's goals, such as what is most beneficial to the researcher and the study, what can be considered credible, the amount of research that needs to be completed within a set period and the context of available resources.

The locus of the study was SPLM, which is both the primary Water Services Provider (WSP) and the Water Services Authority (WSA). For this study, the researcher used stratified random sampling to identify five participants in each of the following areas:

Carters Glen, Hadison Park, Galeshewe, Roodepan, New Park, and Southridge. These participants were used to gain insight into how community members perceive current water management services by SPLM. A sample of n=30 was targeted.

Stratified random sampling is described by Bhardwaj (2019:159) as a sampling method in which the researcher initially separates the population into strata based on shared characteristics. Then, individuals are randomly chosen from each stratum or group to be part of the study. Furthermore, Bhardwaj (2019:159) states that the goal is to create a sample representing the population while addressing the problem at hand. Ozturk and Kavlak (2020:74) contribute to this description by stating that each stratum contains groups of comparable units, and choosing a proportionate simple random sample from the strata typically yields a more representative sample. Nguyen, Shih, Srivastava, Tirthapura, and Xu (2021:666) contribute by stating that random sampling is used to select a per-stratum sample within each stratum. All per-stratum samples are combined to derive the “stratified random sample”. According to Stratton (2019:228), this sampling technique is based on grouping members of a target population into mutually exclusive categories and then choosing study subjects using simple random sampling. When properly implemented, randomly selected volunteers from stratified groups highly represent the target population. Rahman *et al.* (2022:48) state that the benefit of utilising this method is that it ensures that all population segments are represented and that the researcher has more control over the subgroups and can provide their inclusion, resulting in higher population coverage. Furthermore, reducing the possibility of human bias in choosing which cases to include in the sample can be considered the goal of the stratified random sample (Sharma, 2017:750).

The researcher also used purposive sampling when selecting participants within SPLM. These participants, with specialised skills in water services management, include the following staff members of SPLM:

- City engineer: Water and Sanitation
- Compliance manager: Water and Sanitation
- Plant manager: Riverton
- Relevant MMC for Infrastructure
- Relevant ward councillors of the six identified wards

Purposive sampling procedures ensure that specific participants are selected. Bisht (2024) defines purposive sampling as a type of non-probability strategy where the

researcher selects a sample (individuals, cases, or occurrences) based on their judgement that it would be appropriate for the study's goals. Trost (1986), Mason (2002), and Robinson (2014), cited by Campbell, Greenwood, Prior, Shearer, Walkem, Young, Bywaters, and Walker (2020:654), state that the rationale for using a purposive sampling technique is based the study's objectives and specific types of people who may hold diverse and significant perspectives on the ideas and topics in question. The benefit of this method is that it is not always possible to locate and gain access to key participants for various reasons such as conflicting schedules and time constraints, therefore allowing researchers to continue with their study by selecting individuals who have a similar role or knowledge (Campbell *et al.*, 2020:654). According to Schoch (2020:248), purposive sampling is advantageous when employing the case study approach. Through the deliberate selection of the cases, and the people, records, and artefacts within the case, purposive sampling enables the researcher to investigate cases that are rich in information and provide in-depth analysis of topics that are crucial to the project's success (Schoch, 2020:248). Finding people or situations that shed light on the particular circumstance being studied is the aim of purposive sampling, regardless of the overall population. Abdullah, Hussin, and Ismail (2019:135) provide that with the aid of this sampling strategy, the researcher or team of researchers can filter out participants who are unable to support the goals of the study and identify only those participants who can most effectively assist in understanding the issue and the research questions while also providing sufficient data.

The criteria to form part of the study as an inhabitant were as follows:

- Participants should reside in one of the above-mentioned areas (Carters Glen, Hadison Park, Galeshewe, Roodepan, New Park, and Southridge) and be experiencing water service disruptions.
- Participants should be willing and available to participate in the study.

The criteria to form part of the study as a staff member of SPLM was as follows:

- SPLM should employ participants.
- Participants should be directly or indirectly involved in water supply and maintenance management aspects.
- Participants should be willing and available to partake in the study.

1.7.3.3 Data collection methods

Merriam (2002:12) states that the three instruments most frequently used to collect data during a qualitative study are interviews, observations, and documents. The study used all three collection instruments. The data collecting method is decided by the study's question, which determines which data sources will provide the greatest information to answer the question (Merriam, 2002:12). Besides qualitative sources mentioned above, quantitative sources include field experiments, simulations, surveys, correlation studies, and multivariate analysis (Queirós, Faria & Almeida, 2017:380-382). Additional methods include controlled observations, polls, and interviews, which can be conducted face-to-face or by telephone.

1.7.3.4 Observation

Observational data represent a first-hand encounter with the phenomenon of interest rather than a second-hand account obtained in an interview (Merriam, 2002). In addition, the author outlines that observation is ideal when an action, event, or scenario can be witnessed directly, when a fresh perspective is required, or when participants are unable or unwilling to discuss the phenomena under investigation. When conducting qualitative research, observations are one of the most essential data collection tools at the researcher's disposal. According to Noel *et al.* (2017, cited by Dźwigol & Barosz, 2020:142), observations can be considered one of the most universal and comprehensive data collection techniques. Dźwigol and Barosz (2020:142) state that observation is a simple, spontaneous record of facts and happenings and a complex, controlled, systematic observation process aided by additional techniques, such as questionnaires and the ability to capture images and sounds. Researchers may observe physical settings, participants, activities, interactions, talks, or their own behaviour with the goal of witnessing first-hand what is happening instead of assuming that they already know (Cypress, 2018:306). Kumar (2023:1) defines observations as examining and explaining a subject of interest initiated by watching said subject until a hunch or understanding is developed. Science starts with observations, and it requires further observation to confirm any conclusions made at the end of the process (Kumar, 2023:1). Effective observations require the observer to determine what should be observed; how the observation should be recorded; what type of tools and techniques are required; how to ensure accuracy of observation and; what the relation between the observer and subject should be and how

to establish the desired relationship (Kumar, 2023:2). Walshe, Ewing, and Griffiths (2011:1048) asserts that in qualitative research, observational approaches are more advantageous than other methods of gathering data when the objective is to understand actions, roles, and behaviours. Walshe, Ewing, and Griffiths (2012:1049) also assert that observations can be structured and unstructured. Mulhall (2003:306) defines structured observation as a process of observation within which schedules are predetermined using taxonomies developed from known theory. These schedules guide the actions of the observer. Although unstructured observations do not follow a strict schedule like structured observations, they should not be considered unsystematic. When employing unstructured methods, observers go into "the field" with no preconceived assumptions about what they might observe, allowing this to guide them throughout the process (Muhlhall, 2003:307).

The researcher used observation to determine the quality of water services provided by SPLM, i.e., if a water cut does occur, the duration thereof, how and if relevant information is communicated to the residents of affected areas and how SPLM responds. Observations were also used to evaluate the state of the appropriate water services infrastructure.

1.7.3.5 Likert scale Questionnaire

Marshall (2005:132) states that questionnaires can produce high-quality, valuable data, high response rates, and anonymity, promoting more honest and frank responses concerning a subject matter. For Ranganathan and Caduff (2023:152), a research questionnaire is a tool for gathering data that consists of a list of questions or items intended to elicit information from participants about their knowledge, beliefs, attitudes, and behaviours. A questionnaire, as defined by Roopa and Rani (2012:273), is a set of questions that participants fill out to express their opinions. Questionnaires should be designed in a manner which is appropriate, short and intelligible, unambiguous and unbiased, capable of coping with all responses, satisfactorily coded, and ethical to obtain accurate information (Charlton, 2000:356). Questionnaires can be open-ended or closed-ended. Open-ended questionnaires allow participants to elaborate on their answers and thus allow more freedom (QuestionPro, 2022). In closed-ended questionnaires, participants are given alternatives to choose an answer (Formplus, 2022). Patel and Joseph (2016:1) differentiate between open-ended and closed-ended questionnaires by

defining the former as a type of questionnaire that allows the participant to produce their own unique answers and ensures that biased answers are minimised. In a closed-ended questionnaire, participants are presented with several choices to answer a question. The questionnaire provides more structure, which means that data is more straightforward to analyse and interpret (Patel & Joseph, 2016:1).

The Likert scale is well known for being a simple and dependable scaling method that makes it easier to evaluate and understand the perceptions of participants (Tanujaya, Prahmana & Mumu, 2023:90). The most used versions of the Likert scale are the 5-grade/point scale and 7-grade/point scale. Consequently, a 5-point Likert-scale questionnaire was disseminated among identified households using stratified random sampling, as mentioned above, to probe participants regarding their perception of water services management within SPLM. It can be considered that the grades/points represent the participant's agreement or disagreement with the statement presented to them, and their approval or disapproval (Tutz, 2021:18). Furthermore, in 5-grade/point Likert-scales, the grades/points are typically represent opinions such as strongly disagree, disagree, neutral (undecided), agree, and strongly agree (Tutz, 2021:18). According to South, Saffo, Vitek, Dunne, and Borkin (2022:43), by using Likert-scales, researchers can collect quantitative estimates of subjective traits, generating numerical data which can be summarised and visualised. For Alkadi, Masuadi, Mohamed, Mohamud, and Farook (2022:255), a standard Likert scale is commonly used to enable participants to describe their experience and indicate how much they agree or disagree with a specific statement.

Participants were provided two (2) weeks to complete the 5-point Likert scale questionnaire. This data allowed the researcher to understand better the issues surrounding resilient water services management, which could be utilised to develop a plan for more effective, efficient, resilient water services management.

1.7.3.6 Semi-structured Interviews

Interviews were used because the researcher was interested in the experiences, perspectives, opinions, ideas, beliefs, or motivations of entities or individuals regarding water resilience and water conservation practices in the Sol Plaatjie municipality (Islam & Aldaihani, 2022:5). Researchers will often utilise the following interview methods: structured-, semi-structured-, and unstructured interviews. This study used semi-structured interviews as it did not restrict the research to adhere to a pre-determined set

of questions (Doyle, 2020). According to Brown and Danaher (2019:77), semi-structured interviews involve the interviewer preparing a list of topics to cover and questions to ask, which they then commit to during the interview while also ensuring that the questions prompt additional answers. This allows for the development of “in-the-moment” conversations in ways that were not anticipated when the initial topics and questions were created (Brown & Danaher, 2019:77). Bearman (2019:4) emphasises that for these prompts to produce complex, nuanced thoughts and descriptions, they should be relevant and make sense to the participant. Bearman (2019:4) continues by stating that participants respond most effectively when they have fun, do not feel defensive or threatened, and understand exactly what is being requested. The main goal of a semi-structured interview should be to enable an in-depth conversation. This goal is achieved as semi-structured interviews position the interviewer in such a manner which allows them to ask follow-up questions based on verbal and non-verbal responses such as hunches, laughter, and silence (Kakilla, 2021:2). In essence, semi-structured interviews allow the interviewer to add or omit any aspect of the pre-planned questions under the circumstances that prompted questions and answers remains relevant (Alamri, 2019:65).

Several pre-determined questions were compiled beforehand, and the researcher allowed elaboration from the selected SPLM staff members and the selected residents.

The researcher used a questionnaire comprising both open-ended and closed-ended questions to collect relevant data from the identified skilled staff of SPLM involved in water services management.

1.7.3.7 Data analysis

Effective data collection aids in answering questions analysing and predicting outcomes, trends, actions, and scenarios. Data on the ongoing water crisis in Kimberley was collected using social media platforms (i.e. Facebook, X (formerly Twitter), and WhatsApp), the Kimberley City online Portal, and relevant online and hard-copy newspaper articles. The researcher used the internet and internet journals to understand better water problems faced throughout South Africa and the rest of the continent. Questionnaires and semi-structured interviews were utilised in the data collection process.

Following the collection of required data, thematic analysis (TA) was used to analyse and present the constraints of this study. Thematic analysis is an approach for methodically

discovering, categorising, and providing insight into patterns of meaning within the collected data sets (Braun, Clarke, Cooper, Camic, Long, Panter, Rindskopf & Sher 2012:57). This method of analysis emphasizes commonalities within a data set. Still, the researcher must determine which of these commonalities are meaningful or important to their specific research topic and will aid in answering research questions and objectives. Braun *et al.* (2012:58) state that TA offers a way of separating qualitative research from broader debates, where appropriate, and making qualitative research results available to a wider audience.

TA offers researchers three approaches for the analysis of data sets. These approaches are inductive versus deductive or theory-driven data coding and analysis, experiential versus critical orientation to data, and an essentialist versus constructionist theoretical perspective. An inductive approach to data coding and analysis was utilised. This indicates that the codes and themes are generated from the data, ensuring that what the researcher maps during analysis closely fits the data's substance (Braun *et al.*, 2012:58).

TA was used to determine commonalities in the responses of SPLM staff members, which in turn will aid in identifying the leading causes behind the low level of resilience exhibited by SPLM. TA was also used to determine commonalities in residents' perceptions of SPLM. How TA was utilised for this study will be discussed in Chapter 5.

1.8 ETHICAL CONSIDERATIONS

According to DuBois (2008, cited by Sobočan *et al.,* 2019: 807), ethics refers to the determination of right and wrong that may be embodied in principles (beneficence, justice, fairness), laws, policies, or codes. Guillemin and Gillam (2004) delineate three types of research ethics: procedural ethics, ethics in practice, and research ethics. Procedural ethics refers to requesting permission from the relevant ethics committee to do research. Ethics in practice refers to the daily ethical concerns that emerge while conducting research. In addition, research ethics refers to all professional codes of ethics or conduct (Guillemin & Gillam, 2004, cited by Sobočan *et al.,* 2019:806).

The following ethical considerations were applied in this study:

- Permission to conduct research was sought from the NWU ethics committee.
- The researcher requested an approval letter from the NWU Gatekeeper to conduct the research study.

- The purpose of the study was explained to all participants before data was collected.
- Confidentiality and anonymity were ensured by not disclosing any personal information of participants. Only the necessary biographic data (gender, age, etc.) was disclosed. After conducting the questionnaires and interviews with the relevant staff members of SPLM, only their professional position and the necessary biographic data (i.e. gender, age, etc.) were disclosed.
- Verbal and written consent was obtained from participants.
- All individuals who agreed to partake in the study were provided a consent form stating that they agreed, what the study entails, and what was expected of them.
- Participants were made aware that participating in the study was entirely voluntary and that there was no compensation.
- Participants were also informed that the research project will be published on relevant platforms, i.e., the NWU Library website, and the study will be made publicly available.
- Participants did not receive any stipend to partake in the study.

Lastly, the possible risks in this study were managed by the researcher as summarised in the table below:

Table 1.1: Possible risks to the study

Possible risk	**Mitigation strategy**
There were no health or hazardous risks when distributing the questionnaires or conducting the semi-structured interview.	Not applicable because there were no risks. Participants participated from the comfort of their homes/offices.
Emotional distress of the participants.	Participants were ensured that all data would only be utilised to achieve the study's goals.
Tiredness and discomfort.	Participants completed the questionnaires at their own pace and availability.
Lack of privacy and comfort during interviews and questionnaires due to being alarmed that answers provided will be used against them.	This was addressed by assuring participants that confidentiality would be maintained and their responses would remain anonymous.

1.9 FEEDBACK TO PARTICIPANTS AND DISSEMINATION OF RESEARCH FINDINGS

The study would not be classified. Therefore, the researcher, with his supervisor's assistance, publishes the study's findings in scientifically accredited journals regulated by the Department of Higher Education and Training (DHET). Copies of the dissertation (both hard and soft) will be made available in the NWU libraries.

1.10 LIMITATIONS AND DELIMITATIONS OF THE STUDY

Obtaining access to necessary official documentation of SPLM proved difficult for the researcher due to explicit national, provincial, and local laws and regulations or policies prohibiting sharing and disclosing information. The researcher is also not a staff member of SPLM, nor does he have the necessary authority to access all official documents.

Finding relevant internet journals, journals, and published books containing information on the specific issues relating to SPLM, were within reach. A lot has been published about water services management challenges, although not a lot of information was provided on SPLM. The researcher relied on social media and the Kimberley City Portal for the most recent developments regarding the ongoing water crisis.

During the empirical phase of the study, locating and arranging meetings with the relevant SPLM staff members proved to be very difficult as these were professional individuals with busy schedules.

The delimitations of the study were as follows: The researcher utilised non-academic sources (e.g. news articles and social media platforms) and academic sources (e.g. academic articles on search engines such as Google Scholar) to obtain information on water supply management and challenges globally and nationally. The study itself, however, focused solely on the resilience of water services for the benefit of residents of Kimberley and SPLM at large.

1.11 SIGNIFICANCE OF THE STUDY

As stated in the background of the study, everyone has the right to access sufficient water in section 27(1) (b) of The Constitution (1996), which states that everyone has the right to access sufficient water. Section 27(2) of *The Constitution* (1996) requires the State to

take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of this right (*The Constitution,* 1996). Without water, all life on earth would cease to exist. Its importance is evident in environmental and socio-economic development. Nevertheless, natural water supplies are increasingly becoming scarce, and with increasing global consumption intensifying the situation, a global water crisis is a realistic threat (Van der Bruggen, Borghgraef & Vinckier, 2010:1886). Therefore, it is vital to protect water resources and continue to empower and develop policies, regulations, and strategies to ensure the water resources' prolonged use.

The significance of the study is twofold. First, the study intended to contribute by analysing water services management and the resilience of water treatment facilities in SPLM. Secondly, author wanted to contribute to the discipline of public administration by proposing a plan for more resilient water services management within SPLM. The planned research can potentially contribute to ensuring adequate water security and effective quality of water services management.

1.12 CHAPTER LAYOUT

The exposition of chapters in this study will be as follows.

Chapter 1: Orientation and Problem Statement

This chapter provides a background and introduction to the study. The problem statement, research objectives and research questions are also presented. The focus would be on the research methodology and design, explaining the method used to conduct the study and gather information. The ethical considerations and limitations of the study will also be presented in this chapter.

Chapter 2: Water Services Management: Theoretical Perspectives

Chapter 2 discusses water services management and related concepts, by conceptualising the key terms of the study. This chapter also examines the role played by municipalities as WSAs and WSPs. Furthermore, this chapter examines the roles and responsibilities of SPLM and the challenges municipalities face. After that, it concludes with a theoretical review of the study.

Chapter 3: Sustainable Water Resilient Cities

This chapter critically discusses sustainable water resilience in cities by examining various definitions and the elements constituting resilient systems. An international perspective on resilience and a domestic perspective on resilience is also provided. To be resilient, meticulous planning is required for water services. Therefore, the chapter also reviews how public planning could be utilised in water services management.

Chapter 4: Legislative and Regulatory Frameworks of Water Services Management

This chapter analyses the legislative and regulatory framework pertaining to municipal services delivery. The legislative and regulatory framework concerning water services management, in particular, is discussed.

Chapter 5: Research Methodology: Empirical Findings

According to thematic analysis, this chapter presents the data collected (perceptions of water resilience, water use practices, and infrastructure maintenance). Furthermore, it presents an analysis of the collected data, the application of thematic analysis on the collected data, and the correlation between the codes and themes constructed by the researcher.

Chapter 6: Conclusions and Recommendations: Towards an Improvement Plan for More Resilient Water Services Management in the Sol Plaatje Local Municipality

This chapter presents an improvement plan on how SPLM can build resilience in the water services management of SPLM. Additionally, this chapter concludes the study by summarising the research and findings. It also provides sound recommendations on how to apply resilient measures to improve water services management within SPLM.

1.13 CHAPTER CONCLUSION

Chapter 1 provided the context/background to the study, which framed water as a scarce resource and provided measures to ensure its protection. The study's problem statement followed this, as did the research questions and objectives of the study, as well as the study's central theoretical statement and theoretical vantage point. Thereafter, the research- approach, design, and methods were discussed. In addition, Chapter 1 discussed the ethical considerations of the study, feedback to participants and dissemination of research findings, limitations and delimitations of the study, and the

significance of the study. Chapter 1 concluded with the chapter layout for the remainder of the study.

Water services management: Theoretical perspective is the succeeding chapter and defines the study's key terms, provides an in-depth discussion on municipalities, and concludes with the theoretical review of the study.

CHAPTER 2

WATER SERVICES MANAGEMENT: THEORETICAL PERSPECTIVE

2.1 INTRODUCTION

Chapter 1 introduced the context and background of the study. This was done to emphasise the importance of water resources and the necessity to protect them, as they quickly become scarcer due to natural and anthropogenic threats. Chapter 1 also provided the problem statement, research questions, and objectives. The central theoretical statement of the study followed this. Thereafter, the research approach and design of the study were explored. This included the research approach, design, and methods utilised in the study. The chapter then concluded after discussing the ethical considerations, feedback to participants, dissemination of research findings, limitations and delimitations of the study, and the significance of the study.

Chapter 2 discusses water services management and related concepts. This will be done by first conceptualising the key terms of the study. Secondly, Chapter 2 examines municipalities and their role as WSA and WSP. Then, a discussion on SPLM and their role as a Water Services Authority and Provider follows. Thereafter, municipal challenges will be explored. Chapter 2 concludes with a theoretical review of the study.

2.2 CONCEPTUALISATION OF KEY TERMS OF THE STUDY

This section conceptualises the key terms used in the study. The key terms are also captured as variables within the research topic that this study was engaged with.

2.2.1 Local Government

The Department of Public Service and Administration's (DPSA) 2022 National Framework identified local government as a principal sphere within which the professionalisation of the public sector must be widespread to facilitate national development (Good Governance Africa, 2024:3). Local government consists of all municipalities across South Africa. There are 257 municipalities in South Africa, comprising eight metropolitan, 44 districts and 205 local municipalities (CoGTA, 2024). Furthermore, *The Constitution* (1996), Chapter 7, categorises all local government (municipalities) into three categories,

namely: category A, B, and C. Category A outlines that a municipality has exclusive municipal executive and legislative authority in its area; a Category B municipality shares municipal executive and legislative authority in its area with a category C municipality within whose area it falls; Category C elucidates that a municipality that has municipal executive and legislative authority in an area includes more than one municipality (*The Constitution,* 1996:75).

SPLM is a Category B municipality located in the Frances Baard District which shares municipal executive and legislative authority in its area with a category C municipality within whose area it falls. Chapter 7 of The Constitution (1996) also enshrined the primary objectives of all local municipalities. These objectives read as follows: (a) to provide democratic and accountable government for local communities; (b) to ensure the provision of services to communities in a sustainable manner; (c) promote social and economic development; (d) promote a safe and healthy environment; and (e) encourage the involvement of communities and community organisations in the matters of local government (*The Constitution,* 1996:74) Additionally, in Chapter 7 of *The Constitution* (1996)*,* the developmental duties of municipalities are defined. These duties are that a municipality must (a) structure and manage its administration and budgeting and planning processes to give priority to the basic needs of the community and to promote the social and economic development of the community; (b) participate in national and provincial development programmes (*The Constitution,* 1996).

A municipality, as defined by Madumo and Koma (2019:581), is a fundamental governmental entity that offers its citizens essential services and is, therefore, paramount in raising the population's standard of living. The authors continue by stating that local government is a crucial tier with a physical structure that facilitates better communication between the state and its citizens (Madumo & Koma, 2019:581). Nkomo (2017:2) contends and refers to local government as the engine of basic service delivery, ensuring that the community's needs are heard, effectively and compliant with the principles of sustainability. The institutional context in which municipalities operate differs among nations and regions. However, despite these differences, municipalities are generally, and increasingly so, distinguished by their involvement in local networks and partnerships (Kronsell & Mukhtar-Landgren, 2018:990). This can be attributed to the growing need to utilise assets, financial prospects, and expertise of various public, private, and non-profit organisations, to plan, finance, and execute government policies (Kronsell & Mukhtar-Landgren, 2018:990).

Internationally, local government is regarded as the sphere of government that should provide the immediate necessary intervention in terms of the provision of services because it is a sphere that is closer to the community (Masuku & Jili, 2019:1). Masuku and Jili (2019:5) state that local government must fulfil two functions, namely: delivering services to citizens and representing citizens in identifying particular needs; and, how these needs should be addressed. Petrarca and Dugger (2023) define local government as the government of a town, city, or county, meaning that towns, cities, and counties exist as divisions within a state. In other words, local government is subordinate to state and federal governments. The Local government provides several essential services to residents and companies. They include well-known services like waste collection, planning, schools, social services, and housing, as well as less well-known ones like business support, licencing, registrar services, and pest control. The most prevalent kind of local government is a local council, composed of members elected democratically by means of formal local elections. This is done to decide on and carry out local goals; council members collaborate with partners from the community, including businesses and other organisations. Permanent council officials make decisions by providing everyday services (Local Government Association, 2024).

Petracra and Dugger (2023) continue by stating that different regions have varying laws that deal with how local governments are formed and how they function. Koma (2016:128), in their definition, states that local government can be described as a public organisation authorised to manage and govern the affairs of a given territory or area of jurisdiction. In addition, Koma (2016:128) states that local governments are the closest to the people; therefore, it is their constitutional obligation to ensure that the local social and economic needs of the people within their jurisdiction are met. Lastly, Koma (2010:113) defines local government as a sphere of government based inside communities and well-positioned to respond to local needs, interests, and expectations. The author further explains that it is important to note that local government refers to a sphere of government, not individual municipalities. This means that all local municipalities are collectively referred to as the local government. Additionally, this entails that local municipalities are at the forefront in this sphere of government.

The subsequent key term that will be discussed is service delivery.

2.2.2 Service Delivery

The effective functioning of government is vital when attempting to provide relief from poverty and inequality and when pursuing economic growth and effective and efficient service delivery. The African National Congress (ANC), led by the late Nelson Mandela, sponsored a campaign at the end of apartheid in 1994 that focused on providing basic services to the newly enfranchised black majority, in their campaign, with the slogan "a better life for all". Throughout the post-apartheid era, South Africans have demanded better service delivery. The state has significantly increased essential services and infrastructure availability nationwide, after the first multiracial democratic national election in 1994. However, it is still far from achieving universal delivery (De Kadt & Lieberman, 2017:189).

Given that municipal governments oversee the most service delivery implementation, the ability of municipalities, to provide services determines both the quality and scope of those services. Parties can "deploy" politicians, technocrats, and bureaucrats to specific regions, but local communities supply most municipal labourers. Financial payments, however, are the primary sources for service delivery. These are treasury-issued national government allocations, some of which are designated for specific portfolios that establish the budgetary resources accessible to individual local governments (De Kadt & Lieberman, 2017:191). The municipal budget must set out the estimated revenue and the municipality's expenditure. In other words, the budget needs to project the municipality’s revenue and expenditure for the upcoming fiscal year, which starts on 1 July (Civics Academy, 2024). The budget must include the expected revenue and expense amounts two years in advance (Civics Academy, 2024). Therefore, a three-year planning period is included in all municipal budgets. Thus, One can deduce that the quality of service delivery depends on how and more importantly, if monetary allocations and expenditures follow due process and is utilised in the manner it was intended for.

Service delivery is a concept often used across the world to describe the distribution of essential community needs and services, such as housing, water and sanitation, land, power, and infrastructure (Reddy, 2016:1). According to Reddy (2016:2), in the context of local government, service delivery refers to the provision of public goods, benefits, and satisfactions, to improve the quality of life in local communities. The distribution of essential services, including safe water supply, electricity, health care, roads, traffic lights, garbage collection, sewage disposal and maintenance, and public parks, are essentially

what service delivery means (Development Bank of Southern Africa, 2024). In South Africa, the function of local government is primarily to provide effective and efficient basic services to communities (Akinboade, Kinfack & Mokwena, 2012:186). Akinboade *et al.* (2012:185) continue and state that services are usually defined as “deeds, processes, and performances, including garbage collection, water supply, fire-fighting and other emergency services, and traffic regulation.

Van der Waldt (2014:164) differentiates between service delivery, basic municipal services, and municipal services. Fox and Meyer (1995:118, cited by Van der Waldt, 2014:164) state that service delivery is the provision of public activities, benefits or satisfactions. These services can be tangible and intangible. According to Craythorne (2006, cited by Van der Waldt, 2014:164), basic municipal services are services which are necessary to ensure an acceptable and reasonable quality of life, and in the instance where these services are not provided, could lead to negative consequences for public health and safety of the environment. Craythorne (2006:158, cited by Van der Waldt, 2014:164) contends that “municipal service” is a service that a municipality, in terms of its powers and functions, provides or may provide to, or for the benefit of its responsible area, irrespective of whether such a service is provided through an internal or external mechanism and whether fees are levied in respect of such a service or not.

It is the duty of both developed and developing states to ensure their citizens have access to basic amenities, such as, but not limited to, infrastructure, land, electricity, water and sanitation, and housing in a sustainable, equitable, and efficient manner (Zerihun & Mashigo, 2022:1). Zerihun and Mashigo (2022:3) point to the fact that regardless of the type of service being rendered, local government has the responsibility for ensuring that all those living under their jurisdiction are provided with adequate and affordable services on a sustainable basis. The authors continue to state that after the fall of Apartheid, the *Batho Pele* principles were formulated to transform the public service and produce public servants committed to and prioritise serving the people (Zerihun & Mashigo, 2022:3).

The *Batho Pele* principles were established to improve service delivery in South Africa (Joel, 2022:207). Ensuring that the public receives the services to which they are entitled to, and that the public officials work toward efficient and effective service delivery is the primary goal of the *Batho Pele* principles (Joel, 2022:208). The *Batho Pele* principles are Consultation, Services Standards, Access, Courtesy, Information, Openness and

Transparency, Redress, and Value for money. The Parliamentary Monitoring Group (2024) provide a short and easy summary of the *Batho Pele* principles to citizens:

- Consultation: “You can tell us what you need from us.”
- Service standards: “Insist that our promises are kept.”
- Access: “One and all should get their fair share.”
- Courtesy: “Don’t accept insensitive treatment.”
- Information: “You are entitled to full particulars.”
- Openness and transparency: Administration must be an open book.”
- Redress: “Your complaints must spark positive action”.

The prerequisite for effective, efficient, and sustainable service delivery is public servants, who embody the *Batho Pele* principles. If applied rigorously in the public sector, these principles will ensure that citizens receive services they requested in their desired form.

2.2.3 Water Services Management

Water is vital to the survival of all living creatures. Due to its importance, water resources should be managed efficiently. Water management refers to planning, developing, distributing and managing water resources to reach optimum and sustainable use (Toppr, 2024). The Natural Resources Conservation Service (2024) defines water services management as controlling and moving water resources to minimise damage to life and property and maximise efficient, beneficial use. According to Stephenson (2005), water services include water supply, sewerage and storm-water drainage, which is made possible by pipelines, reservoirs, and treatment works. Stephenson (2005) continues and states that water services management includes economics, billing, and business management elements. Rather than only designing and building treatment plants and distribution networks, Water Services Management aims to train engineers in managing and enhancing water services (Stephenson, 2005).

Municipalities perform various water management activities and have numerous administrative responsibilities. However, their actions are limited depending on the level at which the municipality operates (García, Hileman, Bodin, Nilsson & Jacobi, 2019:5). These activities include but are not limited to, developing and sustaining water infrastructure service delivery and various administrative tasks.

Additionally, the Water Research Commission (WRC, 1998:24) provide the objectives of water services, which include:

a) Promoting good governance, including a sound framework for inter-relationships between parties.
b) Ensuring access to services based on the following:
    - equity (equal opportunities to all groups), and
    - affordability (within the constraint of ability to pay).
c) Providing services of a good standard with respect to:
    - reliability
    - product quality
    - Relations between the service provider and customer; and
    - price.
d) Promoting effective institutions which are:
    - sustainable
    - financially viable
    - organisationally efficient; and
    - water use efficient.
e) Ensuring that services are environmentally sustainable.

Water in South Africa is governed by the DWS, which functions, at the executive political lebvel, through the Minister of Water and Sanitation. The DWS is ultimately responsible for ensuring that water as a resource from rivers, lakes, and storage dams is allocated equitably and used beneficially in the public interest, while promoting environmental values (Toxopeüs, 2024). As a result, the DWS is responsible for developing regulations and policies pertaining to the water sector and guaranteeing that water resources are efficiently managed, preserved, developed, and safeguarded (Toxopeüs, 2024). The DWS states that its vision is to be a dynamic, people-centred department that leads the effective management of the nation's water resources and meets the needs of current and future generations (DWS, 2024).

The Water Services Act, No. 108 of 1997 and the National Water Act 36 of 1998 were approved by parliament and the Presidency, to improve water services delivery and thesustainable use of water resources. The Water Services Act, No.108 of 1997, details the roles and responsibilities of WSA, WSP, water services intermediaries and committees. The Water Services Act, No.108 of 1997, detail the responsibilities of

government to ensure that water supply and sanitation services are provided efficiently and sustainably.

The Act also details important objectives concerning water resources and the provision thereof. These objectives include but are not limited to:

- The preparation and adoption of water services development plans by water services authorities are also important.
- A regulatory framework for water services institutions and water services intermediaries.
- The monitoring of water services and intervention by the minister or the relevant province.
- The accountability of water services providers; and
- Promoting effective water resource management and conservation (Water Services Act, 1997:12).

The Water Services Act, No. 108 of 1997, is a regulatory framework as it provides details on how water-related organisations and entities operate.

The purpose of this National Water Act, No. 36 of 1998, is to ensure that water resources are protected, developed, conserved, managed and controlled in such a manner that it is usable for current and future generations (The National Water Act, 1998:18). The Act states that water is a crucial national resource, which requires efficient management by the government.

Some the critical objectives this Act seeks to achieve, include but are not limited to concerning water resources, i.e.:

- promoting equitable access to water;
- promoting the efficient, sustainable and beneficial use of water in the public interest;
- providing for the growing demand for water;
- reducing and preventing pollution of water resources and
- managing floods and droughts (National Water Act, 1998:18).

The main objective of the National Water Act is to protect, maintain and develop all water resources for sustainable use, both now, and in the future.

Governing water resources in a rapidly changing world increasingly requires reimagining water systems as complex systems in a way that captures both prevailing and anticipated

social and hydrological dynamics. Increasing awareness of complexity in social- -hydrological systems has emphasised the need for a more nuanced understanding of change within governance responses to preserve and maintain key functions while adapting or transforming – that is, for them to be resilient (Fallon, Jones & Keskinen, 2022:1). Without water resources, all life on earth will cease to exist. Therefore, resilience must be embedded within water services management. SPLM acts as both a WSA and a WSP. Consequently, it is of paramount importance that their level of resilience improves, in terms of water services.

2.2.4 Resilience

Giddens (2009, cited by Lu & Stead, 2013:200) states that the notion of resilience is a counterpart to the concept of vulnerability, not only as a means of coping with external changes, or shocks, but also of responding actively and positively to risk. These responses are determined by the environmental issue at stake and the context in which it occurs. Change is a fundamental aspect of resilience, both in terms of resistance to change and recovery from it (Lu & Stead, 2013:201). As a result, resilience is linked to both preparations for minimising disruptions and measures to cope with them once they have occurred (Lu & Stead, 2013:201). Lu and Stead (2013:201) thus view resilience as a continuous process of reshaping, reorganising, and generating new adaptive mechanisms. Resiliency to disasters means a locale can withstand an extreme natural event with a tolerable level of losses (Mileti, 1999:5). The authors continue and state that the level of resilience a structure has, determines the level of loss which is experienced and the total cost of repairs and maintenance (Mileti, 1999:8). The significant capabilities of a resilient system include the following: 1.) withstanding capability—withstanding system disruptions and maintaining normal functionality under the disruptions; 2.) absorptive capability—immediately absorbing the disruptions and minimising system damage; 3.) restorative capability—quickly recovering to the standard or acceptable state; and 4.) adaptive capability—adapting to the changing conditions and uncertain disruptions (Shin, Lee, Judi, Parvania, Goharian, McPherson & Burian, 2018:5).

According to Boltz, Poff, Folke, Kete, Brown, Freeman, Matthews, Martinez, and Rockström (2019:1), the ability of systems to respond to changes in external conditions through internal changes in composition, configuration, and interactions to preserve

coherent function, was defined by Holling and his contemporaries as resilience. Boltz *et al.* (2019:2) provide the following characteristics of a resilient system:

- Persistence refers to the ability of a human or natural system to retain cohesive operation amid changing conditions and disturbance without losing its identity.
- Adaptability refers to a system's ability to sustain cohesive function by changing its identity to accommodate change.
- Transformability refers to a situation in which a system is pushed beyond its current state's threshold, meaning it can change its identity and establish a new function in a new equilibrium.

The Resilience Alliance (2024) defines resilience as the amount of disturbance a system can absorb and still remain within the same state or domain of attraction. In other words, is about the degree to which the system is capable of self-organisation and the degree to which the system can build and increase the capacity for learning and adaptation. Rockstrom (2003:871) argues that a resilient system can withstand shocks and even profit from change by providing opportunities for growth, novelty, and innovation.

Resilience, as defined by Falkenmark, Wang-Erlandsson, and Rockström (2019:2), is the ability of a system to cope with disturbance without cross-tipping points into a new stability domain, to adapt to change, and transform into a new state, following a regime shift. Therefore, water resilience means safeguarding and sustaining a particular desired state of a socioecological system and the ability of the hydrological cycle to maintain a stable water supply for societies.

Diao, Sweetapple, Farmani, Fu, Ward, and Butler (2016:383) state that resilience can be characterised in two ways: attribute-based and performance-based. Attribute-based considers the whole system, how it is designed, and whether it enables the system to respond appropriately to any threat (Diao *et al.,* 2016:383). Meanwhile, performance-based refers to the agreed performance of the system or part of the system in responding to a particular threat (Diao *et al.,* 2016:383).

A system is required to be resilient to counteract environmental and man-made threats. An operational definition of resilience provided by the researcher is: Resilience in systems refers to the ability to counteract the effects of environmental and man-made threats. In other words, resilience is the ability of a system to undergo various disturbances, but remain fully functioning, or maintain enough functionality to perform a desired action. Resilience also refers to the length of time it takes for a system to return to functioning at

desired levels after a disturbance has occurred. A fundamental aspect of resilience is how successfully a system can adapt to a disturbance that has already occurred to minimise damage/time to resume functioning if the same or a similar disturbance were to occur. Resilience thus refers to the ability of a system to undergo a disturbance and adapt to said disturbance to mitigate similar effects in the future while maintaining full or partial functioning. Resilience in water systems would imply that water services such as supplying water to residents would not cease in the event of a disturbance, i.e. pipe burst, because provisions have been made for the water supply to continue. In this instance, it is argued that if the water supply is interrupted, its duration is shortened. As the resilience concept in water systems has evolved, resilience measures have been recognised as important in the decision-making process of developing strategies for preparedness, response, and recovery of water infrastructure systems against unexpected disruptive events.

The subsequent section discusses the important roles of WSA and WSP in delivering water as a basic service.

2.3 GENERAL WATER-RELATED ROLES AND RESPONSIBILITIES OF MUNICIPALITIES

Tsibani (2005:336) states that a municipality is an autonomous “sphere of government”. It is responsible for various tasks, including the sustainable supply of basic water services to communities and supporting and developing social and economic growth in all areas that its jurisdiction may allow for. Multiple rules and/or procedures that shape municipal councils, councillors, and officials, and the roles and responsibilities of the WSA and WSP as institutions that have attained special status or legitimacy in terms of various Parliamentary Acts make up these institutions (Tsibani, 2005:337).

In local government and the water and environment functions, the following are viewed as objectives which a municipal council must complete:

- create a local government for the community which is democratic and accountable;
- ensure that the environment is safe and healthy;
- develop and sustain social and economic development and;
- motivate the community's cooperation in local government affairs (Kolisa, 2009:9).

The sections above defined local government, service delivery, water services management, resilience, and provided an overview of some of the roles and responsibilities of municipalities. As stated above, the SPLM is a Category B municipality located in the Frances Baard District which shares municipal executive and legislative authority in its area with a category C municipality within whose area it falls. The SPLM is responsible for delivering several services to the citizens of Kimberley however, this study places an emphasis on water services. Reliable water supply is a constitutional right and requires effective and efficient water services management. The Natural Resources Conservation Service (2024) defined water services management as controlling and moving water resources to minimise damage to life and property and maximise efficient, beneficial use. It is thus of the utmost importance for the SPLM to ensure they can provide citizens with water in a consistent and reliable manner. The following section outlines the functions of the WSA.

2.4 FUNCTIONS OF A WATER SERVICES AUTHORITY (WSA)

Kolisa (2009:13) explains that a WSA is a municipality with the executive authority to provide water services within its area of jurisdiction. One WSA can only exist in a specific area as each WSA has its own area in which it operates, and the area boundaries cannot overlap. The primary responsibility of a WSA is to provide water services to communities in a sustainable, effective and efficient manner. Specific responsibilities of WSAs include ensuring access to water, maintaining water services infrastructure, and planning and developing water services plans, which are not only economical, affordable, sustainable, effective and efficient, but should be developed in such a manner which also promotes sustainable livelihoods and economic development (Kolisa, 2009:15-16).

The WSA also regulates water services provision and suppliers within their jurisdictions and ensures the delivery of effective, efficient, and long-term water services (including water conservation and demand management), either directly or through the selection, procurement, and contracting of external water service providers (Kolisa, 2009:15-16). On the website of the DWS, a WSA is defined as any municipality responsible for ensuring access to water services, may perform the functions of a Water Service Provider, and may also form a joint venture with another water services institution, to provide water services (DWS, 2024). In providing water services, a WSA must prepare a water service development plan (WSDP) to ensure adequate, efficient, affordable and sustainable

access to water services (DWS, 2024). The core mandate of the WSA section is to provide residents with clean drinking water in compliance with the South African National Standard (SANS) 241 standards and ensure the effective treatment of wastewater effluent that will not be harmful to the environment and communities (Kouga Local Municipality, 2024). SANS 241 is a drinking water specification that states the minimum requirements for potable water to be considered safe for human consumption. The WSA's mission is to achieve successful Blue, Green and No Drop audits, which are set as a standard by the DWS for managing water and wastewater treatment and the reticulation infrastructure (Kouga Local Municipality, 2024).

A WSA should fulfil their duty to current and future consumers in its jurisdiction to gradually improve the efficiency, affordability, economics, and sustainability of water services (Beck, Rodina & Harris, 2016:6; Appiah, 2010:38). The WRC (1998:5, 24) state that a WSA is any municipality which has the responsibility of ensuring access to water services. The WRC continues to state that a WSA does not need to undertake the work required to provide service. It may choose to contract this out to others. According to Appiah (2010:38), a WSA may not deny or fail to provide services without a reasonable cause; in the instances of emergencies, reasonable measures must be taken to provide a basic water supply and basic sanitation services to any individual in their jurisdiction, and the usage of water services may be subject to reasonable restrictions imposed by a WSA. The author argues that these duties and responsibilities are subject to the following conditions:

- The availability of resources.
- The need for an equitable allocation of resources to all consumers and potential consumers within the authority’s area of jurisdiction.
- The need to regulate access to water services equitably.
- Consumers are obligated to pay reasonable charges
- The duty to conserve water resources.
- The nature, topography, zoning and situation of the land in question.
- The right of the relevant WSA to limit or discontinue the provision of water services if there is a failure to comply with reasonable conditions set for the provision of such services (Appiah, 2010:38).

In addition to the aforementioned conditions, the following factors also need to be taken into consideration:

- Alternative approaches to delivering water services.
- The need for regional efficiency.
- The need to achieve the benefit of scale.
- The need for low prices.
- The need for equality and the availability of resources from neighbouring Water Services Authorities (Appiah, 2010:38).

Emanti Management's Water Quality Management System (eWQMS) details the following as being the responsibilities of a WSA:

- Realisation of the right to access basic water services: guaranteeing gradual realisation of the right to basic water services, subject to available resources, ensuring that services are practical and efficient and sustainable long-term planning.
- Planning: ensure that water services development plans are in place (which include environmental, social, technical, institutional and financial planning) to ensure efficient, inexpensive, economical, and long-term water availability.
- Selection of WSP: a WSP is chosen, procured, and contracted (including itself).
- Regulation: regulating water service provision and WSP through by-laws, contract regulation, monitoring and performance management.
- Communication: Provide consumer information and education through health and hygiene promotion, water conservation, demand management, and information sharing (eWQMS, 2021).

The primary responsibility of a WSA is to provide water services to communities in a sustainable, effective and efficient manner. They can be considered as the main catalyst for determine the quality of water services citizens receive. A WSA can perform the above-mentioned functions internally and externally; this entails that the WSA itself completes functions performed internally. When these functions are performed externally, the WSA contracts a WSP, and it is only the responsibility of the WSA to regulate the WSP following the agreed-upon contract and all related duties and obligations. The functions of a WSP will be discussed in the subsequent section.

2.5 FUNCTIONS OF A WATER SERVICES PROVIDER (WSP)

Sambo, Senzanje, and Mutanga (2021:888) explain that the Free Basic Water Policy (FBWP) was adopted in South Africa in the early 2000s to fulfil the human right to "sufficient and appropriate water for all". The policy provides six recommended standards for providing water services, particularly in rural areas. They are:

- Distance: 200 meters from community households.
- Water quantity: supply 25 litres/capita/day (l/c/d).
- Water quality: the water should meet standards for human consumption.
- Water delivery: a minimum of 10 litres/minute.
- Reliability of 98% (available 350 days per year).
- Cost: of which 50Kl should be free (Sambo *et al.,* 2021:888).

In addition to policies such as the FBWP, other legal requirements exist for entities that serve as WSPs. Contracts provide the guiding framework for all WSPs. WSP operates under "contracts" supplied by a WSA. "Contracts" refers to the agreement or renegotiated agreement in writing between a WSA and a WSP in terms of which the WSP is to provide water services (DWAF, 2002:4). A contract must describe the scope of the water services to be provided by the WSP, and must:

- Set forth the method by which any relevant component of the water services development plan will be executed and how it will be done.
- Determine the contract area where water services will be delivered and a mechanism for changing the contract area.
- Define the terms and conditions under which other WSPs, both inside and outside the WSA's jurisdictional borders, may have access to and use any component of the water services works.
- Explain the service levels and standards to be supplied for different locations within the contract area, along with particular requirements such as time frames.
- Identify water services works that will be included in the contract and the mechanism through which the WSP will get access to them (DWAF, 2002:6).

Kolisa (2009:17) states that a WSP is any entity or organisation that acquired a contract with a WSA or another WSP to sell water to and/or accept wastewater for treatment from that authority or provider (bulk water services provider) and/or any entity or organisation who has been assigned a contract with a WSA to accept operational responsibility for

delivering water services to one or more consumers in a specified geographic region; or a WSA that provides either or both of the above services itself. According to eWQMS (2021), the primary responsibility of a WSP is to deliver water in compliance with *The Constitution* (1996) and any particular contract conditions imposed by the WSA. It is also the responsibility of the WSP to publish a consumer chart which complies with the by-laws and other regulations, is authorised by the WSA, and outlines not only the obligations and responsibilities of the WSP but that of the customer as well, and finally the water supply conditions and payment terms.

Toxopeüs (2019) defines a WSP as any public or private water services provider contracted by a municipality for their services. In other words, when a WSP is contracted to deliver services directly to consumers, they are required to prepare and publish a consumer chart that establishes a system for dealing with consumer complaints and sets out the consumer's right to redress and consumers in the area must be allowed to participate in developing charter. Toxopeüs further states that although selecting a municipal service provider can be time-consuming, it is critical to ensure that suppliers have the capacity and are well-suited to perform these services and guarantee that everyone has access to water. The primary duty of a water service provider is to provide water services following the Constitution, the Water Services Act, No. 36 of 1998, and by-laws of the WSA and in terms of any specific conditions set by the WSA in a contract (DWS, 2024). A WSP can be considered as the body providing the service, including the day-to-day activities needed to keep a water supply and/or sanitation system running effectively (WRC, 1998:5). Service providers' size and financial stability play a significant role in their capacity to carry out water service operations and fulfil specific duties. Therefore, separate standards would generally apply to different kinds of service providers so as not to overburden smaller service providers. Four groupings of WSP are identified as follows by the WRC (1998:23):

- *Micro:* a service provider with fewer than 5,000 people in its supply area or income from water-related charges of less than R500 000 a year.
- *Small:* a service provider with between 5,000 and 50,000 people in its supply area or income from water-related charges (water and sanitation) between R500 000 and R5 million per year.
- *Medium:* a service provider with between 50,000 and 500,000 people in its supply area or income from water-related charges (water and sanitation) between R5 million and R50 million per year.

- *Large:* a service provider with more than 500,000 people in its supply area or income from water-related charges (water and sanitation) of R50 million or more per year.

According to Global Water Partnership (2021), the functions of a WSP are to construct, operate, and upgrade water supply networks; provide safe, adequate and affordable water supplies; comply with agreed national and/or international health standards on water quality and strictly respect environmental standards for the release and reuse of wastewater; be able to deal with area-specific challenges (urban and rural) in terms of water provision; and be flexible in providing water services.

Furthermore, a WSP can take various shapes, which include:

- Municipalities: this means that an entity, or organisation, can perform the functions of a WSP with the sole responsibility of being a WSP or by a WSA, and municipalities can perform both of these roles within its own area of jurisdiction and when a contract is agreed upon within the jurisdiction of another WSA or WSP.
- Municipal entities are any public service providers owned and managed by a municipality and can be established by by-laws or company acts.
- Water Boards: These WSPs deliver water to other water service organisations.
- Community-based organisations: these are Non-governmental Organisations (NGOs) based in a community which provide said community with the necessary municipal services and work towards developing the community's interests and
- Private operators: These are many private entities or organisations, both locally or internally, that provide water services (eWQMS, 2021).

A WSP can be seen as the "*boots on the ground*" entity responsible for delivering water services to communities and stakeholders. The WSP has to fulfil its unique roles and responsibilities, which are also allocated to it by a WSA. Examples of WSP can include but is not limited to being another municipality, a water board, a community-based organisation, or a company in the private sector. If a WSA contracts a company or individual to provide water supply or sanitation services, they can be considered as a WSP. The SPLM is considered to be a WSA as well as a WSP. The following section with discuss the capacity of the municipality in both roles.

2.6 THE SOL PLAATJE LOCAL MUNICIPALITY (SPLM) AS WSA AND WSP

SPLM serves as both a WSA and WSP, meaning that the municipality is in charge of both the planning and execution of water supply-related initiatives. The municipality must develop a Water Services Development Plan (WSDP) relevant to WSA requirements and define desired and minimum levels of water services for communities, a specific function of a WSP in its area of jurisdiction (SPLM, 2024).

2.6.1 WSA Functions

The following are specific WSA roles of SPLM, as outlined on their official website:

- Policy Development and Bylaws
- Financial planning and management (including tariff setting)
- Contract management (WSA & WSP contracts)
- Water Services Development Plan (WSDP)
- Infrastructure planning
- WSP arrangement (including monitoring and evaluation)
- Performance management and regulation
- Water quality management
- Health and hygiene promotion
- water conservation and demand management
- Reporting and accountability (internal & external)
- Asset management and legal matters
- Transfer of assets
- WSA structure and organisational issues; and
- Disaster management/preparedness (SPLM, 2024).

The above duties indicate an administrative list of responsibilities. SPLM is responsible for developing various plans and strategies to improve the municipality's overall performance and functioning and improve residents' quality of life.

2.6.2 WSP Functions

SPLM also has the following WSP functions:

- setting conditions for the provision of water services;

- financial management and planning (WSP budget);
- water services provision functions;
- infrastructure development;
- customer relations and communications;
- health and hygiene promotion;
- contracts management (WSA & WSP);
- operations and maintenance;
- reporting and accountability to WSA (SPLM, 2024).

The above-mentioned roles are both administrative and practical in nature. SPLM, as a WSP, needs to report internally as it is the WSA. The focus of SPLM as a WSP is on water services and all related aspects thereof, whereas the focus of SPLM as a WSA is much broader.

2.6.3 Additional Roles and Responsibilities of SPLM

Apart from being a WSA and WSP, SPLM is also responsible for various community social, health, and security functions. The social responsibilities of SPLM include providing the community with library services and developing a housing programme that aligns with the Housing Strategy of the Department of Corporative Governance, Human Settlements and Traditional Affairs (CoCHSTA). Furthermore, the health and security responsibilities of SPLM include providing accessible street fire and emergency services. SPLM is also responsible for motor licensing and registration services, supplying electricity to residents, indigent support to those who qualify, stormwater services, wastewater services, urban planning and extending the network to provide higher levels of services and maintain existing networks (SPLM, 2024).

In order to summarise the above, it can be stated that the functions of the SPLM as a WSA and WSP are administrative and practical in nature. It is administrative in nature as it requires of the municipality to engage in strategic planning in an effort to provide citizens with improved water services management. Whereas it is also practical in nature as it is the responsibility of the municipality to ensure that strategic plans directed towards improved water services management are implemented in an effective and efficient manner. The following section discusses water management challenges faced by municipalities in South Africa.

2.7 WATER MANAGEMENT CHALLENGES FACED BY MUNICIPALITIES IN GENERAL (WSA/ AND OR WSP)

Post-apartheid South Africa faces a significant challenge in ensuring that municipalities provide optimal and professional services to citizens of heterogeneous cultures (Pretorius & Schurink, 2007:19). These challenges, in particular, include developing a system of governance, which is characterised as being open, ethical, professional and accountable (Pretorius & Schurink, 2007:23).

According to Managa (2012:3), local government, particularly municipalities, faces the following significant challenges: institutional capacity, mismanagement of funds, high levels of corruption and a lack of public participation. These challenges can be seen as the main forces that deter local government's successful development and functioning. Managa (2012:3) explains that due to a lack of institutional capacity, many municipalities have been understaffed. The lack of competence has reduced service delivery over time and left many communities without appropriate access to essential services. Thusi and Selepe (2023:690) contend and state that municipal service failures may be primarily linked to a lack of effective leadership and human resource issues and that high rates of irregular or inappropriate appointments, along with low ability, inadequate skill development programs, and bad institutional management are hinder the effective functioning of municipalities.

Furthermore, regarding financial mismanagement, many municipalities have difficulties augmenting their budgetary allocation with rate payments to provide the necessary services. According to Dzengwa (2007:272), several towns struggle to be economically engaged and financially viable. In these situations, the ability of towns to sustainably generate their own money and offer services has been hampered by their financial difficulties. This is caused by various factors, which include communities refusing to pay for services, under-spending and over-spending due to poor financial planning and officials misusing state resources for personal benefit (Managa, 2012:5). Additionally and with reference to high levels of corruption, it includes illegal tendering, accepting bribes and unauthorised expenditure (Managa, 2012:4). Although corruption mainly benefits a small number of government employees, politicians, and “tenderpreneurs”, it has severely restricted and hampered government’s ability to combat poverty and deprivation (Kanyane, 2014:100). Moreover, regarding a lack of public participation, communities

protest to voice their displeasure and irritation about municipal officials and councillors who should be their representatives, but exclude them from local decision-making, which goes against the Local Government: Municipal Systems Act 32 of 2000 (Managa, 2012:5).

The author argues that without the participation of the community, officials cannot be held accountable and satisfactory levels of service delivery will not be possible (Managa, 2012:5). Public participation leads to an overall better outcomes and overall better governance. Public participation, when done correctly, will yield two critical advantages: 1.) better and more readily implementable decisions that represent the interests and values of the public and are better understood by the public will be made by sponsor agencies; 2.) communities gain the long-term ability to handle complex social problems and frequently get past misunderstandings and long-standing conflicts (Environmental Protection Agency, 2024).

The above are some of the challenges that municipalities face in day-to-day operations. These challenges are also what limits the effective and efficient functioning of municipalities.

CoGTA (2023), in their report on the state of local government, presented on 15 November 2023, presented the following facts concerning challenges faced by municipalities:

- The report confirmed a correlation between failures in governance and political oversight as the primary causes underpinning the increase in the number of dysfunctional municipalities. These failures are also attributed to the lack of adequate support from National and Provincial Government departments and other service delivery departments.
- The significant year-on-year percentage increase in average outstanding debt per municipality owed to Eskom, DWS), Water Boards, and other suppliers of goods and services is a clear indication that the majority of municipalities are not honouring payment arrangements with the suppliers of bulk services and that virtually no progress has been made to reduce the debt owed to the suppliers of bulk services.
- Vacancies in key senior management positions within distressed municipalities remain a serious challenge. The absence of Chief Financial Officers in

municipalities impacts sound financial management, and vacancies in the technical departments compromise service delivery.

- Most dysfunctional municipalities face revenue challenges, some of which are caused by the negative economic outlook and unemployment (CoGTA, 2023:5).

Furthermore, COGTA's the State of Local Government report also stated that low and medium-capacity municipalities do not have the technical and financial capacity to perform infrastructure assets condition assessments (CoGTA, 2023:21). Infrastructure condition assessments inform long-term capital project planning, adequacy of annual maintenance funding, if any, and the structural and functional integrity of assets. The report also stated that municipalities have not yet eradicated basic services backlogs, as highlighted by Census 2022 results, because of several factors, including lack of technical capacity. This is evident in unspent infrastructure grants and lack of operations and maintenance of existing infrastructure (CoGTA, 2023:22). The report continues and states that municipalities' poor performance on infrastructure asset management is evidenced by unreliable basic services provision and published results like the Green Drop and Blue Drop Reports and the Auditor General's report among others. Lack or poor infrastructure asset management leads to service disruptions and at worst catastrophic failures that result in loss of life and damage to property (CoGTA, 2023:23).

It is possible to assume that the above-mentioned challenges are re-occurring themes within municipalities as illustrated in the years 2010 and 2011 when the Auditor-General of South Africa conducted a comprehensive review of 283 municipalities in South Africa (Khale & Worku, 2013:63). Based on the findings of the review, more than 75% of municipalities were characterised by the following key challenges: ineffective professional administration; dysfunctional councils; weak and/or absent mechanisms for local democracy; poor intergovernmental support and oversight and; weak municipal performance management (Khale & Worku, 2013:63).

The section above highlighted a number of water services management challenges which are encountered by numerous municipalities across the country. These challenges include political interference, a lack of leadership, skilled labourers, and resources, and financial mismanagement. It can be deduced that without strong political leadership as well as leadership within the municipalities itself, it is not possible to deliver services in an effective and efficient manner. With strong leadership, financial resources can be fully utilised throughout a municipality ensuring optimal functioning. Strong leadership also

plays a significant role in how services are delivered as they are responsible for identifying and selecting the right individuals to perform tasks. If all levels of leadership as well as all levels of labours within a municipality commit themselves to serving the citizens, it is possible to achieve effective and efficient service delivery. The subsequent section will discuss the theoretical review of the study.

2.8 THEORETICAL REVIEW OF THE STUDY

Van der Waldt (2017:187) states that sound research requires using the most suitable theory to construct theoretical, conceptual, and analytical frameworks to examine a particular phenomenon. Different theories best suit various units, such as groups, behaviours, and organisations (Van der Waldt, 2017:188). Miles and Huberman (1994:18) describe a theoretical framework as a written or visual presentation of what the researcher intends to study, the key factors, concepts, constructs or variables and the relationship among them. This section of the chapter discusses the decision theory, the public choice theory, the public value theory, the social exchange theory, and the SCT for this study.

2.8.1 Decision Theory

The decision theory is a theory about decisions (Hansson, 2005:5). It can be divided into two parts: normative and descriptive. The normative theory focuses on how a decision ***should be made***. In contrast, descriptive theory focuses on how a decision ***is made*** (Hansson, 2005:6). Normative decision theory primarily concerns how an agent ought to choose when faced with some decision problem (Elliott, 2019:755). A decision problem can be thought of as consisting of a set of acts, each within the agent's power to choose. These acts are mutually exclusive and jointly exhaustive, and each one might have a range of different outcomes depending on which state of the world is actual (Elliott, 2019:756). Normative decision-making models, as proposed by Gati, Levin and Landman-Tal (2019:122), aim to characterise the processes involved in reaching the best decision. The primary foundation of normative models is assessing every potential course of action (Gati *et al.,* 2019:122). Airth (2024) views normative decision-making as predictive decisions based on what should happen in an ideal setting.

On the other hand, descriptive decisions concentrate on the processes by which individuals appear to make decisions. "Decision theory" describes statistical and economic methods for examining a person's decisions (Gajendrakar, 2024). Stated differently, it enables the entity to decide as logically as possible when faced with unknown and unclear conditions. Descriptive decision theory is thus concerned with characterising and explaining regularities in the choices that people are disposed to make (Chandler, 2017:2). This is important because it can help society understand why or how people make decisions and how to improve these decisions (Jankelová & Puhovichová, 2020:2) The CFI team (2024) states that descriptive decision-making theories are used to look at the assumptions made by the individual making the decisions.

Individuals will make choices which hold the best outcomes for themselves. However, they take various factors into account, *i.e.* the level of certainty an individual has on an expected outcome after a choice is made, which and how many choices are available and how their decision can affect others. When decisions have to be made, or different options are presented, the individual in question will try to obtain as good an outcome as possible, according to some standard of good or bad (Hasson, 2005:13).

Therefore, it is possible to categorise decisions into three broad categories. The first is decision-making under certainty, the second is decision-making under risk, and the third category is decision-making under uncertainty. Decision-making under certainty is the type of decision-making in a situation where the result of selecting an alternative is undoubtedly determined (Takemura & Takemura, 2014:7). Decision-making under certainty can also be described as a situation where a decision-maker can collect all available information and knowledge which increases the level of certainty, predictability, and control they have when making a decision (Hutchins, 2024). It is less probable that you will make a mistake or fail when you decide after gathering all the necessary information and understanding the potential results (Springbord, 2022). Decision-making under risk refers to a condition that occurs with known probability as the result of selecting an alternative (Takemura & Takemura, 2014:7). Taghavifard, Khalili-Damghani & Tavakkoli-Moghaddam (2009:8) state that risk implies a degree of uncertainty and an inability to control the outcomes or consequences of such an action fully. When deciding when facing risk, evident, known probabilities are associated with options. For example, selecting between an option that has a 50% chance of yielding R5 and an option that has a 100% probability of yielding R1 (Byrnea, Cornwall & Worthy, 2019:8). Lastly uncertainty in this context refers to a state in which the likelihood of the result of selecting an

alternative is not known (Takemura & Takemura, 2014:8). Uncertainty in decision-making relates to the discrepancy between the knowledge that is available and the knowledge that a decision maker would require to make the optimal decision (Marchau, Walker & Bloemen 2019:1). Uncertainty in decision-making, according to Pratric (2024), can be understood as having no knowledge when having to make a decision, which results in a decision being made based on the individual's attitude towards the unknown.

Decision theory can thus be explained by referring to the function of consciousness in making a decision. Technically, it can also be defined as selecting an alternative from a group of other options by considering various factors. For this study, it can be assumed that when inhabitants decide to support SPLM and pay their utility fees, the decision is taken under uncertainty as residents do not fully know whether or not they will receive water services.

2.8.2 Public Choice Theory

Public choice theory studies how public spending and decision-making are affected by the actions of voters, public officials, and other parties involved in government (Crain, 2024). The basic hypothesis of the field of economics known as "public choice" is that the citizens of democratic political jurisdictions perceive a connection between the taxes they pay and the government services they receive (Gërxhani & Wintrobe, 2021:789). In other words, citizens elect governments to provide them with goods and services. The public choice theory states that public choice can be defined as the economic theory of non-market decision-making or simply applying economics to political science (Mbaku, 2008:429). The basic behavioural postulate of public choice is that man is an egoistic, rational utility maximiser (Mbaku, 2008:429). Individuals will always try to act in a manner that has the best outcomes for themselves, especially those with access to abundant resources. Public choice presumes that individuals are primarily motivated by their own self-interests and, more crucially, that people's incentives in the political process are no different from those in the home or automobile markets (Shughart, 2024). Although people in the political arena have some concern for others, their main motive, whether they are voters, politicians, lobbyists, or bureaucrats, is self-interest (Longley, 2022). Therefore, it is important that these individuals be constitutionally constrained to minimise their ability to engage in activities that could negatively influence the state and the public. In addition, fully understanding how individuals behave in political markets is critical so

that members of a society can develop and implement institutional arrangements that effectively limit those who serve the public and prevent them from engaging in activities that reduce national welfare (Mbaku, 2008:430).

Authors working in the public choice tradition share two assumptions concerning local government. The first is the *self-interest axiom,* which implies that left to their own devices, policymakers will pursue their private interests rather than the public interest. Secondly, politicians and officials can be redirected towards the public interest if they are constrained by the pressure of *competition* (Boyne, 1997:57). Competition between councils can take two forms. First is geographical competition between authorities in different areas for market share in households and businesses. Second, competition between different tiers of local governments for a share of local tax revenues in the same geographical area (Boyne, 1997:58).

The public choice theory is also known as the public value theory. 'Value-in-use' is based on users' perceptions and is created throughout and from the collaboration and interaction between the consumer and the provider in mutual exchanges during use, consumption, or experience (Petrescu, 2019:1734). Private value is consumed individually by users, while public value is received collectively by the citizenry, based on the needs and wants of the collective citizenry. At its core, it includes the needs of citizens and ensures the goods and services they receive from the government are of value to them as individuals and as a community. Naidoo and Holtzhausen (2020:192) explain that beyond the needs of citizens, public value also has significant implications for public managers tasked with creating public value.

According to Bryson, Crosby, and Bloomberg (2014:448), public value creation is the extent to which public values criteria are met, where these are some combination of inputs, processes, outputs, and outcome measures. Moore (1995:163) highlights the following public values: efficiency, effectiveness, socially and politically sanctioned outcomes, procedural justice, and substantive justice (Bryson *et al.,* 2014:448). Furthermore, Moore (1995:163) also believes that citizens expect the following from their governments: 1) high-performing service-oriented public bureaucracies, 2) public organisations that are efficient and effective in achieving desired social outcomes, and 3) public organisations that operate justly and fairly and lead to just and fair conditions in the society at large. This theory thus focuses on the extent to which governments display the values for which the public holds them accountable. Public value creation has now

become a general term associated with the processes of collaborative negotiation, especially between government officials and other stakeholders, which is directed at resolving social problems and achieving shared goals or purposes (Head, 2019).

In other words, there is an exchange or an implicit contract between the citizenry and the government. The government provides goods and services to citizens in exchange for their support. The residents of Kimberley expect SPLM to improve water service delivery as they pay their utility fees. For this study, it can be assumed that the arrangement between SPLM and its residents is that when residents pay their utility fees, they will receive water services. However, this is not always the case, as water shortages are still frequent.

2.8.3 The Social Exchange Theory

One of the main approaches to the study of social interaction and social structure is the social exchange theory. The importance of the benefits and costs traded during social interactions is how social relations are understood. According to this perspective, social structures are networks of interconnected social relationships between people or groups (Cook, 2015:482). Nickerson (2023) contends that people evaluate relationships using economic principles, whether consciously or unconsciously, weighing the advantages and disadvantages of each option and comparing them. Individuals and groups will be more attracted to relationships where rewards are more significant than cost and abandon those with greater costs than profit (Nickerson, 2023). Lambe, Wittman, and Spekman (2001:4) allude that the resource exchange may be intangible, such as social amenities or friendship, and tangible, such as goods or money. Lambe *et al.* (2001:4) argue that the primary premise of the social exchange theory is that people form and sustain connections in the hopes of obtaining a reward out of it.

The foundation of social exchange can be considered to be the following: 1: actors rely on one another for valued resources; 2: actors behave in ways to increase positively valued resources and decrease negatively valued resources; 3: actors participate in repeated exchanges over time with particular partners (Mitchell, Cropanzano & Quisenberry, 2012:100). Fan, Mahmood, and Uddin (2019:103) argue that the social exchange theory requires a series of interactions or transactions that obligate complementary actions from another entity. This implies that one party's specific action or behaviour in the exchange process imposes a mutual duty on the other party. In

addition, Meira and Hancer (2021:670) explain that trust, loyalty, and mutual commitment from all parties involved are vital for successful social exchange.

Therefore, if it is beneficial to all parties involved, exert the required amount of effort to maintain the relationship. The social exchange theory can be simplified by stating that the more you give, the more you receive. For this study, SPLM is at risk of losing the support from residents. It can be assumed that SPLM is not exerting the required amount of effort to keep residents loyal to them.

2.8.4 Social Contract Theory (SCT)

This study found its theoretical grounding in the social contract theory. Friend (2024) defines SCT as the belief that individuals' moral and/or political duties are contingent on a contract or agreement between them to establish a society. SCT is, by all accounts, the rules by which we live and work in a society, along with the consequences of non-compliance to the rules (Snyder, Carpenter & Slauson, 2007:4). The contractual agreement that exists between a constituted authority and the citizenry as predicted by the social contract model assumes various responsibilities and obligations as far as each party to the contract is concerned.

The SCT is a widely accepted explanation for a constituted authority and individual citizen relationship. This is because SCT can justify both political relationships and obligations. Udo and Inua (2020:13) state that another benefit of SCT is that it elucidates a sharp focus on political correlation because of its implication on the issue of contract vitiation when either of the parties to social contract did not live up to contractual obligation as may be required.

SCT demonstrates the benefits and circumstances in which organised government is appropriate, leading all rational individuals to view it as a voluntary duty. This is done by contrasting the organised government's benefits with the natural state's drawbacks. Following that, these results were condensed into a social compact, from which it was assumed that all of people's fundamental freedoms and responsibilities could be inferred (Duignan, 2024).

Seabright, Stieglitz, and Van der Straeten (2021:5) further state that the SCT is based on the principles of legitimate political power through a rational and materialistic approach. Within the SCT, two different types of contracts are encountered: the ‘contract of

association' and the 'government contract'. The SCT holds that human authorities are created through agreements with their subjects for particular tasks, that these agreements can be enforced through well-defined processes, just like private law contracts, and that the authority of human authorities is contingent upon the accomplishment of these tasks (Black, 1993:57). It should be highlighted that contracts are unique among oaths and promises because they are conditional by definition (Black, 1993:57). The 'contract of association' is defined as the contract of individuals among themselves when they decide to unite to confer on a single person or an assembly of the task of making decisions in such a way that these decisions are considered to be the will of all (Seabright *et al.,* 2021:5). Small (2020) contends and states that a voluntary association of persons is driven by the mutual agreement between members and an entity that is convenient to use for a recreational and/or public-benefit activity. The terms and conditions that all parties are required to adhere to, information regarding the identities and positions, and the shared objectives of members are all included in the contract (Contracts Counsel, 2024). Additionally, the 'government contract' is defined as the voluntary surrender of some individual liberty and the promise to obey the government (Seabright *et al.,* 2021:5). Fundamentally, it is suggested that people give up their freedom to do as they like in exchange for government's protection (The New Jersey Center for Civic Education, 2024:1). Conventional views of the social contract hold that governments emerged as a result of a contractual arrangement that outlines the rights and obligations of individuals and governments, and what is implicitly and explicitly agreed upon for civil society to exist (Lemmens, Ghimire & Perehudoff, 2022:18).

For this study, SCT was initiated when the residents of Kimberley voted to elect their representatives in the council of the local municipality (contract of association) and agreed to pay for their services (government contract), such as water provision. However, SPLM does not always uphold their end of the contract, as the water cuts and shortages in the jurisdictive area of the municipality can testify. This could lead to dire consequences for SPLM, such as a rise in service delivery protests, which is the case in many local municipalities in South Africa.

2.9 CHAPTER CONCLUSION

Chapter 2 began by conceptualising the key terms of the study. These key terms were Local Government, Service Delivery, Water Services Management, and Resilience. The

subsequent section focused on the roles and responsibilities of municipalities, and the roles of a WSA and/or WSP. Thereafter, SPLM and its roles and responsibilities were discussed. Challenges deterring the effective functioning of municipalities were also discussed. The chapter then concluded with a theoretical review of the study.

In the next chapter, the resilience of cities is discussed with specific reference to water services management.

CHAPTER 3
SUSTAINABLE WATER RESILIENT CITIES

3.1 INTRODUCTION

Chapter 2 gave an overview of water services management from the theoretical perspective and discussed water services management and related concepts. These concepts included the following: Local government, service delivery, water services management, and resilience. This was proceeded by examining the roles and responsibilities of the WSA and WSP. SPLM became the focal point as their role as a WSA and WSP was discussed. Chapter 2 then concluded by exploring the challenges faced by municipalities, followed by the theoretical review of the study.

This chapter critically discusses sustainable water resilience in cities by examining various definitions and the elements constituting resilient systems. An international perspective on resilience and a domestic perspective on resilience is also provided. To be resilient, meticulous planning is required for water services; therefore, the chapter also reviews how public planning could be utilised to advance water services management.

3.2 AN OVERVIEW OF WATER RESILIENCE

As a result of rising temperatures and living standards coupled with population increase, domestic water consumption has been on the rise over time. The natural hydrological cycle will be significantly altered by human activity, coupled with global warming, leading to significant changes in water availability and demand (Tzanakakis, Paranychianakis & Angelakis, 2020:2). These changes will also exacerbate conflict between water users, emphasising the necessity to update current water governance plans to meet future demands and guarantee sustainable water use (Tzanakakis *et al.,* 2020:2).

According to a study by He *et al.* (2021:2), from 1950 to 2020, the global population living in cities increased from 0.8 billion (29.6%) to 4.4 billion (56.2%) and it is projected to reach 6.7 billion (68.4%) by 2050. This causes a significant increase in the demand for water resources. Infrastructure and engineering have traditionally been used to address urban water scarcity. Reservoirs are frequently used to store water during surplus availability and to continually distribute water to towns to prevent water shortages during dry spells. However, water infrastructure development is expensive, demands a large amount of

material, energy, and human resources, is constrained by terrain and geographic position, and could significantly negatively influence the environment (He *et al.,* 2021:2).

Urban environments comprise several interrelated systems known as critical infrastructure and lifelines. These systems are of such importance that the absence or destruction could lead to dire consequences for public protection, economy, health or security (Quitana, Molinos-Senante & Chamorro, 2020:2). One of the most important critical infrastructure systems are potable water systems; this is because it is responsible for producing water consistently, in the appropriate quantity and quality to meet the demands of the public (Quitana *et al.,* 2020:2). Due to the high dependence on these systems, especially water systems, building and improving the resilience and readiness to respond to disruptions should be of the utmost importance to governments around the world.

The notion of resilience is not new in the Social Sciences (Bourbeau, 2018:21). According to Bourbeau (2018:21), several disciplines and fields of research, including psychology, child development, criminology, biology, ecology, and social work, have established the components and strengths of a resilience strategy over the last sixty years, if not longer. Due to the concept of resilience spanning multiple disciplines, Bourbeau (2018:21) states that various definitions and perspectives on resilience have been suggested along the way.

The social revolution worldwide of the 1960s paved the way for profound changes in the sciences that would continue through the 1970s (Prigogine, 1996; Jantasch, 1980, cited by Curtin & Parker, 2014:913). In this period, a group of scientists from the University of British Columbia, with Crawford S. Holling at the forefront, came together to remake the face of ecology and natural resource management (Curtin & Parker, 2014:913). Stability and resilience have always been used in conjunction, but Holling proposed that these concepts should be viewed separately. According to Holling, the stability perspective stresses preserving a predictable environment. In contrast, the resilience view emphasises alternate stable states and the necessity for persistence under varied levels of unanticipated disruptions (Curtin & Parker, 2014:915). The persistence-driven resilience perspective focuses on establishing longevity-inducing behaviours that maintain a system while it is subject to change (Curtin & Parker, 2014:915). Resilient systems emerged from this perspective. If systems, *i.e.* water distribution systems, are to

be regarded as resilient, they would have to continue functioning as usual under abnormal conditions.

Water security is key to planetary resilience for human society to flourish in an era of extraordinary global change (Keys, Porkka, Wang-Erlandsson, Fetzer, Gleeson & Gordon, 2019). Resilience in all systems, especially in water-related infrastructure systems, is becoming a focal point for governments around the globe. The capacity to persist in the face of change, adapt to change, and transform, resulting in new system configurations of functions and interactions, is referred to as resilience (Keys *et al.,* 2019:2).

The ability of social-ecological systems to deal with shocks, adapt to changing conditions, and transform in crisis scenarios is essentially dependent on water functions, such as regulating the earth's climate, supporting biomass production, and providing water supplies for human societies (Falkenmark, Wang-Erlandsson & Rockström, 2019). However, massive, inter-connected human interference involving climate-forcing water withdrawal, dam constructions, and land-use change, have significantly disturbed these water functions (Falkenmark *et al.,* 2019). In many cases, changes in core water functions have pushed systems beyond tipping points and led to fundamental shifts in system feedbacks (Falkenmark *et al.,* 2019). Due to human interference, the production and supply of water resources have become severely strained. When water resources and supply are left exposed or exhausted, the cause can be linked back to human and engineering errors.

From the first definitions of Holling (1996) for complex structural systems, there have been an increasing number of studies dealing with understanding, defining, evaluating and improving the resilience of infrastructure systems in the face of hazards and disasters of both human and natural origin (Quitana *et al.,* 2020:3). In fact, there are two perspectives for understanding and defining resilient systems which is the engineering and the ecological perspectives.

The engineering perspective focuses on the functional stability of a system near a single equilibrium steady state and how quickly the system recovers to that state once a disturbance occurs, emphasising efficiency, steadiness, and predictability (Quitana *et al.,* 2020:4). The ecological perspective, on the other hand, encompasses concepts such as persistence, change and unpredictability, associating conditions that are far from any

equilibrium steady state, where disturbances can lead to a “new stability”, the focus is on instability and the tendency to develop into a new state (Quitana *et al.,* 2020:4).

Currently, the resilience of infrastructure and lifeline systems is understood from both perspectives, engineering and ecological, as the definition proposed by Resilience Alliance (2019). This definition refers to resilience in general (not just physical systems) as “a social-ecological system can absorb or withstand perturbations and other stressors such that the system remains within the same regime, essentially maintaining its structure and function (Quitana *et al.,* 2020:4).

According to Holling *et al.* (2002) and Walker *et al.* (2004, cited by Clarvis*,* Allan & Hannah, 2014:99), resilience is defined as a measure of the amount of perturbation a linked social-ecological system (SES) can withstand and still maintain the same structure and functions. A persistent system can withstand pressures and change (this can be both positive and negative). In contrast, a system’s response to change reveals its capacity to adapt (Barnes, 2013, cited by Clarvis *et al.,* 2014:99). In the face of numerous pressures (exploitation, pollution, climate change, and climate extremes) on water resources, considerable attention has been paid to identifying factors within water governance and management that may enhance or reduce the resilience of social-ecological systems, particularly in terms of their adaptive capacity, which refers to the ability to prepare for and respond to variability, change or surprise in the state of SES (Chapin *et al.,* 2009; Smith & Wandel, 2006, cited by Clarvis *et al.,* 2014:99).

Although various definitions for resilience exist, it is essential to keep in mind that each definition needs to be applied to the specific system being investigated. The subsequent section conceptualises the term resilience.

3.3 DEFINING RESILIENCE

Resilience can be defined in different ways. For example, Sutherland, Roberts, and Douwes (2019:33) define resilience as a ‘re-emerging concept’ applied to deal with the shocks and stresses facing society and the environment due to both human-induced and physical hazards. According to Welsh (2014, cited by Sutherland *et al.,* 2019:34), resilience can be defined as the capability of a socio-ecological system to bounce back from stress or a shock, and resume its original configuration, shape, functional relationships, or trajectory, afterwards. Resilience is not only about returning to a ‘normal’ state after a disruption occurs but about how a system takes a disruption and uses it to

equip itself better if and when such a disruption is to take place in the future. Shaw (2012, cited by Sutherland *et al.,* 2019:34) states that a system needs to 'bounce forward' to a new, more resilient state.

Notions of urban resilience and resilient planning have gained increasing attention and interest in recent years in the fields of environmental management and urban planning (Lu & Stead, 2013:200). According to Mileti (1999, cited by Lu & Stead, 2013:200), in response to environmental risks, the study of resilience began in the late 1990s. The focus was on physical and infrastructure improvements to prevent disturbances (Lu & Stead, 2013:200).

Gunderson and Holling (2002, cited by Lu & Stead, 2013:201) emphasise that resilience can be understood as the capability of a system to remain functional while absorbing or buffering disturbances. Newman (2009, cited by Lu & Stead, 2013:201) states that the notion of resilience is often associated with the ability to learn, primarily to become more robust to change. Change is a fundamental aspect of resilience, both in terms of resistance to change and recovery from it (Lu & Stead, 2013:201). As a result, resilience is linked to both preparations for minimizing disruptions and measures to cope with them once they have occurred (Lu & Stead, 2013:201). Lu and Stead (2013:201) thus view resilience as a continuous process of reshaping, reorganising, and generating new adaptive mechanisms.

Godschalk (2003, cited by Lu & Stead, 2013:201) states that the literature on resilience planning has often emphasized preparation and mitigation actions, especially at the local scale, such as SPLM. This closely coincides with a traditional approach to land use planning as a means of minimising existing disturbances (e.g. avoiding 'bad neighbours' through the separation of specific land uses) and reducing the risks and adverse effects of possible disturbances (e.g. locating developments away from ecologically sensitive or flood-prone areas) (Lu & Stead, 2013:201). Furthermore, the literature focused on mitigation and adaptation, recognising that mitigation is frequently insufficient to avert some disruptions (Lu & Stead, 2013:201).

Furthermore, in engineering and some branches of ecology, resilience is commonly understood as a natural balance or a steady state to which a system returns after stress or perturbation (Givens, Padowski, Guzman, Malek, Witinok-Huber, Cosens, Briscoe, Boll & Adam, 2018:3). Givens *et al.* (2018:3) state that these understandings often reference the ball and cup analogy of returning to a state of equilibrium or possibly transitioning to

a new state with a new equilibrium. In engineering, resilience may be operationalised as time to return to equilibrium, in ecology, resilience might be measured as the magnitude of change that can be absorbed before transition to a new state Berkes *et al.* (2003, cited by Givens *et al.,* 2018:3). Folke (2006) and Olsson *et al.* (2015, cited by Givens *et al.,* 2018:3) defines resilience from a socio-ecological perspective as the ability of systems to resist or adapt to change or shocks and persist, or to move into an alternative, possibly more desirable state. The author makes it clear that resilience should not only focus on being prepared for disruptions, but it is of utmost importance that the system adapts to the specific disruption to improve and be better equipped if the same or similar disruptions occur again.

Internal and external pressures, including threats, will always be present in the provision of water services and when dealing with water resources; therefore, it is essential always to have a 'plan of action' when an undesired event occurs, such as a pipe burst. Water companies and service providers must continue to find ways to not only operate but maintain performance and provision of services in such instances (Lawson, Farmani, Woodley & Butler, 2020:3). Countries worldwide are implementing more resilient-based systems. The importance of resilience in systems is becoming increasingly prevalent and has been adopted in some countries' legislations. For example, in England and Wales, it takes the form of the Water Act 2014. The amendment to the Water Act 2014 now requires water companies to:

- Secure the long-term resilience of water undertakers' supply systems and sewage undertakers' sewage systems as regards environmental pressures, population growth and changes in consumer behaviour; and
- to ensure that undertakers take steps to enable them to meet, in the long term, the need for the water supply and the provision of sewerage services to customers (Lawson *et al.,* 2020:4).

Furthermore, Cimellaro *et al.* (cited by Lawson *et al.,* 2020:7) argue that resilience can be defined within the context of the speed at which systems go towards equilibrium, their capacity to cope and/or bounce back, and to be inherently strong, flexible, and adaptive. As stated above, the definition of resilience will vary. As with all definitions of resilience, the adopted approach is based on the sector or field, the theoretical basis or stance, and the overall goal of a study or aspect of practice (Lawson *et al.,* 2020:7).

Considering the research presented above, an operational definition of resilience for this study is the ability of a system to undergo a disturbance which causes it to function abnormally, or not as effectively as it usually would, and the speed at which it returns to normal and effective functioning. The system should then be able to integrate the disturbance to adapt and be better equipped to deal with it.

3.4 DEFINING WATER RESILIENCE

While there is no single approach to defining water-related resilience, building resilience in the water sector is often loosely framed as contributing to improved water security in the face of climate change on the one hand and reduced vulnerability to water-related risks and hazards on the other (Rodina, 2018:3). According to Bell *et al.* (2017) and White (2010, cited by Rodina, 2018:3), in terms of specific dimensions of water resilience, arguments have been made for increased flexibility in the water sector and increased reliance on natural, or green infrastructure as a flexible option with multiple benefits from flood risk mitigation to improving water supply and quality. Internal and external pressures are currently and will continue to pose substantial problems for water services (Makropoulos, Nikolopoulos, Palmen, Kools, Segrave, Vries, Koop, Van Alphen, Vonk, Van Thienen & Rozos, 2018:316).

In the aftermath of a disaster, the ability of a water supply system to function is critical. Failure of these systems can disrupt residents' and critical users' lives and other hard and soft infrastructures and services (Balaei, Wilkinson, Potangaroa & McFarlane, 2020). When defining the resilience of water systems, one would state that water supply resilience is the ability of the system to keep functioning acceptably in the wake of a disaster and to recover a normal level of functionality after a decline experienced due to the disaster (Balaei *et al.,* 2020:1). Water resilience thus focuses on response, restoration and mitigation measures.

According to Brown *et al.* (2009) and Albrechtsen (2011, cited by Makropoulos *et al.*, 2018:316), examples of pressures can be found on the supply side (in terms of both quantity and quality) due to hydro-climatic changes resulting in uncertainty at the delivery side, as the infrastructure itself gets older and less reliable in a context of limited new investment and at the demand side with services and related customer expectations. These pressures can occur outside and within the water systems themselves. Pressures

can also occur in an intermediate space where the water system decision-maker has some influence but no direct control (Makropoulos *et al.,* 2018:316).

Bruce, Brown, Avello, Beane, Bristow, Ellis, Fisher, Freeman, Jiménez, Leten, and Matthews (2020:1) define water resilience as the ability of the system to persist, adapt and transform when conditions require and use these characteristics to determine water resilience better. Urban water systems are the systems used to provide water to residents. The concept of urban water resilience relates to building these characteristics: persistence, adaptability and transformability to manage water-related chronic stresses or sudden shocks that threaten widespread disruption or the collapse of physical or social systems (Bruce *et al.,* 2020:1).

Water resilience, according to Falkenmark *et al.* (2019:2), may be defined as the function of water in preserving and sustaining a particular desirable condition of social-ecological systems through sustaining the state of ecosystems and biomes to the ability of hydrological cycles to provide stable water supply for communities.

WSA and WSP must be fully aware of the challenges they face concerning water services delivery in their respective jurisdiction areas. Johannessen and Wamsler (2017:4) identified three levels of disturbances which could disrupt the normal functioning of water systems, namely:

- Socio-economic disturbances occur within the urban water supply infrastructure and the organisations that oversee and govern it rather than as a result of external threats. Corruption, power dynamics, capacity gaps, and operation and maintenance expenses are disturbances linked to socioeconomic, political, institutional, and governance frameworks.
- Hazard disturbances are crises-related disturbances that occur outside the urban water supply infrastructure, and the bodies that regulate and govern it are referred to as hazard disturbances.
- Long-term disturbances refer to disruptions to the broader social-ecological system, such as unsustainable resource extraction by urban water services.

As stated above, WSA and WSP must know the challenges of deterring service delivery. It is just as crucial for WSA and WSP to be able to measure their levels of resilience. According to Meng, Fu, Farmani, Sweetapple, and Butler (2018:378), six metrics can be used to measure a system's resilience: time to strain, failure duration, failure magnitude, failure rate, recovery rate and severity.

- Time to strain refers to the period at which a disturbance commences and the start of service failure, for example, when the level of service at a node drops below a predefined performance threshold.
- Failure duration refers to how long a disturbance is active and prevents effective functioning until normal performance can commence again.
- Failure magnitude refers to the most severe drop in system service.
- Failure rate measures the rate of degradation of the system under stress.
- Recovery rate refers to the speed at which a system can function normally after a disturbance.
- Severity refers to the area between the quality of performance and the period of service failure.

In summary, an operational definition of water resilience refers to the rate at which a water system can function normally after a disturbance, i.e., how long consumers would have to wait for water provision after a pipe burst.

The following section discusses resilience from a global perspective.

3.5 RESILIENCE FROM A GLOBAL PERSPECTIVE

The National Academy of Science, based in the United States of America, defines resilience as “the ability to prepare and plan for, absorb, recover from, and successfully adapt to adverse events” (National Academy of Science, 2012, cited by Klise, Bynum, Moriarty & Murray, 2017:420). Building and improving resilient water systems should be a priority for governments worldwide as water is crucial for humans' daily lives. Individuals, hospitals, schools, nursing homes, fire stations, restaurants, and other industries that rely on water greatly benefit from resilient water systems (Klise *et al.,* 2017:420). Water is one of the most important resources as it directly and indirectly influences everything and everyone. Due to its crucial nature, various programmes have been developed to ensure the resilience of water systems. One of these programmes is The Water Network Tool for Resilience (WNTR), which will be discussed next. A discussion regarding the UN SDGs follows.

3.5.1 The Water Network Tool for Resilience (WNTR)

Multiple difficulties confront drinking water systems, including ageing infrastructure, water quality concerns, supply and demand unpredictability, natural catastrophes, environmental emergencies, and cyber and terrorist attacks (Klise, Murray & Haxton, 2018:1). All of these threats have the potential to shut down a significant percentage of a water system, inflicting crucial infrastructure damage, endangering human health, and disrupting customer service (Klise *et al.,* 2018:1). Due to this growing list of concerns, the Water Network Tool for Resilience (WNTR) application was developed. WNTR is a software application used to simulate and analyse the resilience of water distribution networks. The application was developed by The United States Environmental Protection Agency (EPA) in partnership with Sandia National Laboratories (SNL).

WNTR is a computer-based application; dedicated software is required to run the programme. One of these programmes is Python. Python is a programming language used to write clear, logical code for both small- and large-scale projects.

According to Klise *et al.* (2018:2), WNTR was developed to expand on the Environmental Protection Agency Network (EPANET) capabilities by incorporating a broader set of hydraulic and water quality scenarios that are crucial to consider when simulating disruptive occurrences and recovery operations. The WNTR application makes use of both demand-driven and pressure-dependent demands. Furthermore, Klise *et al.* (2018:2) state that pressure-dependent demand simulations help users better comprehend network interruptions that isolate parts of the network or limit the network's capacity to provide water to consumers. The WNTR application also allows the user to simulate damage states of both a whole water distribution system and individual components (e.g. pipes, pumps, tanks). This feature enables users to create stochastic disaster scenarios by assigning a damage probability to each element, response and repair techniques, such as repair time and personnel availability can also be given a likelihood (Klise *et al.,* 2018:3). The capabilities of WNTR include:

- generate and modify water network structure and operations;
- simulate disaster scenarios;
- model response and repair strategies;
- simulate pressure-dependent demand and demand-driven hydraulics;
- simulate water quality;
- calculate resilience metrics and;

- visualise results (Klise *et al.,* 2018:1).

The WNTR application thus minimises the overall damage to water distribution systems.

3.5.2 United Nations SDGs 6, 11 & 12: Clean water and sanitation, including safe and resilient cities

A common roadmap for peace and prosperity for people and the planet, both now and in the future, is provided by the 2030 Agenda for Sustainable Development, which was accepted by all United Nations Member States in 2015 (UN, 2024). The 17 Sustainable Development Goals (SDGs), which represent an urgent call to action for all nations in a global partnership, are at the centre of it. They recognise that eradicating poverty and other forms of deprivation requires concerted efforts to combat climate change, protect our seas and forests, enhance health and education, lower inequality and promote economic growth (UN, 2024). The SDGs are noted in Figure



Figure 3.1: UN SDGs (UN, 2024)

Amongst the above-mentioned, SDG 6, clean water and sanitation, and SDG 11, sustainable cities and communities, are particularly relevant in the fight against water scarcity. These goals envision a future in which every human on the planet has sufficient access to water resources and cities are developed in a manner which is sustainable and environmentally friendly (not strenuous on water resources).

SDG 6 ensures the availability and sustainable management of water and sanitation for all (UN, 2024). Target 6.1 aims to achieve universal and equitable access to safe and affordable drinking water for all (UN, 2024). Target 6.3 aims to improve water quality by reducing pollution, eliminating dumping and minimizing the release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally (UN, 2024). Target 6.4 aims to substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity (UN, 2024). Target 6.5 aims to implement integrated water resources management at all levels, including through transboundary cooperation as appropriate (UN, 2024). Target 6(a) aims to expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies (UN, 2024). Target 6(b) aims to support and strengthen the participation of local communities in improving water and sanitation management (UN, 2024).

SDG 11 aims to make cities and human settlements inclusive, safe, resilient, and sustainable (UN, 2024). Target 11.1 aims to ensure access for all to adequate, secure and affordable housing and essential services and upgrade slums (UN, 2024). Target 11.3 aims to enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries (UN, 2024). Target 11.5 aims to significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to the global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations (UN, 2024). Target 11.6 aims to reduce the adverse per capita environmental impact of cities by paying special attention to air quality and municipal and other waste management (UN, 2024). Target 11(a) aims to Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning (UN, 2024). Target 11(b) aims to substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels (UN,

2024). Target 11(c) aims to support least developed countries through financial and technical assistance in building sustainable and resilient buildings utilizing local materials (UN, 2024).

The above SDGs are essential and should be considered when drafting an improvement plan for water services management in SPLM.

3.6 SOUTH AFRICAN PERSPECTIVE ON RESILIENCE

The South African perspective on resilience involves the views of the Rockefeller Foundation's 100 Resilient Cities, the *Batho Pele* principles, and the Blue- and Green Drop Certifications. This is subsequently discussed.

3.6.1 Rockefeller Foundation's 100 Resilient Cities

Although there are various programmes to integrate more resilient systems, i.e. Rockefeller Foundation's 100 Resilient Cities (100RC) and the *Batho Pele* principles, more can be done to improve the resilience of systems in South African cities and towns. The 100RC initiative of the Rockefeller Foundation intends to assist cities throughout the globe in becoming more resilient to the physical, social, and economic difficulties that are a growing part of the 21st century (Sutherland *et al.,* 2019:35). Durban was one of 10 African cities that have participated in 100RC. According to Sutherland *et al.* (2019:35), the initiative takes a resilience strategy that considers both acute shocks, such as earthquakes and floods, and chronic pressures, such as high unemployment, inadequate public transportation, and chronic food and water shortages. At its core, all resilient programmes and the development and maintenance of resilient systems aim to improve service delivery and society's quality of life.

3.6.2 The *Batho Pele* principles

The *Batho Pele* principles were not intended to improve systems' resilience; however, these principles focused on improving service delivery to citizens of South Africa in general. By following these principles, public servants would ensure that citizens receive quality service delivery. Water infrastructure must be maintained and improved to deliver

effective and efficient water service. The *Batho Pele* principles thus indirectly support the move towards more resilient water infrastructure systems.

There are eight *Batho Pele* principles. These principles are consultation, service standards, access, courtesy, information, openness and transparency, redress, and value for money:

- Consultation: citizens should be consulted on the quantity and quality of public service they receive and given a choice over the services supplied.
- Service standards: citizens should be aware of the expected level of service.
- Access: all citizens should be able to use the services they are entitled to on an equitable basis.
- Courtesy: citizens should be treated with respect and consideration.
- Information: citizens should be provided with complete and accurate information on the public services to which they are entitled.
- Openness and transparency: citizens should have access to information on how departments are operated, how resources are spent, and who is in charge of services.
- Redress: citizens should be offered an apology, a thorough explanation, and a prompt and effective remedy if the stated standard of services is not met, and citizens should receive a compassionate and positive response when they file complaints.
- Value-for-money: Public services should be economical and practical to give citizens the best possible value for money (Kariuki & Reddy, 2019:102).

Citizens and other clients should provide continuous feedback to municipalities to uncover service shortcomings and address these as soon as possible (Kariuki & Reddy, 2019:102). The *Batho Pele* principles aim to improve service delivery by focusing on the needs of citizens. They also aim to address shortcomings through customer feedback and surveys. SPLM should create an opportunity for employees in which the *Batho Pele* principles are reiterated to reignite the behaviour and flame of public servants.

3.6.3 The Blue Drop Certification programme

South Africa have introduced legislation and policies governing water supply and sanitation services since the advent of democracy in 1994, which was done to ensure

equitable access to water resources and water supply. The change in government came with its own challenges, such as the capacity of local government to provide water services efficiently (Nealer & Mtsweni, 2013:38). The DWAF launched the Blue Drop Certification Program in 2008 to preserve and enhance the Republic of South Africa's drinking water quality. The Programme entails an obligatory annual evaluation of the administration and provision of potable water supply services by water services authorities (WSAs) within their respective geographical areas of operations (Nealer & Mtsweni, 2013:38). A municipality will receive the Blue Drop Certificate in the instance that its water quality gets a score of 95% and above based on set criteria, serving as a sign that the drinking water quality in that particular municipal area is of good quality and can be consumed and used confidently (Nealer & Mtsweni, 2013:46).

Nealer and Mtsweni (2013:43) state that the Blue Drop Certification encountered challenges such as inadequate human resources, insufficient funding for drinking water quality management, lack of knowledge of drinking water requirements and inadequate access to credible laboratories. Nealer and Mtsweni (2013:44) state that these challenges can be overcome with full support and commitment from all relevant stakeholders responsible for water service delivery. The commitment also involves ensuring that water works employees have the appropriate training and skills to manage and operate water supply systems and full transparency regarding the management of drinking water by means of reliable information (Nealer & Mtsweni, 2013:44).

The Blue Drop watch report states that throughout the drinking water value chain, which includes abstraction, treatment, delivery, distribution, and end use, the Blue Drop program aims to modify the behaviour of individuals and organisations to promote best practice management adoption and continuous improvement. Consequently, regress and sub-par performance are penalised, while progressive improvement and outstanding performance are acknowledged and rewarded (DWS, 2023:1).

A municipality can receive the Blue Drop certification after completing a Technical Site Assessment (TSA) and receiving an overall score of 95% or above. The TSA score indicates the functionality and status of the water network and treatment system that has been inspected and assessed. These inspections consider the following:

- General aspects, housekeeping, and the physical appearance of the plant terrain and buildings.
- Raw water handling pump stations, pipe network, inlet works and flow splitting.

- Chemical dosing and storage.
- Functionality and condition of the respective process units – flocculation, phase separation (clarification/settling, dissolved air flotation, sand filtration, membrane filtration, granular activated carbon), and disinfection.
- Sludge treatment and disposal;
- Functionality and condition of high lift pump stations, bulk pipe network from plant to command reservoirs and booster pump stations (DWS, 2023:3).

Inspections of 151 water supply systems were carried out between December 2022 and February 2023, providing a general overview of systems owned and run by municipalities, water boards, and water service providers. All 140 municipalities, along with 27 water boards and bulk water service companies, were included in the assessments (DWS, 2023:8). According to the Blue Drop Watch Report 2023 (2023:10), 128 systems were observed to be in a functional/good state based on TSA. Out of the 128 observed systems, eight systems (6%) were in excellent condition, 46 systems (36%) were in good condition, and 74 (58%) were in average condition (DWS, 2023:10). The remaining systems, 23/151, were observed to be in a dysfunctional/critical state based on TSA. Out of the 23 observed systems, 18 systems (78%) were in poor condition, and five systems (22%) were in a critical state (DWS, 2023:12).

According to the Blue Drop Watch Report 2023 (2023:16), the DWS stated that *they "note concerns with the overall poor water quality that is produced and distributed to the consumer. A balanced view is also taken on the technical assessment results, showing systems ranging from excellent to critical. The Blue Drop Watch will inform appropriate regulatory authorities and provide support to facilitate the correction, restoration, and improvement of water services to consumers. The report further serves to inform stakeholders and government departments about the current status of drinking water infrastructure in the field, intending to mobilise interventions without having to wait for the release of the Blue Drop audit report. The Blue Drop Watch results stress the importance of drinking water supply and quality as a primary focus area of government."*

3.6.4 The Green Drop Certification Programme

The Green Drop regulation program was started to identify and strengthen the essential capabilities that, if strengthened, would progressively and sustainably raise the bar for wastewater management in South Africa (DWS, 2023:1). Every Green Drop audit cycle

is built around a set of audit criteria that are more stringent than the requirements of the previous cycle, through the adoption of the PDCA (Planning, Doing, Checking, and Acting) concept of continuous improvement through standardisation (DWS, 2023:1). This ensures a positive push for betterment and improvement in wastewater management by the DWS. Additionally, the Green Drop Watch Report 2023 (2023:1) states that the audit process offers a "consultative audit process" that enables those in charge of wastewater management to deliver per the established criteria by transferring skills. It's a transparent procedure with well-defined standards designed to safeguard the nation's water supplies while shielding customers from potentially dangerous and unsustainable services (DWS, 2023:1). According to the DWS (2023:1), the ultimate goal of the Green Drop is to inspire a path that brings about sustainable and compliant wastewater services through competent people, disciplined thought, and collective action, which can be measured and reported to South African citizens every year.

In compliance with the Green Drop audit criteria, 850 wastewater systems from 144 municipalities were evaluated in 2021–2022. According to the Green Drop Report 2022, 334 (or 39%) of the municipal wastewater systems were found to be in a serious condition that called for immediate attention and restoration (DWS, 2023:3). The national Cumulative Risk Ratio for treatment plants regressed from 65.4% in medium risk locations (in 2021) to 70.1% of plants in high-risk positions (in 2023), according to diagnostic analysis (DWS, 2023:3). The most significant hazards were identified at the treatment level and included over-capacity works, equipment and process malfunctions (particularly concerning disinfection), a deficiency in flow monitoring, and non-compliance with sludge and effluent regulations (DWS, 2023:3).

The Green Drop Watch Report 2023 also provides an overview of the support supplied to improve the municipal status quo and reads as follows:

- To make sure council members are appropriately and consistently developed to fulfil their roles, the 2021–2026 Councillor Development Strategy (CDS) was created. Water and Sanitation Councillor Inductions took place in all nine provinces to start the CDS. During these inductions, Councillors were briefed about the Green Drop programme and their responsibilities for enhancing the performance of their own communities moving forward.
- Through the South African Local Government Association (SALGA), the Green Drop results and the Support Programme have been presented to Councillors

through the SALGA political engagement structures at a provincial level (Provincial Working Group) and at a national level (National Working Group).

- Direct support has been provided to poorly performing municipalities by Cooperative Governance and Traditional Affairs (CoGTA), the Municipal Infrastructure Support Agent (MISA), SALGA and DWS through Green Drop Corrective Action Plan workshops. Where draft corrective action plans are developed, municipalities are engaged one-on-one to finalise the plans for signature by the respective Accounting Officers. These workshops have also reinforced municipal officials' understanding of the Green Drop programme.
- MISA and SALGA have urged municipalities to use the 10% of the Municipal Infrastructure Grant (MIG) designated for municipalities to resolve DWS non-compliance notices to finance the remedial action plans. By taking this measure, municipalities could improve their overall MIG expenditure while obtaining the necessary financing to solve some issues.
- The Department has established the National Water Partnerships Office (NWPO) in collaboration with the Development Bank of Southern Africa (DBSA) and SALGA, acknowledging the part underinvestment has played in the current unfavourable situation of municipal wastewater systems. Increased private sector investment in municipal initiatives related to WWTWs is the goal of one of the sub-programs within the NWPO that is focused on Wastewater Treatment Works (WWTWs).
- In addition to creating and carrying out Corrective Action Plans, provinces have put up specialised support initiatives to help municipalities make improvements in the near to medium term. These specifics depend on the demands of the Provinces and corresponding municipalities (DWS, 2023:7-8).

Upon release of the Green Drop Report 2022, the then Minister for Water and Sanitation, Mr Senzo Mchunu, said:

> *It is of great concern that there are so many systems with scores below 31%, indicating a dismal state of wastewater management, posing a risk to both environment and public health. I am therefore making the call … to use this report as the turning point towards sustainable improvement. I need to make it clear that action will be taken against those municipalities that flagrantly put the lives of our people and environment at risk. We will use this report as the baseline for the Water Services Improvement Programme (10-point*

plan) from where we will measure the sustainable turn-around which we aspire to." (DWS, 2023:1).

In its concluding remarks regarding the Green Drop Watch Report 2023, the DWS (2023:8) states that to guarantee community safety and the preservation of natural resources, the regulator will keep an eye on the state of these wastewater systems and may take appropriate enforcement action, pay for remediation work done by the non-complying municipality, or take more drastic measures. To help municipalities through the creation of a Green Drop Support Plan that comprises specific support actions, as detailed in the report, the Department is additionally scaling up its cooperation with pertinent sector partners (SALGA, CoGTA, and MISA) (DWS, 2023:8). To expedite observable and quantifiable improvements in wastewater management; the Department is also working to strengthen its internal ability to be proactive and better equipped to fulfil its statutory and mandated duties (DWS, 2023:8).

The above sections discussed resilience as well as related concepts. This next section discusses whether SPLM water distribution system is resilient enough to consistently provide water to Kimberley residents in the Northern Cape Province.

3.7 AN EVALUATION OF THE RESILIENCE OF WATER SERVICES BY THE SOL PLAATJE LOCAL MUNICIPALITY

As stated in Chapter 1 (cf. 1.3), Kimberley's residents are unsatisfied with the quality of water services they receive from SPLM. The water cuts in Kimberley have had a negative impact not only on citizens but on businesses as well. According to Masuabi (2019), water shortages have wreaked havoc among Kimberley businesses, with some owners threatening to sue SPLM. It is alleged by some business owners that they have lost considerable income per day, due to water cuts (Masuabi, 2019). This dilemma has also jeopardised the sustainable security of businesses; for example, insurance companies have begun contacting Kimberley business owners, warning them of the dire consequences of continued water cuts and shortages (Masuabi, 2019). Sharon Steyn, the chief executive officer of the Northern Cape Chamber of Commerce and Industry, alluded that insurance companies could, for example, not pay if a fire breaks out in any of these businesses, and it was advised that businesses should install fire detectors worth R90 000 (Masuabi, 2019). Water cuts also brought about financial instability among citizens as they had to purchase purified water from different supermarkets for drinking

purposes. The Kimberley Business Chamber also stressed that water was not fit for human consumption in some instances. It was discoloured (Masuabi, 2019). SPLM, however, responded to businesses and residents that the water cuts and discolouring of the water were due to infrastructure upgrades that were predicted to last not more than two days. Since 2020, the municipality has begun maintaining its water infrastructure, and people in Kimberley have resorted to social media to share photos of the murky water running from their taps (Masuabi, 2019).

The Kimberley water crisis has attracted much attention as residents grew more frustrated with SPLM. The matter received the attention of the South African Human Rights Commission (SAHRC), promising to probe the issue for further investigation.

The SAHRC provincial manager, Ms Chantelle Williams, stated that the complaints of Kimberley residents dated back to April 2020 and were all related to the issue of water service delivery, including water shortages (Hoo, 2021). According to McCain (2021), the SAHRC was very concerned about the impact of water shortages on residents, particularly elderly people, people with disabilities, health care facilities, women and children. The SAHRC has, therefore, requested reasons for the water shortages and a contingency plan on how they seek to handle these issues (McCain, 2021).

After filing a complaint with the SAHRC on behalf of residents of SPLM, human rights activist Katlego Chibamba indicated he was willing to take the case to the Constitutional Court if necessary (Hoo, 2021). Chibamba, according to Hoo (2021), was quoted as saying, "*There has been a massive outcry from the community regarding the sewage, water and refuse complaints*". Chibamba also believed that SPLM manager and the executive mayor should face criminal charges if the situation did not improve drastically. There were also demands made that the water pipes and systems be renewed or replaced and that qualified residents should take over hiring service providers and procuring required materials, including taking over the municipal sewage works (Hoo, 2021). The complaints to the SAHRC included many social media groups formed on WhatsApp, Facebook, and Telegram, estimating that up to 10,000 residents in these groups were affected by poor service delivery (Hoo, 2021).

The water cuts/shortages were not the only cause of frustration for residents; public health was also affected. There were allegations by the activist Chibamba (2021) that the city's poor water quality contributed to the death of an infant. The infant had contracted

gastroenteritis, and there was also a growing fear of a cholera outbreak within SPLM boundaries (Hoo, 2021).

In the face of a global pandemic (COVID-19) where water is an absolute necessity, a dependable water source was crucial, and the residents of Kimberley were fully aware of this fact. Due to regular water cuts enforced by the municipality and the provision of low-quality water, COVID-19 protocols regarding hand washing could not be followed (Chibamba, 2021, cited by Hoo, 2021).

The discussion above was compiled from newspaper articles, including social media, emphasising the quality of water services provided by SPLM. A resilience timeline was drawn up for this study to solve the water-related problems within SPLM. This information is presented below and extracted from *Kimberley City Info.*

3.7.1 Resilience timeline of the Sol Plaatje Local Municipality

The timeline focused on the period from 01 September 2021 until 15 October 2021. During this period, the following action was undertaken by SPLM to attend to issues of water services delivery:

- 01 September: SPLM stated that emergency repairs were being made to a pipe leak in Reservoir Road, New Park. The water supply was temporarily switched off at the Newton Reservoir.
- 02 September: the Department of Waterworks switched off the water supply from Newton Reservoir; repairs were made to a pipe opposite Robert Sobukwe Hospital, and the water supply was off for approximately three hours, although longer than stipulated.
- 07 September: parts of Kimberley were experiencing little to no water pressure, repairs were being made to a pipe burst in New Park and Newton Reservoir was switched off.
- 16 September: parts of Kimberley were experiencing little to no water pressure due to a water issue/pipe burst in the following areas affecting water supply: De Beers (location of a pipe burst known), Roodepan (location of a pipe burst unknown), New Park (location of a pipe burst unknown). The time of restoration of the water supply was unknown.

- 08 October: Parts of Kimberley were experiencing little to no water pressure due to a massive pipe burst being repaired on Halkett Road, and the Newton Reservoir was switched off to facilitate repairs. The time of restoration of the water supply was unknown.
- 09 October: A pipe burst in Gemsbok Street, Verwoerd Park, affected the water supply in the area, and little to no water pressure was reported. The time of restoration of the water supply was unknown.
- 15 October: SPLM was repairing a burst pipe in Oliver Road, causing some areas to experience low water pressure. SPLM stated that the repairs would take several hours, and water pressure would gradually return to normal. The time of restoration of water supply was unknown (Kimberley City Info, 2024).

As of January 2022, the following reports of water disruptions within Kimberley were recorded on the following dates:

- 27 January: Water supply was interrupted due to a pipe burst;
- 11 February: Water supply was interrupted due to repairs being performed on Newton Reservoir;
- 16 February: Residents in Hadison Park reported little to no water pressure due to a suspected pipe burst; residents were unsure if SPLM were indeed attending to the matter;
- 22 February: Newton Reservoir was shut down due to a massive pipe burst, and many areas experienced low water pressure to no water supply;
- 24 February: Water supply was temporarily switched off due to repairs being performed;
- 25 February: Newton Reservoir was switched off due to repairs being performed;
- 09 March: A pipe burst at the centre of Sinovich and Rhodes Avenue, which caused residents in nearby areas to experience little to no water pressure;
- 16 March: Due to a massive pipe burst and repairs being performed, residents in Memorial Road and Klisserville experienced low water pressure to no water supply;
- 03 April: Water supply from Newton Reservoir was interrupted due to repairs being performed;

- 22 April: The water supply at Newton Reservoir was switched off, and residents experienced little to no water pressure. Water supply was resorted to later that night;
- 30 April: Water supply from Newton Reservoir was interrupted due to repairs; water was restored later that day

(Kimberley City Info, 2024).

As of June/July 2022, residents have experienced temporary water interruptions on multiple occasions on the following dates:

- 21 June: Temporary water interruption at Newton Reservoir.
- 13 July: Temporary water interruption at Newton Reservoir.
- 21 July: Temporary water interruption at Newton Reservoir.
- 27 July: Temporary water interruption at Newton Reservoir.
- 11 August: Temporary water interruption at Newton Reservoir.
- 13 August: Temporary water interruption at Newton Reservoir.
- 16 August: Temporary water interruption in the Roodepan area.
- 26 August: Temporary water interruption at Newton Reservoir.
- 28 August: Temporary water interruption at Newton Reservoir.
- 05 September: Temporary water interruption at Newton Reservoir.
- 10 September: Temporary water interruption at Newton Reservoir.
- A temporary water interruption was scheduled from 06 October to 10 October 2022.

During 2023, approximately 39 water disruptions were recorded on the Kimberley city portal. These water disruptions occurred for various reasons. These include water being switched off to allow time for maintenance, pipe bursts, and low-pressure levels at reservoirs (Kimberley City Info, 2024).

As of 2024, more than ten water disruptions were recorded on the Kimberley city portal. These water disruptions occurred for various reasons. These include water being switched off to allow time for maintenance, pipe bursts, and low-pressure levels at reservoirs. According to the Kimberley City Portal, temporary water interruptions were planned for all areas from 04-08 April 2024. After that, on 19 April 2024, the Kimberley City Portal stated that due to a pipe burst and repairs to follow, Verwoerd Park and Diamant Park had their water supply affected (Kimberley City Info, 2024).

The timeline above indicates that the main reasons for water shortages within SPLM were burst pipes and ageing water infrastructure requiring urgent repairs. The researcher could deduce from the timeline that the water infrastructure was dated, not maintained regularly, and not up to standard. Therefore, SPLM could not deliver satisfactory service to residents within its boundaries. Observing the Kimberley City Portal shows that although numerous water disruptions have been recorded, different ward councillors remain in contact with their ward members and assure them that SPLM is actively engaging in maintenance and investigations when and where these disruptions are recorded. Therefore, SPLM must prioritise maintenance to ensure long-term water supply to residents.

As alluded to earlier in this chapter, resilience requires a water system to function normally after a disturbance. A succinct overview of public planning is therefore provided next.

3.8 PLANNING AS CORE PUBLIC ADMINISTRATION FUNCTION

Traditionally, the study of public administration concerned the administrative activities required to govern and the administrative requirements that affect governmental policies. Thornhill (2014:4) defines public administration as the activities performed by public officials in supervisory posts when they contribute to policymaking, coordinate the functions, are involved in human resource issues, determine work procedures and excise control within the section, decorate or branch they are responsible for.

3.8.1 Conceptualising Public Administration

Most historical human achievements were likely made possible by public administration, as it is known today. Organisation and management practices in collective or public settings are as old as civilization. Significant changes in those practices tend to accompany historical shifts in mass-scale social organisation and operation (Frederickson, Smith, Larimer & Licari, 2018:1). Goodsell (2006:624) argues that the focus of the state's perception of public administration is on matters about proprietary. The author (2006:624) continues by stating that administration is considered the tool of the executive authority, serving its direct objectives. From the civil society perspective, public administration should promote public participation and protect those who have

been previously or are currently disadvantaged (Goodsell, 2006:626). This should create equity, equality, and economic growth (Goodsell, 2006:627). Coates (2024:6) defines public administration in its political, legal, managerial, and occupational dimensions.

- Political: Public administration is what the government does within its political environment. Public administration is about the implantation of public interest; additionally, it is about achieving goals as a collective that cannot be attained by a single individual (Coates, 2024:6).
- Legal: Public administration is law in action in the form of constitutional law, legal statutes, regulations, ordinances, codes, etc. (Coates, 2024:6).
- Managerial: The executive nature of public administration enables the public to be translated into action by the individuals responsible for running the bureaucracy (Coates, 2024:6).
- Occupational: Public administration includes many occupational fields such as economics, engineering, social welfare, etc. It is within the framework of each of these fields that public administrators transform political, legal, and managerial aspects of public administration into the work of government (Coates, 2024:6).

The University of Pittsburgh (2024) continues to expand on the vastness of public administration by stating that the discipline's students explore the intersections of politics, economics, and social welfare, aiding in the development of communities. The University of Pittsburgh (2024) continues and states that those who venture into this field can find themselves employed as public administrators who oversee the day-to-day activities of government departments, ensuring efficient delivery of public services or as a policy analyst charged with evaluating and developing policies to address societal issues, working in government departments, think tanks, or advocacy organisation. This also includes but is not limited to municipal managers, human resource specialists, budget analysts, and urban planners (University of Pittsburgh, 2024). At its core, public administration is the art and science of managing public programmes and policies, ensuring their effective execution for the benefit of society. According to Dahl (1947:573), in the science of administration, whether public or private, the basic “good” is efficiency. Completing the task at hand with the least amount of labour and material used is the primary goal of the science of public administration (Dahl, 1947:573).

The belief that public administration should be as effective and efficient as possible is also grounded in South African legislation such as the Public Administration and

Management Act No. 11 of 2014. This belief is expressed through the objectives of the Act found in Chapter 1, which state said objectives are to (c) promote a high standard of professional ethics in the public administration, (e) promote efficient service delivery in the public administration, and (f) facilitate the eradication and prevention of unethical practices in public administration (DPSA, 2014:10). This belief is expressed further in Chapter 2 of this Act which provides the basic values and principles governing public administration, these are to: (a) promote and maintain a high standard of professional ethics; (b) promote efficient, economic and effective use of resources; and (h) ensure good human resource management and career development practices to maximise human potential (DPSA, 2014:10-11).

The primary objective of this diverse field is the advancement of management methods and policies for the government to function effectively. Thapa (2020:2) contends that public administration is centrally concerned with the organisation of government policies and programmes and the behaviour of officials (usually non-elect) formally responsible for their conduct. Thapa (2020:2) continues by stating that public administrators include a wide range of non-elect public servants, such as cabinet secretaries, human resource directors, municipal budget directors, city managers, census managers, state mental health directors, and heads of county, regional, state, and federal departments. Governmental administrators are employees of the government who serve in all tiers of governmental departments and agencies (Thapa, 2020:2). Talin (2024) identified the following seven fundamental roles of government:

- Provision of public goods: goods and services that are non-excludable and non-rival. This means there are no trade-offs if more people use them or you cannot prevent someone from using them—for example, police services.
- Managing externalities: Both positive (healthcare) and negative (overfishing) externalities exist, and positive externalities are typically overseen by heavily regulated public/private businesses or state-owned businesses. Laws, regulations, and the establishment of standards usually reduce the majority of negative externalities.
- Government spending: governments can spearhead investments into particular sectors or investments.
- Income distribution continues to be one of the most important and pressing political issues; in addition to guaranteeing minimum wages and increasing equality, it

entails regulating markets and ensuring earnings are allocated as somewhat as feasible.

- Federal budget: Governments have the important function of controlling revenue and expenditure and managing any deficits that may occur. Taxes and fees are typically used to raise revenue, which is used to finance administrative expenses, public defence, social security, and education.
- Taxation: establishing the tax system and its effects on the economy, social equality, and other aspects such as competitiveness are crucial tasks for the government.
- Social security: pension and disability insurance are the two most fundamental pillars of social security for most governments worldwide.

In South Africa, *the Constitution (1996) sets the rules that* determine the scope and functioning of the government. The South African government consists of the National, Provincial, and Local governments. The government is responsible for enacting laws and policies about citizen rights and responsibilities and providing public services (ETU, 2024). Through tax collection, the government generates revenue, which is then used to fund infrastructure and services to enhance the quality of life for all citizens, focusing on disadvantaged groups (ETU, 2024). The website of the Parliament of the Republic of South Africa (2024) states that Parliament plays a direct and active role in national affairs. It is within Parliament where its members (MPs) look after the interests of their citizens; they also perform functions such as making laws intended to improve the lives of citizens, discussing political issues, representing the views of citizens, assisting citizens with their constituencies; perform budgetary functions; and holding the government at large accountable (Parliament of the Republic of South Africa, 2024).

The importance of planning is well emphasised in the work of several prominent scholars such as Henri Fayol, Luther Gulick, and Lyndall Urwick. Within South Africa, the National Development Plan 2030 is seen as the blueprint to usher in a fully developed South Africa. The subsequent section will examine the importance of various forms of planning as an activity of public administration within multiple spheres of government.

3.8.2 Planning

Taxmann (2024) defines planning as setting objectives, outlining a course of action, and allocating the resources and labour required to complete said objectives. It entails

planning for possible obstacles or opportunities, deciding the best course of action, and projecting future requirements and conditions (Taxmann, 2024). Hall and Tewdwr-Jones (2020:3) share a similar view and define planning as a general activity involving making an orderly sequence of actions that will lead to achieving a stated goal or goals. The primary methods of planning have historically been written declarations, possibly with a medium-to-long-term perspective, that are complemented as needed by statistical projections, trend analysis, visual aids, quantitative assessments, and diagrams showing the connection between the plan's various components (Hall & Tewdwr-Jones, 2020:3). Planning, as defined by Banfield (1959:139), is the process by which an actor or actors select a course of action referred to as a set of means, for the attainment of their ends. Banfield (1959:139) states that planning can be considered "good" if the selected course of action is likely to attain desired means or maximise the likelihood of attainment.

For Byju (2024), planning is essential as it provides direction, mitigates any possible risks, decreases overlapping and wasteful activities, encourages innovative ideas, and aids in overall decision-making. Mindmesh (2024) agrees and states that planning is a detailed project plan which outlines all steps required to achieve project plans while identifying possible risks or challenges and developing strategies to manage them. Planning is a strategic framework for the improved functioning of government, a business or an organisation or a contingency plan in an unforeseen emergency (Williams & Hartzell, 2023). Williams and Hartzell (2023) also warn that businesses and organisations, including the government, that do not plan may face serious consequences.

According to the American Planning Association (2024), planning is elected leaders' most effective tool for managing growth, navigating change, and making tough decisions facing communities, like where to invest in transportation, housing, and parks. By making leaders define their goals, rational planning creates a framework for resource allocation that serves the organisation's objectives (Boyne & Gould-Williams, 2003:116). Additionally, all employees can be informed of the goals, allowing them to direct their efforts properly (Boyne & Gould-Williams, 2003:116). Furthermore, planning allows both internal and external changes to be identified and brought into alignment. It enables choices between multiple approaches based on extensive information rather than irrationally based on hypotheses or assumptions (Boyne & Gould-Williams, 2003:117).

The following section will define and discuss strategic planning and its importance within businesses and organisations.

3.8.3 Strategic Planning

Strategic planning aids in the precise definition of a business or organisation's long-term goals and illustrates how current efforts and goals will contribute to their accomplishments (Martins, 2024). The author explains that if goals and objectives are the destination on a map, the strategic plan can be considered the navigation system (Martins, 2024). Hanna, Bigelow, and Pratt (2024) clarify that strategic planning is forward-looking and differs from traditional business planning, which usually concentrates on short-term, tactical objectives, like allocating funds. For Gartner (2024), strategic planning is the actions and investments needed to accomplish long-term strategic objectives as it bridges the gap from overall direction to specific projects and day-to-day actions that will ultimately lead to goals and objectives being completed and achieved. According to the CFI Team (2024), strategic planning is an "art" that involves developing targeted business plans, executing them, and assessing the outcomes in light of the company's overarching long-term objectives. This notion centres on integrating multiple departments, including finance, marketing, and human resources, inside an organization to achieve its strategic objectives (CFI Team, 2024).

Glaister and Falshaw (1999:108) contend that using the word "formal strategic planning" indicates that an organisation's strategic planning process entails clear, methodical steps taken to increase the involvement and commitment of the main stakeholders whom the plan will impact. An effective strategic planning system links long-term strategic goals with short-term and operational plans (Glaister & Falshaw, 1999:108). Glaister and Falshaw (1999:108) continue to state that those participating in strategic planning include gathering information, forecasting, modelling, and constructing alternative future scenarios. Furthermore, through strategic planning, organisations prepare for environmental instability and direct resource allocation appropriately (Rudd, Greenley, Beatson & Lings, 2007:100). Being flexible allows for the generation and consideration of different choice possibilities that can be used as and when specific environmental opportunities or risks present themselves (Rudd e*t al.,* 2007:100). Organisations can adapt rapidly through the exploitation of the alternative options generated in their strategic plans, giving a potentially valuable route to superior performance (Rudd e*t al.,* 2007:100).

According to Benzaghta, Elwalda, Mousa, Erkan, and Rahman (2021:55), strategic planning can also be explained through the acronym S(strengths), W(weaknesses),

O(opportunities), and T(threats). The four components, referred to as the SWOT analysis, are carried out by organisations at a strategic planning stage in which attempts are made to identify and examine existing resources, both internally and externally, and investigate trends and patterns that may have a positive or negative impact on the organisation (Namugenyi, Nimmagadda & Reiners, 2019:1145). Leaders would thus utilise SWOT analysis when strategic planning takes place as it helps them identify components which should be highly considered within organisational plans. Strategic planning is also important and useful.

Strategic planning gained momentum with the development of New Public Management (NPM) and managerial reforms that promoted private-sector management practices in public organisations (George, Walker & Monster, 2019:811). This was due to the belief that by adopting strategic planning, the functioning of public organisations would significantly improve, similar to how it helped private organisations perform better (George *et al.*, 2019:811). For Bryson, Edwards, and Slyke (2018:317), strategic planning is a "deliberative, disciplined effort in developing decisions and actions that shape and guide what an organisation is, what it does, and why". The following features are typically used by public administration and planning scholars to characterise public-sector planning as strategic (Bryson *et al.,* 2018:320):

- When designing the strategic planning approach, close attention is paid to the particulars of context, including the decision-making context.
- Carefully consider purposes, goals, and situational requirements (e.g., political, legal, administrative, ethical, and environmental).
- An initial focus on a broad agenda and later moving to a more selective action orientation.
- Emphasis on systems thinking refers to working to understand the dynamics of the overall system being planned for as it functions– or ideally should function– across space and time, including the interrelationships among constituent sub-systems.
- Careful attention to stakeholders, including elected, appointed, and career officials. Multiple levels of government and various sectors are typically explicitly or implicitly involved in strategy formulation and implementation.
- A focus on strengths, weaknesses, opportunities and threats, and competitive and collaborative capabilities and advantages.
- A focus on the future and how different strategies might influence it.

- Careful attention to implementation challenges as strategies are formulated. A strategy that cannot be operationalised effectively to fit the implementation context is hardly strategic.

The subsequent section will define and discuss public planning.

3.8.4 Public planning

Planners have a crucial role in the design and development of public places. They do so in two different ways (Carmona, 2019:48). First and foremost, planners frequently start public space initiatives by identifying the need and opportunity for newly constructed or renovated public places in specific areas under the direction of the area- or site-based plans, briefs and frameworks, or support (Carmona, 2019:48). The second, according to Carmona (2019:48) is that planners are the guardians of how public spaces come into being through the regulatory processes of development management (granting or denying permission to develop). The author states that both are critical roles in ensuring that the public interest is fully served by public spaces (Carmona, 2019:48). For Sailus (2024), public planning, also referred to as urban planning, is the art and science of shaping the future of our cities and towns and include numerous city-life elements such as new and pre-existing land, buildings, roads, communal spaces, transportation, economic development, infrastructure, and the environment, among others. Due to their wide area of operations, urban planners have many responsibilities, some of which include: 1.) envisioning the future of cities while taking into account factors like population growth and economic development; 2.) designing the physical layout of cities; 3.) address challenges like housing and traffic congestions and; 4.) engage with residents, businesses, and stakeholders to ensure that urban planning decisions reflect the needs and aspirations of the community (Sailus, 2024).

A formal master plan for a city or metropolitan area, a residential area plan, a project plan, or a list of policy alternatives are examples of the outcomes of the planning process (Fainstein, 2024). Fainstein (2024) contends that a plan takes political intelligence and entrepreneurial spirit from planners and sponsors to be successfully implemented. When new plans are developed, Altshuler (1965:3) asserts that these plans should be comprehensive and include all relevant physical elements of the urban environment, be related to regional development trends, and recognise and take into account important social and economic factors. Furthermore, the plan should address urban needs; the

preparation of general physical plans for land use and the provision of public facilities, with long-range fiscal plans to accompany the long-range development plans; coordination of all related plans of the departments and subdivisions of the government concerned; intergovernmental coordination of planning activities; and the preparation of supporting regulatory and administrative measure (Altshuler, 1965:5). It is evident that urban planners have an essential role when designing cities or improving specified areas in a town. For the Association of Collegiate Schools of Planning (2014:2-3), urban and regional planners apply their expertise to assist communities dealing with issues related to social, economic, environmental, and cultural aspects by a) developing ways to preserve and enhance their quality of life; b) finding methods to protect the natural and built environment; c) identifying policies to promote equity and equality; d) structuring programmes to improve services to disadvantaged communities; and e) determining methods to deal effectively with growth and development of all kinds.

The following section defines planning concerning water resources.

3.8.5 Water resource planning

The inability of water resource systems to satisfy the various water demands is frequently a reflection of shortcomings in decision-making, planning, and management at levels higher than water (Loucks & van Beek, 2017:1). Due to its unpredictability, Loucks and van Beek (2017:2) contend that water resources professionals have learned how to plan, design, build, and operate structures that together with non-structural measures increase the benefits people can obtain from the water resources. Furthermore, the authors states that these professionals should not only be knowledgeable about the relevant physical science and technology related to water resources but also about the multiple institutional, social, or political issues confronting water resources planners and managers (Loucks & van Beek, 2017:2). For Herman, Quinn, Steinschneider, Giuliani and Fletcher (2020:1), water resources planning can be categorised into two groups, first, robust planning frameworks and second, dynamic planning frameworks. Robust planning frameworks are designed to circumvent uncertainty, aiming to identify a range of scenarios leading to system failure. In contrast, dynamic planning frameworks identify policies to select actions in response to new information over time, recognising that future decisions are altered as new information comes to light (Herman *et al.,* 2020:2). The characteristics of society at the time provide a context within which the goals and priorities are set. This is because

society’s aims alter over time as attitudes and needs change (Parker & Penning-Rowsell, 2024:11). Water planning seeks to make adjustments to both the social context and the resource base to sustain the yield of the resource base and to provide for society’s needs (Parker & Penning-Rowsell, 2024:12). Water plans may involve adjustments to the resource base, such as installing man-made storage capacity, and adjustments to the social context by, for example, offering incentives for economical use of water leading to a change in the attitudes of users (Parker & Penning-Rowsell, 2024:12).

According to Jain and Singh (2023:19), water resources planning and development are concerned with modifying the time and space available to accomplish specific national, regional and local objectives. Planning and developing water resources is typically driven by a government's desire to enhance national or regional welfare, boost national income, achieve national self-sufficiency, and maintain environmental quality (Jain & Singh, 2023:20). The objective of water resources planning and management is to provide the supplies of water following the temporal and spatial distribution of demands through river regulation and distribution systems (Jain & Singh, 2023:20).

In South Africa, there are numerous Acts and formal plans that emphasise the importance of planning regarding water resources. The following section will discuss some of the key acts and strategies of the government in this regard.

3.8.6 The National Development Plan (NDP) 2030

The National Science and Technology Forum (2018:2) view the NDP as South Africa’s guiding document. It was published in 2011 and is meant to serve as a guide for addressing the problems facing South Africa (The National Science and Technology Forum, 2018:2). The NDP intends to have effective and evolving water management services by 2030, which reflects an understanding of available water resources and effective water planning, cutting across economic sectors and spheres of government, and encompasses a reliable water supply to meet needs, including efficient agricultural water use (The National Science and Technology Forum, 2018:14). The NDP 2030 (NPC, 2011:178-179) states that managing, monitoring and protecting South Africa's water resources sustainably while allowing for economic growth demands effective administration, evolving water-resource management, and prioritisation. Some of the water-management strategies mentioned in the NDP 2030 (NPC, 2011:179-180) are establishing a national water-resources infrastructure agency, reducing demand, manage

agricultural use better, and investigating water reuse and desalination. Chapter 4 will provide a comprehensive overview of these functions and strategies.

3.8.7 National Water & Sanitation Master Plan (NW & SMP)

To address the crisis in the water and sanitation sector, including the aim for a water-secure future with dependable water and sanitation services for everyone, and ensuring that these efforts contribute to achieving national development objectives, the DWS is leading a suite of initiatives that includes the NW & SMP (DWS, 2024). These initiatives are being led in collaboration with other government departments, agencies, the private sector, and civil society. According to the DWS (2024), the NW & SMP set out a schedule of prioritised actions until 2030 to create a water and sanitation sector that can meet national objectives in the National Development Plan and the SDGs. The NW & SMP also sets out the roles and responsibilities of government, the private sector and civil society for implementing the plan (DWS, 2024). The NW & SMP is composed of three volumes.

Volume 1 is “a call to action” and sets out the critical priorities to be addressed by the water sector in the period from 2018 – 2030 (DWS, 2018:3). To obtain stakeholder agreement on the significant difficulties facing the water sector at this time, DWS conducted extensive engagement with partners in late 2017 and early 2018. This was made possible by the Call to Action (DWS, 2018:3). Volume 2 is the “plan to action”. It states that restoring the integrity and efficacy of governance, delivery, management, and monitoring systems requires swift action in response to the decline in standards (DWS, 2019:5). Furthermore, it states that to address pressing issues, have a quantifiable influence, and guarantee that positions, objectives, and actions are in line, the NW & SMP lays out a strategic focus and works to mobilise support and resources (DWS, 2019:5). Finally, volume 3 is the “schedule of actions” and is the core deliverable of the NW & SMP (DWS, 2019:8). Volume 3 contains considerably more information about all the initiatives, programs, and projects needed to fulfil the goals of the NW & SMP, which where applicable, are broken down to provincial or catchment level (DWS, 2019:8). It also provides additional details regarding the specific responsibilities of the relevant parties and a breakdown of deliverables intended to be used for monitoring and evaluation of the achievements of the set targets (DWS, 2019:8). A further discussion of the NW & SMP, and each volume will proceed in Chapter 4 of this study.

3.8.8 Legislative frameworks

The South African government has also developed and empowered numerous acts, the main objective being the country's effective and efficient management and use of water resources. Some of the most crucial frameworks include *The Constitution* (1996), the National Water Act 36 of 1998, the Water Services Act 108 of 1997, the Local Government: Municipal Structures Act, Act 117 of 1998 and the Local Government: Municipal Systems Act 32 of 2000.

- ***Constitution of the Republic of South Africa* 1996:** Chapter 7 of the *Constitution* discusses local government in detail. It provides the objectives of all municipalities, including that municipalities must ensure the provision of services to communities sustainably.
- **National Water Act 36 of 1998:** The purpose of this Act is to ensure that water resources are protected, developed, conserved, managed and controlled in such a manner that they are usable for current and future generations.
- **Water Services Act 108 of 1997:** The Act details the responsibilities of the government to ensure that water supply and sanitation services are provided efficiently and sustainably.
- **Local Government: Municipal Structures Act, Act 117 of 1998:** Defines the functions and powers between different categories and types of municipalities and is responsible for regulating internal systems, structures and municipal officials of municipalities and ensuring that electoral systems are in place.
- **Local Government: Municipal Systems Act 32 of 2000:** Defines the key principles, mechanisms and processes necessary for municipalities to improve local communities (social and economic aspects).

A further explanation of how these Acts function will be provided in Chapter 4 of this study.

3.8.9 Classic theorists and planning

As stated in 3.8.1, scholars such as Henri Fayol believed that meticulous planning of various organisational functions could increase effectiveness and efficiency. This motion was expressed through Fayol’s 14 principles of management, which are: 1.) division of labour, 2.) authority, 3.) discipline, 4.) unity of command, 5.) unity of direction, 6.) subordination of individual interest to the general interest, 7.) remuneration, 8.)

centralisation, 9.) scalar chain, 10.) order, 11.) equity, 12.) stability of tenure of personnel, 13.) initiative and, 14.) esprit-de-corps (Adamu & Ibrahim, 2024:299). It can be assumed that division of labour, unity of command and direction, and order emphasized the importance of planning. According to Uzuegbu and Nnadozie (2015:59), this principle was based on the premise that staff exhibit increased performance when assigned a task according to their specialities. Work productivity and efficiency are best attained when employees are working on diverse tasks at the same time. Yet, all contribute to the same overall objective (Uzuegbu & Nnadozie, 2015:60). This principle, therefore, requires leaders to determine which employees should be assigned a specific task and for this process to be repeated numerous times through planning. To prevent the duality of information, an employee receives two orders that conflict and does not know which to follow. Unity of command asserts that each employee should always receive instructions from a single supervisor or superior (Karan, 2024). Here, each supervisor or superior is responsible for planning each of their activities with other supervisors or superiors to allocate roles and responsibilities. Unity of command and direction usually function in tandem to produce increased results. Unity of direction states that every group in an organisation with similar goals should have a single leader and adhere to a single strategy to achieve goals and objectives (Khan, Bhide, Mahale & Marathe, 2024:4). After collaborating with other supervisors or superiors, each leader should then plan a course of action of how their allocated roles and responsibilities will be delegated to their specific subordinates. Finally, order refers to allocating resources (manpower, money, materials, etc.) in a timely and efficient manner, ensuring that resources are utilised correctly and in a structured manner (Davis, 2024). This refers to top-level management conducting strategic planning to outline organisational goals and objectives and, more specifically, how they will utilise organisational resources to achieve them.

The work of Henri Fayol had an immense influence on the work of Luther Gulick and Lyndall Urwick. The two scholars developed their approach to improving management functions and organisational performance. This is embodied in their acronym POSDCORB. These principles are Planning, Organising, Staffing, Directing, Co-ordinating, Reporting, and Budgeting (Phongsamran, Mahanmud & Triyakun, 2020:1). Here, planning entails forward-thinking and contemplation (Ugwulashi, 2012:316). Stated differently, the process involves planning and implementing strategies based on priority to achieve desired outcomes with limited resources (Ugwulashi, 2012:316). For Chalekian (2014:9), planning entails laying out in general terms what has to be done and

how to execute it to achieve the organisation's goal. Furthermore, directing is the continuous task of making decisions and embodying them in specific and general orders and instructions, as well as serving as the leader of the enterprise (Chalekian, 2014:10).

Considering the abovementioned sections, an operational definition of planning and all its variants, for this study, is a process in which leaders, with the assistance of numerous stakeholders, plan for an "event" or activity to achieve both short-term and long-term goals and objectives. This could range from determining when and how to conduct critical water infrastructure maintenance to where and how to construct new critical water infrastructure. It also involves formulating strategies which mitigate water service disruptions when they occur. Furthermore, this process should consider residents' well-being when plans are being formulated and implemented. The entire planning and implementation process should strive to be as practical and effective as possible while resources are utilised sustainably.

3.9 CHAPTER CONCLUSION

This chapter introduced the concept of resilience by providing an overview and defining resilience and water resilience. This was followed by an international perspective on resilience, including the WNTR system and the UN SDGs 6 and 11. The domestic perspective on resilience, which followed, included the Rockefeller Foundation's 100 Resilient Cities, the *Batho Pele* principles, and the Blue and Green Drop Certification Programmes, respectively. An evaluation of how resilient SPLM water resources were provided. Chapter 3 also discussed planning as a core function of public administration. This was done by conceptualising public administration, followed by different definitions of planning, such as general, strategic, public, and water resource planning. The discussion focused on the NDP 2030, the NW & SMP, and legislative frameworks, emphasising the importance of planning within South Africa. Chapter 3 concludes with a short discussion of classic theorists who emphasise the importance of meticulous planning within organisations.

Chapter 4 will next provide an analysis of the legislative frameworks that guide the functioning of municipalities in South Africa and how these frameworks are intended to contribute to the effective and efficient management of water services.

CHAPTER 4 :
LEGISLATIVE AND REGULATORY FRAMEWORKS OF WATER SERVICES MANAGEMENT

4.1 INTRODUCTION

Various legal and regulatory frameworks guide the functioning of municipalities by outlining their responsibilities and ensuring effective and efficient service delivery. Some of the most crucial frameworks include The Constitution of the Republic of South Africa (1996), the Water Services Act 1997 (Act No. 108 of 1997), the National Water Act 1998 (Act No. 36 of 1998), the Local Government: Municipal Structures Act 1998 (Act No. 117 of 1998), and the Local Government: Municipal Systems Act 200 (Act No. 32 of 2000). Additional frameworks include the National Water Resource Strategy, the National Development Plan 2030, and the National Water and Sanitation Master Plan. The aforementioned legislative and regulatory frameworks of water services management are subsequently discussed.

4.2 THE DEPARTMENT OF WATER AND SANITATION

The DWS, led by the cabinet minister, develops and implements legislation for water and sanitation services in the country (Mnguni, 2020:197). The department is led by Minister Pemmy Majodine and her deputy ministers, Mr David Mahlobo and Mr Isaac Sello Seitlholo. The DWS is regarded as the custodian of the water sector in South Africa. The DWS oversees compliance with quality standards for potable water and wastewater discharge into natural water bodies. This includes water abstraction from various sources, treatment and distribution to users, and collection, treatment, and discharge of treated wastewater back into the environment (Mnguni, 2020:198). Additionally, the department promotes ongoing improvement in performance among sector participants and partners, owns most large dams, and plans infrastructure for long-term water supply across the country (Mnguni, 2020:198). According to Meissner and Jacobs-Mata (2017:155), DWS operates the country's government-owned dams, water pipelines, and irrigation projects, using operational standards, both under normal conditions and during droughts. At times of water supply uncertainty, Meissner and Jacobs-Mata (2017:155) state that water-use priority is given to basic human needs and the water requirements of strategic users, such

as power stations and significant industries, while ensuring resource sustainability. Edokpayi, Enitan-Folami, Adeeyo, Durowju, Jegede, and Odiyo (2020:194) list the following as the responsibility of the DWS:

- Monitoring and reporting on performance (national perspective), including audits.
- Investigation of non-compliance and drinking water quality failures.
- Definition and communication of regulatory requirements.Identification and specification of required regulatory actions or support.
- Undertaking regulatory actions where necessary to ensure adequate steps are taken to comply and reduce health risks to acceptable levels.
- Reporting on regulatory actions undertaken and outcomes attained.

Additionally, the authors (Edokpayi *et al.,* 2020:195) state that there are also regulatory approaches put in place to ensure the supply of sustainable potable water to South Africans, which are:

- Compliance monitoring (norms & standards).
- Punitive regulation (enforcement).
- Risk-based targeted regulation.
- Incentive-based regulation (Blue and Green Drop Certification).

The legislative and regulatory framework guiding municipalities' functioning will now be discussed. Although these documents in their entirety have been developed and implemented to ensure effective and efficient use and management of water resources, for this study, the researcher only highlights specific segments of each document.

4.3 THE CONSTITUTION, 1996

The Constitution, 1996 states that the right of access to water is a basic human right that cannot be denied to anyone. Chapter 7 *in* The Constitution, 1996 discusses local government in detail. Chapter 7 (s.152) assigns the following objectives to all municipalities:

- To provide a democratic and accountable government for local communities.
- To ensure the provision of services to communities in a sustainable manner.
- To promote social and economic development.
- To promote a safe and healthy environment.

- To encourage the involvement of communities and community organisations in local government matters.

The developmental duties of municipalities are also enshrined in Chapter 7 (s.153) and are as follows (The Constitution, 1996:74):

- A municipality must structure and manage its administration, budgeting, and planning processes to prioritise the community's basic needs and promote them.
- A municipality must participate in national and provincial development programmes.

Furthermore, The Constitution, 1996, Chapter 7 (s.155), categorises all local government (municipalities) into three groups, namely: category A, B, and C. A Category A outlines that a municipality has exclusive municipal executive and legislative authority in its area of jurisdiction; Category B states that a municipality shares municipal executive and legislative authority in its area with a category C municipality, within whose area it falls; Category C elucidates that a municipality that has municipal executive and legislative authority in an area includes more than one municipality (The Constitution, 1996:75). Aspects such as the powers and functions of municipalities; composition and election of municipal councils; membership of municipal council; terms of municipal council; internal procedures and; publication of municipal by-laws are also discussed in Chapter 7.

Additionally, Part B of Schedule 4 and 5 in *The Constitution* (1996) provides that the following are the responsibilities of municipalities:

> *Each municipality is responsible for their own area of jurisdiction: fencing and fences; local amenities; local sport facilities; municipal parks and recreation; municipal roads; pounds; public places; refuse removal, refuse dumps and solid waste disposal; street lighting; electricity and gas reticulation; firefighting services; municipal airports; municipal planning; municipal health services; municipal public transport; storm water management systems in built-up areas; water and sanitation services limited to potable water supply systems and domestic waste-water and sewage disposal systems.*

The Constitution, 1996, through the national and provincial spheres of government, provides support and monitors and regulates local government. The Constitution, 1996, Chapter 7, clarifies the roles and responsibilities of each municipality within its scope of operation. Chapter 7 of The Constitution, 1996, also emphasises that all action taken by municipalities should benefit the citizens they serve and that municipalities should be developmental-oriented. The Constitution, 1996, can be regarded as the foundation upon

which government institutions are formed and provides the overall direction that these institutions should take.

4.4 THE WATER SERVICES ACT (ACT NO. 108 OF 1997)

The Water Services Act 108 of 1997 also enshrines the right of access to basic water supply and sanitation. According to this Act, every water services institution must take reasonable measures to realise these rights. The main objectives of this Act are to provide for (Water Services Act, 1997:12):

- The right to access basic water supply and the right to basic sanitation are necessary to secure sufficient water and an environment that is not harmful to human health or well-being.
- The setting of national standards, norms and standards for tariffs regarding water services.
- The preparation and adoption of water services development plans by water services authorities are also important.
- A regulatory framework for water services institutions and water services intermediaries.
- Establishing and disestablishing water boards and water services committees and their duties and powers.
- The monitoring of water services and intervention by the Minister or the relevant Province.
- Financial assistance to water services institutions.
- The gathering of information in a national information system and the distribution of that information.
- The accountability of the WSP.
- The promotion of effective water resource management and conservation.

Chapter 3 of this Act provides the specific duties of a WSA. The Act states that every WSA has a duty to all consumers or potential consumers in its area of jurisdiction to progressively ensure efficient, affordable, economic and sustainable access to water services (Water Services Act, 1997:19). This duty is subject to aspects such as the availability of resources, the duty of consumers to pay reasonable prices, and the right of the relevant services authority to limit or discontinue the provision of water services if there is a failure by consumers to comply with reasonable conditions (Water Services Act,

1997:19). The Act (Water Services Act, 1997:19) asserts that a WSA may not unreasonably refuse or fail to give access to water services to a consumer or potential consumer in its area of jurisdiction. Also stated is the fact that in an emergency, a WSA must offer basic water and sanitation services to anyone within its jurisdiction, even if it means incurring costs (Water Services Act, 1997:19). Furthermore, the Act requires water services authorities to prepare a water services development plans, discusses conditions of contracts and joint ventures with WSP, the functioning of a WSA when acting as a WSP, and by-laws (Water Services Act, 1997:20-26). Chapter 4 of this Act discusses WSP, while Chapter 5 discusses water services intermediaries, Chapter 6 deals with water boards, and chapter 7 with water services committees.

Chapter 8 provides the purpose of monitoring and the conditions for intervention in water service institutions. According to Chapter 8 (Water Services Act, 1997:51), monitoring of water services institutions takes place to ensure:

- Compliance with all applicable national standards prescribed under this Act.
- Compliance with all norms and standards for tariffs prescribed under this Act.
- Compliance with every applicable development plan. Policy statement or business plan adopted in terms of this Act.

The grounds for intervention are justified if a water services institution has not effectively performed any function imposed on it by, or under this Act, and has failed to intervene or has intervened but failed to do so effectively (Water Services Act, 1997:51). Chapter 7 of The Constitution, 1996, can be regarded as the foundation of functions which are to be performed by local government. The Water Services Act states precisely what the role of each institution is and how they should function.

4.5 THE NATIONAL WATER ACT (ACT NO. 36 OF 1998)

According to Chapter 1, Section 2, this Act aims to protect, use, develop, conserve, manage, and govern the nation's water resources while considering various issues such as (National Water Act, 1998:10):

- Meeting the basic human needs of present and future generations.
- Promoting equitable access to water.
- Redressing the results of past racial and gender discrimination.

- Promoting the efficient, sustainable and beneficial use of water in the public interest.
- Facilitating social and economic development.
- Providing for the growing demand for water use.
- Protecting aquatic and associated ecosystems and their biological diversity.
- Reducing and preventing pollution and degradation of water resources.
- Meeting international obligations.
- Promoting dam safety.
- Managing floods and droughts

Chapter 2 discusses the development of measures to properly manage water resources. Part 1 of Chapter 2 provides a national water resource strategy framework.

> *Part 1 requires the progressive development, by the Minister, after consultation with society at large, of a national water resource strategy. The national water resource strategy provides the framework for the protection, use, development, conservation, management and control of water resources for the country as a whole. It also provides the framework within which water will be managed at regional or catchment level, in defined water management areas. The national water resource strategy, which must be formally reviewed from time to time, is binding on all authorities and institutions exercising powers or performing duties under this Act* (National Water Act, 1998:11).

Furthermore, Part 2 of Chapter 2 provides the framework for catchment management strategies.

> *Part 2 requires every catchment management agency to progressively develop a catchment management strategy for the water resources within its water management area. Catchment management strategies must be in harmony with the national water resource strategy. In the process of developing this strategy, a catchment management agency must seek co-operation and agreement on water-related matters from the various stakeholders and interested persons. The catchment management strategy, which must be reviewed from time to time, will include a water allocation plan. A catchment management strategy must set principles for allocating water to existing and prospective users, taking into account all matters relevant to the protection, use, development, conservation, management and control of water resources* (National Water Act, 1998:12).

The main objective of this Act is to provide guidelines to stakeholders within the water sector on how to effectively and efficiently manage water resources without negatively influencing the environment.

4.6 THE LOCAL GOVERNMENT: MUNICIPAL STRUCTURES ACT (ACT NO. 117 OF 1998) (MSA)

According to Van der Waldt (2014:46), the Local Government: Municipal Structures Act 117 of 1998 is designed to regulate municipalities' internal systems, structures and office bearers and provide for appropriate electoral systems. Van der Waldt (2014:122) emphasises that the MSA provides for a proper division of functions and powers of all categories of municipalities, further regulates the internal systems and structures thereof, and aids in implementing performance management systems.

Chapters 1 and 2 of the Act provide the requirements and criteria for establishing different categories and types of municipalities (metropolitan, local or district). Chapter 3 discusses municipal councils. More specifically, in Part 1 of Chapter 3, municipal councils' composition, membership, operation, and dissolution are discussed. Section 19 of Part 1 (Municipal Structures Act, 1998:26) provides municipal objectives and states that a municipal council must annually review:

- The needs of the community.
- Its priority is to meet those needs.
- Its processes for involving the community.
- Its organisational and delivery mechanisms for meeting the needs of the community.
- Its overall performance in achieving the objectives.

Chapter 4 of this Act regulates internal systems, structures and municipal officials of municipalities and ensures that electoral systems are in place. Aspects such as the composition, function and powers, and the election and removal of executive committee members, metropolitan sub-councils, ward committees, and other committees if municipal councils are all detailed within this chapter. Chapter 4 (p.1, s.44(2)) of the Municipal Structures Act (1998:41) provides that the executive committee should:

- Identify the needs of the municipality.
- Review and evaluate those needs as a priority.
- Recommend to the municipal council strategies, programmes and services to address priority needs through the integrated development plan and estimates of revenue and expenditure while considering any applicable national and provincial development plans.

- Recommend or determine the best methods, including partnership and other approaches. to deliver those strategies, programmes and services to the maximum community benefit.

Chapter 4, Section 74 (Municipal Structures Act, 1998:53) provides the functions and powers of ward committees which are to:

- Make recommendations on any matter affecting its ward to the ward councillor or through the ward councillor, to the metro or local council, the executive committee, the executive mayor or the relevant metropolitan sub-council.

Chapter 5 of this Act defines the functions and powers of municipalities. Section 84 (1) (Municipal Structures Act, 1998:59) provides an extensive list of the functions and powers of a district municipality, some of which include but are not limited to:

- Bulk supply of water that affects a significant proportion of municipalities in the district.
- Bulk sewage purification works and primary sewage disposal affect a significant proportion of municipalities in the district.
- Municipal roads form an integral part of a road transport system for the area of the district municipality as a whole.
- Municipal health services serve the area of the district municipality as a whole.

The abovementioned Acts all frame the roles and responsibilities of government institutions to achieve effective and efficient water service delivery and management while maintaining a healthy environment. The Municipal Structures Act's primary role is to ensure that municipalities are structured to achieve developmental objectives and provide services to citizens in a manner that leaves them satisfied. Thus, this Act defines the roles of public servants within municipalities.

4.7 THE LOCAL GOVERNMENT: MUNICIPAL SYSTEMS ACT 32 OF 2000

This Act defines the key principles, mechanisms, and processes necessary for municipalities to improve local communities (social and economic aspects). Furthermore, the Act ensures that affordable water services are available to all; provides the legal framework which allows for the participation of community members; defines the powers of the municipalities and their functions; provides enabling frameworks, i.e. performance management, which enables the development of local government; ensures that lower-

income individuals are not excluded from service delivery and develops frameworks which are used to support and monitor local government (Municipal Systems Act, 2000:2).

Chapter 2 of this Act defines municipalities' legal nature, rights, and duties. Section 4(2) (Municipal Systems Act, 2000:20) of this Chapter provides that the council of a municipality is responsible for:

- Exercise the municipality's executive and legislative authority and use the municipality's resources in the local community's best interests.
- Encourage the involvement of the local community.
- Strive to ensure that municipal services are financially and environmentally sustainable to the local community.
- Consult the local community about (i) the level, quality, range and impact of municipal services provided by the municipality, either directly or through another service provider and (ii) the available options for service delivery.
- Give members of the local community equitable access to the municipal services to which they are entitled.
- Promote and undertake development in the municipality, amongst others.

Chapter 2, Section 6(2) (Municipal Systems Act, 2000:20) details the roles of the administration of a municipality as follows:

- Be responsive to the needs of the local community.
- Facilitate a culture of public service and accountability amongst staff.
- Take measures to prevent corruption.
- Establish clear relationships and facilitate cooperation and communication between it and the local community.
- Give members of the local community complete and accurate information about the level and standard of municipal services they are entitled to receive.
- Inform the local community about how the municipality is managed, the costs involved, and the persons in charge.

Chapter 5 of this Act pertains to integrated development planning. This Chapter states that municipal planning should be developmental oriented. According to Section 26, an integrated development plan should reflect the following (Municipal Systems Act, 2000:38):

- The municipal council's vision for the long-term development of the municipality with special emphasis on the municipality's most critical development and internal transformation needs.
- The council's development priorities and objectives for its elected term include its local economic development aims and internal transformation needs.
- The council's operational strategies, among others.

Furthermore, Section 51 in Chapter 7, Schedule 1, and Schedule 2 all provide the framework within which public servants should function. Schedule 1 and Schedule refer to these frameworks as "codes of conduct". Section 51 provides that the administration of a municipality should be organised in a manner which enables it to (Municipal Systems Act, 2000:38):

- Be responsive to the needs of the local community.
- Ensure that its political structures, political office bearers, managers, and other staff members align their roles and responsibilities with the priorities and objectives in the municipality's integrated development plan.
- Hold the municipal manager accountable for the administration's overall performance, among others.

Schedule 1 (s.2) details the general code of conduct of councillors (Municipal Systems Act, 2000:106):

- Perform the functions of the office in good faith, honestly and transparently.
- At all times, act in the municipality's best interest and in such a way that the credibility and integrity of the municipality are not compromised.

Schedule 2 (s.2) details the general conduct of municipal staff members and councillors (Municipal Systems Act, 2000:114):

- Loyally execute the lawful policies of the municipal council.
- Perform the office functions in good faith, diligently, honestly and transparently.
- Act in the municipality's best interest, and in such a way that the credibility and integrity of the municipality are not compromised.

This Act provides the framework for collaboration between municipalities and the community they serve. Furthermore, this Act emphasises how municipal officials and public servants should conduct themselves. All actions taken by municipal officials and public servants should benefit the community they serve. Section 4.8 – 4.10 will discuss

the National Water Resource Strategy 1 and 2, the National Development Plan (NDP) 2023, and the National Water and Sanitation Master Plan (NW & SMP) which consist of three volumes.

4.8 NATIONAL WATER RESOURCE STRATEGY 1 AND 2 (NWRS)

The First Edition of the National Water Resource Strategy (NWRS) outlines how South Africa will protect, use, develop, conserve, manage, and govern its water resources in line with policy and law (National Water Resource Strategy, 2004:i). Furthermore, the NWRS is focused on finding opportunities to make water available for productive livelihoods, provide support for practical water usage, highlight the importance of water conservation and efficiency, and provide the support available to adopt these measures (National Water Resource Strategy, 2004:i). Chapter 3 of the NWRS 1 describes strategies for water resource management, emphasising elements such as the protection of water resources, water use, water conservation and water demand management, among others. The National Resource Strategy (2004:56) states that to achieve the interrelated goals of sustainability and equity, a water resource management approach has been adopted that includes measures to protect water resources by establishing objectives for the desired condition of resources and putting controls in place to limit impacts to acceptable levels. The approach comprises two complementary strategies and is as follows (National Water Resource Strategy, 2004:56):

- Resource-directed measures focus on the quality of the water resource itself.
- Source-directed controls: these measures contribute to defining the limits and constraints that must be imposed on the use of water resources to achieve the desired level of protection.

The NWRS, now in its second edition, aims to manage South Africa's water resources in a way that is fair and sustainable over the next five to ten years to achieve the country's goals for growth, development, and socio-economic priorities (National Water Resource Strategy 2, 2013:1). The purpose of the NWRS2 is to establish the vision, principles, goals, and strategic actions for effective developmental water management to achieve an inclusive, sustainable, and equitable economy. It places special emphasis on the role of the State, particularly the DWS, associated sector departments, catchment management agencies, water services authorities, water board, and other state bodies with water management responsibilities (National Water Resource Strategy 2, 2013:1). Additionally,

it also emphasises how crucial it is for communities, civil society, the private sector, and water use sectors to get engaged in and commit to progressive water resource management (National Water Resource Strategy 2, 2013:1). The strategic themes of the NWRS 2 which can be seen as a means towards achieving its objectives (cf. 3.5) are defined as 1.) water resource planning, development, and infrastructure management; 2.) water resource protection; 3.) equitable water collection; 4.) water conservation and water demand management; 5.) regulation; 6.) managing water resources for climate change; and 7.) international co-operation and trans-boundary water management (National Water Resource Strategy 2, 2013:16).

The National Water Resource Strategy 3 which was published in March 2023 outline that its vision is “The protection and management of water resources to enable equitable and sustainable access to water and sanitation services in support of socio-economic growth, development and sustained ecosystem functioning for the well-being of current and future generations.” (NWRS3 of 2023).

4.9 THE NATIONAL DEVELOPMENT PLAN (NDP) 2030

The NDP 2030 (NPC, 2011:178-179) states that managing, monitoring, and protecting South Africa's water resources sustainably while allowing for economic growth demands effective administration, evolving water-resource management, and prioritisation (cf. 3.8.6). The NDP contends that clear and coherent legislation and policies, along with intense research and development capabilities and technical tools, are essential for effective administration (NPC, 2011:178-178). Furthermore, the NDP states that water resources should be managed and administered nationally due to their interconnectedness and cross-political nature.

According to the NDP (NPC, 2011:179), a legislative process exists to establish a national water resource strategy every five years to ensure evolving water resource management. This strategy is based on catchment management strategies and the local government's water services development plans (outlined in integrated development plans). Implementing this review method effectively identifies priority areas for improvement and allows for monitoring of progress (NPC, 2011:179).

In terms of prioritisation, the NDP draws attention to the fact that a comprehensive plan is needed to conserve water resources and the environment in the Mpumalanga Highveld coalfields, including upstream of the Vaal and Loskop dams and the Lephalale-Waterberg

area (NPC, 2011:179). This is based on the idea that groundwater, with good planning and management, may frequently meet local needs more efficiently than massive infrastructure projects (NPC, 2011:179).

The first water management strategy mentioned in the NDP is establishing a national water resource infrastructure agency (NPC, 2011:179). The NDP argues that a national water-resources infrastructure agency, like the South African National Roads Agency Limited, should make significant investments in regional systems. This agency would build on the foundation provided by the Trans-Caledon Tunnel Authority (TCTA), which already supports the implementation of several large projects and helps to resolve the organisational challenges faced by the Department's Water Trading Entity. The national government should oversee the planning process and review programs every five years to ensure alignment with long-term economic and infrastructure objectives (NPC, 2011:179).

The second strategy is to reduce demand (NPC, 2011:179). According to this strategy, achieving demand reductions requires programmes to reduce water leakage in distribution networks and improve efficient domestic and commercial water use (NPC, 2011:179). The National Planning Commission (NPC) argues that practical demand-management projects should be prioritised and considered equally important as water-supply expansion projects (NPC, 2011:179). Another strategy the NPC suggests is managing agricultural use (NPC, 2011:179). According to this strategy, to compensate for the expansion of irrigated agriculture, the farming sector must enhance water efficiency to raise productivity and transfer water to new users in water-scarce areas (NPC, 2011:179). The NPC suggests a national programme to support local and sectoral initiatives to reduce water demand and increase water efficiency, claiming that water-saving and demand-management projects should be viewed equally as crucial as water expansion projects (NPC, 2011:179).

The last strategy mentioned in the NDP is investigating water reuse and desalination (NPC, 2011:180). In many inland areas, municipal and industrial wastewater is treated and returned to rivers, resulting in widespread indirect water reuse. However, there is a significant possibility for additional water reuse (NPC, 2011:180). The NPC argues that water infrastructure investment should include projects to treat and reuse water, selected on their merits (NPC, 2011:180).

4.10 THE NATIONAL WATER AND SANITATION MASTER PLAN (NW & SMP)

On the website of the DWS, it is stated that the NW & SMP's primary goal is to provide an overall view of the scope of the water and sanitation business to provide a comprehensive schedule of actions needed to address current challenges. This includes estimating the investments required to ensure effective water resources and water and sanitation service delivery and facilitating effective integrated investment planning, action implementation, and achievement evaluation (DWS, 2024). This planning and implementation of the NW & SMP is covered in three separate volumes, which are discussed below.

4.10.1 Volume 1: Call to Action

The National Water and Sanitation Master Plan (NW & SMP) Call to Action highlights current and future challenges facing the water and sanitation sector in South Africa. It encourages collaboration among stakeholders to stay ahead of the curve (DWS, 2018:2). These challenges, or priorities, are clustered into two sections: Water and Sanitation Management and Enabling Environment. Water and Sanitation Management priorities include: reducing demand and increasing supply; redistribution for transformation; managing adequate water and sanitation services; regulating water and sanitation; improving raw water quality and; protecting and restoring ecological infrastructure (DWS, 2018:6). Priorities of enabling environment include: creating effective institutions; managing data and information; building capacity for action; ensuring financial sustainability; legislation and; enhancing research, development and innovation (DWS, 2018:6).

The following section provides a summary of actions to address key priorities.

Reducing demand: set cap on water use with reducing targets over time; minimise water demand and increase water efficiencies of industrial users; include water use efficiency and water loss reduction targets in the key performance indicators of municipal managers and municipal water supply and sanitation managers, and in municipal implementation plans (DWS, 2018:15).

Increasing supply: development of strategic water resources infrastructure and increase groundwater use (including artificial recharge) and re-use of water (DWS, 2018:16).

Redistributing water for transformation: identify alternative sources of water and water that is not utilised (e.g. as mines are closing resulting from War on Leaks, etc) for

transformation; identify where more water can be made available in government water schemes for transformation; identify areas where small dams or groundwater development can provide water for small scale black farmers; investigate, revitalise, refurbish existing underperforming Black Owned schemes (DWS, 2018:18).

Managing adequate water and sanitation services: plan for disaster management by implementing sufficient flood protection and drought management on regional level; provide direct water services development planning support to water services authorities as part of a legal requirement and integration into municipal integrated development plans; deliver services to achieve (100%) universal sanitation coverage (Municipal Sanitation Projects); provide services to achieve (100%) universal water services provision (Municipal Water Supply Projects); develop and implement programmes for recruiting experienced technical and managerial staff in South Africa first and then internationally (DWS, 2018:22-24).

Regulating the water and sanitation sector: develop and implement municipal by-laws to protect water quality; establish a mechanism for applying administrative penalties; ensure that sufficient revenue is received through tariffs and grants to operate, maintain and improve the water supply and sanitation system (DWS, 2018:27-28).

Improving raw water quality: developing strategic water resources infrastructure; developing and implementing municipal bylaws to protect water quality; routinely monitoring resource water quality (DWS, 2018:31-32).

Protecting and restoring ecological infrastructure: review and promulgate aggressive restrictions within the legislation to restore and preserve ecological infrastructure and develop new policies and strategies on matters not previously addressed, in consultation with all stakeholders, to facilitate the sustainability of various water sector programmes (DWS, 2018:37).

Creating effective water institutions: establish a business case for streamlined institutional arrangements in the water and sanitation sector and establish a Municipal Intervention Unit for Water and Sanitation in DWS, staffed with highly competent experts to drive a national programme of intervention at the municipal level (DWS, 2018:41).

Managing data and information: revitalise the Green, Blue and No Drop programmes and publish results, and review and develop and implement comprehensive and appropriate management, monitoring and reporting structures of the DWS data portal (DWS, 2018:45).

Building capacity for action: develop and implement programme for recruiting experienced technical and managerial staff in first South Africa and then internationally, and partner with institutions to fund training of water sector practitioners in the curation, management and use of data and the associated technologies (DWS, 2018:46).

Ensuring financial sustainability: develop regulations in terms of Section 139 (8) of *The Constitution* (1996), which allows for a national entity to take over the water service functions, including revenue and billing, in a municipality if service deliver criteria are not met, and in all entities put in place mechanisms to deal with accumulated debts (DWS, 2018:52). Amending the legislation: develop new policies and strategies on matters not previously addressed, in consultation with all stakeholders, to facilitate the sustainability of various water sector programmes (DWS, 2018:54).

Enhancing research, development and innovation: strengthen partnerships with key water sector institutions to accelerate research and solutions into practice, and fund research into new models to better understand implementation approaches for water allocation reform, and equity issues (DWS, 2018:57).

4.10.2 Volume 2: Plan to Action

As stated in Chapter 3 (cf. 3.87) of this study, Volume 2 states that to address pressing issues, have a quantifiable influence, and guarantee that positions, objectives, and actions are in line, the NW & SMP lays out a strategic focus and works to mobilise support and resources (DWS, 2018:5). A summary of these focus points will be provided next.

Reducing demand and increasing supply: water resources planning aims to ensure the country's water security despite limited resources by implementing innovative interventions such as resource management (e.g. water conservation and water demand management), catchment support activities (e.g. catchment care and water quality monitoring) and the infrastructure development of resources. (DWS, 2018:54). The action plan also states that the DWS need to develop guidelines for implementing water reuse projects (DWS, 2018:61). These guidelines should be based on sound decision-making and implementation. The guidelines should also address management and control, project implementation, choice of technology, operations and maintenance, project financing, development and implementation of tariffs, public and stakeholder education, engagement and consultation for different types of water re-use projects (DWS, 2018:61).

Redistributing water for transformation: here the focus is on ensuring black South Africans have access to enough water for productive activities, including small-scale farming,

commercial farming, afforestation, and more (DWS, 2018:72). Re-allocating water to historically disadvantaged individuals will address the imbalance in access to water for productive uses in South Africa, aligning with *The Constitution's* (1996) broader goals (DWS, 2018:76). If done appropriately, it will contribute to rural development and the reduction in inequality and poverty in the country. General authorisations (DWS in cooperation with all spheres of government and other institutions) should be used proactively to support the reallocation of water to black users and legalise small-scale water use without needing a licence (DWS, 2018:76).

Managing adequate water supply and sanitation services: in terms of sufficient water supply, the South African government aims to provide 100% reliable and safe water supply by 2030, in line with the National Development Plan (NDP) and Global Sustainable Development Goals (SDGs) (DWS, 2018:84). Furthermore, each WSA should have a detailed sanitation master plan that is constantly updated. The plans must address backlogs under their jurisdiction and operational and maintenance needs. Municipalities must secure funds for the sanitation master plan (DWS, 2018:91).

Regulating the water and sanitation sector: compliance monitoring and enforcement programs will prioritise those with the most significant impact on non-compliance with legislation and regulations (DWS, 2018:110). After controlling non-compliant high-impact users, smaller-impact users can be handled. This way, the most significant effect can be obtained with limited resources (DWS, 2018:110). By implementing this targeted approach, successful prosecutions of high-impact users will be widely publicised, which will, in turn, act as a driving force for behavioural changes among other users (DWS, 2018:110).

Improving raw water quality: water quality should meet standards appropriate for its intended use, including agriculture, domestic, industrial, recreational, and spiritual reasons (DWS, 2018:114). To achieve this, the action plan has identified the following targets: 1.) By 2030, water in or from water resources shall be fit for use; 2.) By 2030, all waste/ water containing waste generated by households and by economic activities shall be disposed of/ discharged lawfully and safely; 3.) By 2030, integrated Water Quality Management shall be implemented at all levels, including the transboundary, national, water management area (WMA) and sub-catchment levels (DWS, 2018:117-119). Protecting and restoring ecological infrastructure: The ideal state for a water resource supports both ecological and socio-economic needs while maintaining its ability to provide

necessary goods and services (DWS, 2018:135). Therefore, protecting rivers, wetlands, and groundwater should be considered a key priority and can be achieved through actions provided in Volume 1.

Creating effective water sector institutions: separating policy-making, shareholding, and regulation will ensure successful governance in the sector (DWS, 2018:143). Institutional integration is also essential to guarantee that functions are allocated to institutions that are most suited to perform them to optimise sector capacity (DWS, 2018:135). DWS, as the water and sanitation sector leader, should work with partners to simplify and streamline complicated institutional structures. Furthermore, it should promote enhanced functionality and efficiency in institutional arrangements (DWS, 2018:147).

Managing data and information: improved and modernised information systems must be developed in support of the implementation of the NW & SMP and continue to build and expand on the suite of knowledge products and communication channels that are and should be utilised to share knowledge in a customised manner (DWS, 2018:152).

Building capacity for action: according to DWS (2018:162), the envisaged future of the water sector includes a well-skilled and adaptable water sector workforce, an attractive sector that competes with other sectors for skills and can retain skilled staff in the water sector, accountable and strong governance structures focused primarily on monitoring and evaluation of new and existing training/skills development programmes and funding available for scarce skills throughout the skills development pipeline. The envisaged future of the DWS and building capacity for action require individuals to receive the necessary skills and educational training and development. Ensuring financial sustainability: to attract investors, the government should provide transparent long-term investment paths and manage a pipeline of projects to achieve development goals set by the Cabinet (e.g., the Medium-Term Strategic Framework) and international agreements (e.g., sustainable development goals) (DWS, 2018:205).

Amending the legislation: It is necessary for policies and strategies that are not effective to be amended to achieve goals and objectives within the water sector and to improve the cooperation between various sector stakeholders (DWS, 2018:210). Enhancing research, development and innovation: some of the reasons justifying the enhancement of research, development, and innovation is that it enables faster and more effective deployment of context-appropriate technologies, insight on how best to balance protection and use of the environment, and facilitates a learning culture in water sector

institutions about the challenges, risks, opportunities and solutions of the water sectors (DWS, 2018:212).

4.10.3 Volume 3: Schedule for Action

According to the DWS (2019:11), Volume 3 of the NW & SMP organises and translates the identified activities and interventions in Volumes 1 and 2 into annual quantifiable outcomes, including roles, responsibilities, timeframes, and associated costs. Furthermore, the DWS (2019:11) states the aim of Volume 3 is to:

- Position each action according to its NW & SMP section and key element.
- Categorise each action according to its level of importance within Volume 3 since the key actions listed within Volume 1 have a higher impact value than the sub-ordinate actions indicated within Volume 2.
- Assign specific responsibilities, measurable targets and costs to each action.
- Illustrate interconnectivity between actions and responsibilities to allow sector buy-in and acceptance of sector responsibility sharing.
- Enable the prioritisation and scheduling of actions depending on the budgets available per fiscal year.
- Allow for regular reviews and amendments.
- Allow for proper monitoring and evaluation of achievements.
- Allow for monitoring of the performance of responsible parties for each action.

The NW & SMP, specifically Volume 3, aims to align all stakeholders on provincial and catchment-level targets, rather than replacing local planning processes (DWS, 2019:53). According to the DWS (2019:55), Volume 3 is currently still under development, its full functionality and interactiveness is therefore currently work in progress.

4.11 CHAPTER CONCLUSION

Chapter 4 provided an overview of legislative and regulatory policies to improve water services delivery and management. This chapter started by first providing a brief background regarding the DWS, which is the head or custodian of the water sector within South Africa. Secondly, the chapter discussed the relevant legislative and regulatory policies, which include the *Constitution of the Republic of South Africa* 1996, the *Water Services Act* 1997 (Act No. 108 of 1997), the National Water Act 1998 (Act No. 36 of

1998), the Local Government: Municipal Structures Act 1998 (Act No. 117 of 1998), and the Local Government: Municipal Systems Act 200 (Act No. 32 of 2000). Additional frameworks that were discussed included the National Water Resource Strategy 1 and 2 and the National Development Plan 2030. Chapter 4 concludes by discussing the National Water and Sanitation Master Plan, broken down into three volumes, each with a unique purpose.

The following chapter provides an analysis of the empirical findings of the study.

CHAPTER 5 :
EMPIRICAL FINDINGS, RESULTS AND DATA ANALYSIS

5.1 INTRODUCTION

The subsequent chapter, Chapter 5, discusses this study's empirical findings, results, and data analysis. Chapter 5 begins with a discussion on thematic analysis (TA), the method of analysis utilised for this study. This is followed by a discussion of the observations made by the researcher and the semi-structured interview conducted with municipal officials from SPLM. Thereafter, an in-depth analysis of the collected data is presented using graphs, descriptions, and TA. A detailed overview of the research methodology for this study was provided in Chapter 1 and will not be duplicated here.

5.2 THEMATIC ANALYSIS (TA)

Finding, examining, and interpreting patterns of meaning, or “themes” within data, is possible through Thematic Analysis (Clarke & Braun, 2017:297). TA uses codes to locate said patterns of meaning or themes. The most minor analytical units that can capture interesting aspects of data that are possibly relevant to the study issue are referred to as codes (Clarke & Braun, 2017:297). Clarke and Braun (2017:297) continue by stating that these codes serve as the foundation for themes, which are more prominent patterns of meaning supported by a common organising principle. The researcher’s analytical observations can be arranged and reported using themes. Clarke and Braun (2017:297) assert that TA is useful as it grants the researcher great flexibility in research questions, sample size, data collection, and approaches to meaning generation.

Furthermore, Clarke and Braun (2017:297) state that through “experimental research”, which attempts to understand participants’ thoughts, feelings, and behaviours, TA can find patterns in and across data pertaining to participants’ life experiences, viewpoints, behaviours, and practices. As defined by Kiger and Varpio (2020:2), TA is a method for describing data and involves interpretation in selecting codes and constructing themes. Kiger and Varpio (2020:3) define a theme as a patterned response or meaning derived from the data that informs the research question. Through the use of TA, researchers can identify themes regardless of how frequently an idea or item associated with that theme appears in a data set (Kiger & Varpio, 2020:3). Kiger and Varpio (2020:2) share a similar

view as the previous authors as they state one of the most significant advantages of TA is the level of flexibility offered to the researcher concerning theoretical and epistemological frameworks, research questions, designs, and sample size.

According to Kiger and Varpio (2020), Christou (2023), and Castleberry and Nolen (2018), TA consists of more or less six steps.

- Step 1, familiarising yourself with the data: Although it may be tempting to start coding data and looking for themes right away, getting to know the complete data set first will provide the researcher with a valuable perspective on the raw data and serve as the basis for any other actions that follow (Kiger & Varpio, 2020:5). According to Christou (2023:7), researchers should fully immerse themselves in all information obtained through qualitative methods to become better acquainted with both the breadth and depth of the data's substance. For Castleberry and Nolen (2018:808), this step is essential as the researcher gains a sense of the totality of the data and permits a deeper understanding of word choice or meaning when considered concerning the whole.
- Step 2, generating initial codes: Here, researchers make notes about possible interesting data items, questions, relationships between data items, and other preliminary ideas (Kiger & Varpio, 2020:5). After defining the coding framework, researchers label data extracts with relevant codes and apply the same codes to the whole data set which in turn develops themes. (Kiger & Varpio, 2020:5). According to Christou (2023:7), coding can begin when the researcher has arranged the data into relevant groupings. The authors continue by stating that codes provide aspects of data that the researcher finds interesting (Christou, 2023:7). For Castleberry and Nolen (2018:808), coding, in the realm of qualitative research, is defined as "the process by which raw data are gradually converted into usable data through the identification of themes, concepts, or ideas that have some connection with each other."
- Step 3, searching for themes: The researcher constructs themes by breaking down, combining, comparing, and even visually presenting the relationships between codes. The themes found in the inductive analysis, as was the case with this study, are derived explicitly from the coded data, meaning that they are more closely associated with the original data and representative of the complete set of data (Bruan & Clark, 2006, cited by Kiger & Varpio, 2020:5). According to Kiger and Varpio (2020:6), important themes will provide essential relationships between

data items and address important features of research questions. Furthermore, the researcher cannot be confident which themes will be retained, eliminated, or changed in the final analysis until they have reviewed the themes in step 4. Christou (2023:8) asserts that this step involves a focus on a broader level of themes, essentially entailing a combination of codes to form overarching themes. After reassembling the data via coding, the researcher can take selected portions of the data and examine their connection (Castleberry & Nolen, 2018:812). By doing this, the researcher can start concentrating on interpreting what is happening within and across diverse experiences, beliefs, and histories, enabling the researcher to identify themes throughout the data (Castleberry & Nolen, 2018:812). Themes represent a fundamental aspect of the phenomenon being studied in connection to the research question or objectives of the study.

- Step 4, reviewing themes: This step can be divided into two sections. The first section involves the researcher examining the coded data placed within each theme to ensure proper fit through re-organising and modifying themes (Kiger & Varpio, 2020:6). Here, themes can be added, combined, divided, or discarded. Section two applies similar questions to the themes concerning the entire data set. The researcher determines if the specific themes make sense within the dataset and whether the themes appropriately and accurately capture the entirety of the data set (Kiger & Varpio, 2020:6). Christou (2023:9) provides that during step 4, researchers need to refine the themes by considering whether the generated themes are problematic and whether data extracts fit in specific themes. After the researcher fully understands the various themes, their relationships, and the narrative they wish to present, this step is completed (Christou, 2023:9).
- Step 5, defining and naming themes: In step five, the researcher establishes each topic and provides a narrative explanation, highlighting its significance for the more significant research issue (Bruan & Clark, 2006, cited by Kiger & Varpio, 2020:7). The researcher's task at this point is the TA process is to determine each theme's essence. For Christou (2023:9), this step includes identifying the story that each topic conveys and how each of these stories ties into the larger narrative that the researcher wishes to convey. It does not merely include "labelling" each theme.
- Step 6, producing the report: Here, the researcher should describe the data and offer a justification for why their explanation adequately and richly addresses the research question (Kiger & Varpio, 2020:8). This can be achieved by using both

narrative descriptions and representative data extracts such as direct quotes from participants. Castleberry and Nolen (2018:812) state that these themes' definitions and identification result in interpretations. The answers to the research questions or the study's objectives are found in these interpretations, providing conclusions (Castleberry & Nolen, 2018:812).

The codes which were initially constructed form the themes for the study. The researcher did not see the need to alter the initial codes as they were sufficient in describing the reoccurring ideas and opinions of residents, ward councillors, and municipal officials. The themes are as follows:

- Municipal revenue refers to any capital generated or received by SPLM intended to finance its functioning and operations. This includes purchasing bulk infrastructures such as water pipes, pipe fitting equipment, and vehicles such as water tankers and utility vehicles/“bakkies”.
- Quality water-related services: This refers to any action or behaviour, or lack thereof, of SPLM concerning water services delivery. This includes responding to residents' and ward councillors' questions and concerns in an acceptable and timely manner. This also includes addressing/fixing problems that may lead to water restrictions or shutdowns.
- Accountable and water-sensitive community: This refers to any action or behaviour, or lack thereof, of residents and ward councillors concerning water conservation. This includes ensuring that taps are correctly closed and being conscious of water conservation when water gardens, washing vehicles, and emptying and refilling swimming pools.
- SPLM resources: This refers to resources in all capacities, for example, employees such as administrative clerks and water technicians/technical staff or resources such as water tankers and pipe fitting equipment.
- Perception of water services management in SPLM: This refers to the opinions residents and ward councillors have of SPLM regarding their effectiveness and efficiency.

5.3 OBSERVATIONS

Observation is helpful for researchers seeking to gather information on a phenomenon beyond words and statistics. Ferguson (2018) states that observation is a methodical

approach to collecting data by studying individuals (or occurrences) in their natural environment.

The researcher observed the following:

- Water shutdown on 11 July 2024, 11:00 am – 16:30 pm.
- Water shutdown on 14 July 2024, 11:00 am – 20:00 pm.
- Water shutdown on 15 July 2024, 17:00 pm – 23:45 pm.
- Water shutdown on 24 July 2024, 15:30 pm – 22:30 pm (remained off when researcher went to sleep).
- Water shutdown on 25 July 2024, 07:00 am (off when researcher woke up) – 12:00 pm.

The last time the researcher observed a water shutdown before concluding the observation process was 04 August 2024, at 19:30 pm.

5.4 SEMI-STRUCTURED INTERVIEW

A semi-structured interview is a qualitative research method used to understand a participant's feelings and beliefs on a specific topic (Heath, 2023). The interviewer can change the order, omit unnecessary questions, or come up with new ones as they prepare them in advance. The interviewer should also be ready to elicit additional information and ask follow-up questions.

The study was earmarked to interview five (5) staff members from SPLM who are involved in delivering water services management to residents of the broader Kimberley area. However, SPLM only provided the names and contact details of three (3) skilled staff members for such interviews. Out of the three (3) staff members, only one (1) who was initially identified, participated. Another staff member indicated their willingness to participate; however, the researcher could not establish a meeting, as contact with the staff member had ceased. The researcher attempted to contact the staff member via email and phone calls and arrange an appointment on multiple occasions, but was unsuccessful. The researcher made contact with the third staff member. However, this person indicated an unwillingness to participate in the study, blaming a lack of time on his part.

As a result, a semi-structured interview was conducted with only one (1) skilled participant from SPLM, who had initially been identified. The participant is currently acting in a senior management position within SPLM.

The researcher conducted a semi-structured interview with the identified participant of SPLM on 31 July 2024. The researcher was also granted permission to record the semi-structured interview. The recording was used to document the semi-structured interview. The wording has been changed in some instances. However, the main idea remains the same and unaltered. The questions and answers are summarised below:

- Q1: Would you say that the budget provided by the national government is a challenge for SPLM in terms of old water infrastructure?

  "Budget is a challenge all over the country, it's never enough, especially when dealing with old bulk infrastructure as we are. Although we are lucky to have received funding from National Treasury of R2.5 billion to address the water infrastructure over the next 7 years, starting last year(2025). Coming to ordinary repairs and maintenance, which are much dependent on revenue collection or internal revenue which is always a challenge because we are not collecting enough because people are not paying for services but with national budget we are covered."

  - *Code identified:* Municipal revenue.
    "Coming to ordinary repairs and maintenance, which are much dependent on revenue collection or internal revenue which is always a challenge because we are not collecting enough because people are not paying for services."
- Q2: Would you say or feel that people support effective water use and conservation or do you think that we should 'step up' our game to make your job easier?

  "Look we need to 'step up' the game, let me start there. There are three aspects: 1.), to use water sparely understanding that water is a scarce resource and should be used for necessities and not as a 'nice to have'; 2.), if there are any water leaks and so forth observed by the public it must be reported timeously; 3.), within our internal water infrastructure as communities, if you leave a toilet leaking, that is extra demand on water supply. People also need to pay for water services. Currently we are at about 56% payment for water, which is very low."

  - *Code identified:* Accountable and water-sensitive community.

    "Use water sparely understanding that water is a scarce resource and should be used for necessities and not as a 'nice to have'".

"If there are any water leaks and so forth observed by the public it, must be reported timelessly."

"People also need to pay for water services. Currently we are at about 56% payment for water which is very low."

- Q3: So, the community definitely plays a role?

  "Definitely, a big role. Remember the municipality works on revenue and revenue collected so if you don't pay it will suppress the level of service delivery."

  - *Code identified*: Municipal revenue.

    "Remember the municipality works on revenue and revenue collected"

  - *Code identified:* Accountable and water-sensitive community.

    "If you don't pay it will suppress the level of service delivery."

- Q4: In terms of repairs, if there is a pipe burst, how would you rate the response and performance of technicians and staff? Do they act immediately or is there a process which they need to follow before they can tackle the problem?

  "Obviously there is a process, firstly, all water leaks or service delivery related matter should be reported to the call center for them to assign the work to the right person to respond. Once that person has been assigned, depending on the information which was given, sometimes it's necessary to first do observations to determine the tools and materials which will be required, but when information is accurate, and they have an idea of what to do, they can go with the necessary tools and materials. Our turn-around time, depending on the size of the pipe burst, should be within 1 to 2 hours, and if it's a house connection, within 24 hours. We also have capacity constraints which may affect this turn-around time, and even if it's not repaired, it will be addressed."

  - *Code identified:* Accountable and water-sensitive community.

    "All water leaks or service delivery related matter should be reported to the call center."

    "Depending on the information which was given."

    "We also have capacity constraints which may affect this turn-around time."

  - *Code identified:* SPLM resources.

    "Should be reported to the call center for them to assign the work to the right person to respond."

    "Once that person has been assigned, depending on the information which was given sometimes it's necessary to first do observations to determine the tools and

materials which will be required, but when information is accurate, and they have an idea of what to do, they can go with the necessary tools and materials."

"Sometimes it's necessary to first do observations to determine the tools and materials which will be required."

"We also have capacity constraints which may affect this turn-around time."

- *Code identified:* Municipal revenue.

  "We also have capacity constraints which may affect this turn-around time."

- Q5: Would you say that the capacity problem is one of physical equipment or technical staff to address these problems?

  "It's mainly on human resources, we don't have enough people and teams, but we have advertised to address that gap. Kimberley is big, we need to have at least about twelve pipe fitting teams and at the moment we only have seven, which is a constraint. Fleet is also a problem, but we bought four 'bakkies'/vehicles to augment that problem, but the problem is with human resource."

  - *Code identified:* SPLM resources.

    "It's mainly on human resources."

    "We don't have enough people and teams, but we have advertised to address that gap."

    "Kimberley is big, we need to have at least about twelve pipe fitting teams and at the moment we only have seven, which is a constraint."

    "Fleet is also a problem, but we bought four 'bakkies' to augment that problem."

    "But the problem is with human resource."

- Q6: In terms of overall resilience, what is Sol Plaatje doing behind the scenes for these water shortages and restrictions to stop or occur on a less frequent basis?

  "From the municipality's point of view, we need to beef up our human resources, so we have enough teams to respond, we are addressing the issue of planted equipment which is also critical in terms of our response time and effective reaction. From the community, there are basically two main things, 1.) you have to pay for services because non-payment is a problem which impacts service delivery. 2.), use water sparingly and apply water conservation at a household level. It is very important."

  - *Code identified*: SPLM resources.

    "From the municipality's point of view, we need to beef up our human resources, so we have enough teams to respond."

    "We are addressing the issue of plant equipment which is also critical in terms of our response time and effective reaction."

  - *Code identified:* Accountable and water-sensitive community.

“You have to pay for services because non-payment is a problem which impacts service delivery.”

“Use water sparingly and apply water conservation at a household level. It is very important.”

With assistance from the constructed code and now theme, Municipal revenue, the researcher determined that this is one of the first key aspects of service delivery. During the semi-structured interview, it became apparent that although SPLM has received an estimated amount of R2.5 billion from the National Treasury, this money is not used to address the day-to-day challenges faced by recipients of water services in SPLM. Instead, this amount is used to address bulk water infrastructure. To address “ordinary repairs and maintenance”, SPLM relies on revenue collected from the residents. It is crucial that residents pay for services as it greatly impacts turn-around time, and a lack thereof may lead to constraints and suppress the level of water services delivery in particular.

The second code, now the theme, is accountable and a water-sensitive community. On multiple occasions, the interviewee stated that inhabitants should not underestimate their role in water service delivery. As previously stated, not paying for services could impact the turn-around time of repairs and maintenance and may lead to constraints on the responses and effectiveness of SPLM. Payment for services is currently at 56%, considered very low. At a household level, inhabitants should practice water conservation and use it sparingly. They should understand that water is a scarce resource and should be appreciated as such. Residents should also understand that they can do a lot more to assist SPLM; this includes reporting pipe leaks and pipe bursts to SPLM call centre promptly and accurately. Timely and accurate information is necessary to determine the required response type and the tools and materials needed to address the issue. If these requirements are not met, turn-around time is greatly affected as observations by an SPLM staff member, such as a pipe fitter or water technician, should first be conducted to determine the type of resource required and the tools and materials needed to address the problem.

The third code and theme identified during the semi-structured interview was SPLM resources. As stated above, a pipe fitter or water technician should first be assigned to a problem before they can act. This is why the interviewee emphasises the importance of timely and accurate information. The interviewee acknowledged that SPLM needs to strengthen the capacity of its human resources as this is one of the main challenges it

faces in terms of effective and efficient response. Currently, seven pipe fitting teams are deployed across Kimberley, and according to the interviewee, at least 12 pipe fitting teams are required. SPLM addresses this issue by advertising the various positions within these teams on the job market. Furthermore, the interviewee also provided that the fleet is a problem. However, they have acquired four extra vehicles to augment the problem.

It is possible to deduce that all three themes mentioned above are interlinked and connected. To address “ordinary repairs and maintenance” called for by residents/inhabitants, SPLM needs their assistance paying for service delivery, as this revenue makes repairs and maintenance possible. Residents should also provide SPLM call centre with timely and accurate information on pipe leaks or bursts so they can be addressed effectively and efficiently. Furthermore, this cooperation also includes the fact that residents should practice water conservation and use it sparingly to reduce the water demand faced by SPLM. Suppose residents consistently commit to paying municipal fees. SPLM can use these funds to expand their human resources and equipment capacity to become a more effective and efficient WSA/WSP. For SPLM to improve water service delivery, inhabitants must be committed to water conservation and assist where possible.

5.5 QUESTIONNAIRE COMPLETION BY RESIDENTS: ANALYSIS OF DATA

The following sections will provide an analysis and discussion of the responses provided by participants.

Section A: Consent form

The sample of this study consisted of thirty (30) residents of the selected areas, including Hadison Park, Carters Glen, New Park, Southridge, Galeshewe, and Roodepan. Initially, the study was also supposed to include five (5) staff members of SPLM and five (5) ward councillors. However, the researcher only made successful contact with two (2) staff members and three (3) ward councillors. In total, the study consisted of thirty-five (35) participants. All thirty-five (35) participants agreed to sign the consent form in Section A, indicating their willingness to participate in the study. The consent form is attached as an annexure to this study.

Section B: Biographical data

5.5.1.1 Gender

Out of thirty-five (35) participants, twenty-three (23) were females and twelve (12) were male. It can thus be deduced that females are generally more willing to help others than their male counterparts. The researcher approached households, and the household would select a member from within, concluding that females are more willing to help.

5.5.1.2 Age

The age groupings were categorised as under 25, 26-35, 36-45, 46-55, and above 55. Each age category was populated as follows:

- Under 25: 1
- 26-35: 7
- 36-45: 12
- 46-55: 12
- Above 55: 3

Here, it can be deduced that due to a high number of participants being older than age 35 (77%), their perspectives and opinions regarding SPLM were more accurate as they have been receiving services from SPLM is or were employed by SPLM longer than those in other age categories.

5.5.1.3 Level of education

This section was only relevant to staff members of SPLM. As stated above, the researcher initially intended to include five (5) staff members from SPLM who are active in delivering water services to residents. However, SPLM only provided the necessary approval to include three (3) staff members. Out of the three (3) staff members, only one (1) who was initially identified participated. One (1) staff member indicated their willingness to participate; however, the researcher could not establish a meeting, as contact with the staff member had ceased. The researcher made contact with the third staff member. However, they indicated they were unwilling to participate in the study because they did not have time to do so, leading to the researcher identifying another staff member in the same office, bringing the total number of participants from SPLM to two (2).

Their level of education included an Honours degree and a Bachelor's degree. It can, therefore, be deduced that the participant had the relevant qualifications and skill on demand to render water services management.

5.5.1.4 Position in SPLM

This section was only relevant to staff members of SPLM. The positions occupied included senior management and technician. One of the main criteria for advancing to senior management in any organisation is that an individual should be very experienced in their field. In this instance, it is experienced in water services management. This is directly linked to a vast amount of field-specific knowledge and skills. Similarly, an individual should meet all the technical and educational requirements to qualify as a technician. Due to their positions within SPLM and the criteria to advance into these positions, it can be deduced that their responses are highly credible and information-rich.

5.5.1.5 Years in current position

This section was only relevant to staff members of SPLM. The years in the abovementioned positions are 6-10 years and less than 5 years. As a result of acting in their positions for at least one year, it can be deduced that they meet the professional standards to remain in their positions. This makes their responses credible and information-rich as they have the necessary knowledge to be appointed into these positions and continue acting in them.

Section C, PART 1 (Residents/Ward councillors): Likert-scale statements

This section represents the collected data by way of graphs and relevant explanations. Part 1 of the questionnaire is intended to gain insight into the perception of residents and ward councillors regarding water services management within SPLM. Participants were provided with a statement and had to indicate how much they agree or disagree with it.

5.5.1.6 Statement 1

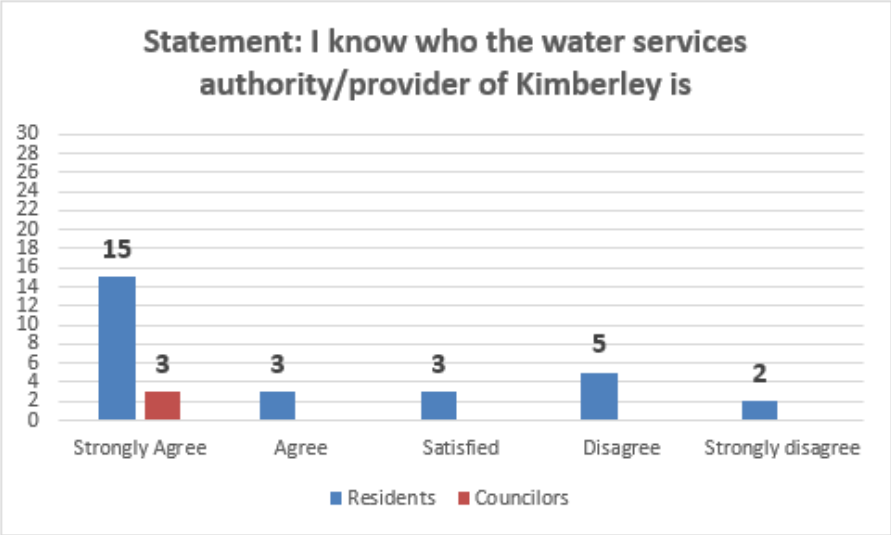


Figure 5.1: Statement 1 – I know who the WSA/WSP of Kimberley is

Statement 1 intended to determine whether participants knew who the WSA and WSP in their area were. The data showed that fifteen (50%) participants representing the residents, including all ward councillors, and three (100%) strongly agreed they knew who the WSA/WSP was. Three (10%) participants representing the residents agreed, while five (17%) participants representing the residents disagreed, and two (7%) participants representing the residents strongly disagreed, meaning that they were unaware of who the WSA and WSP were.

- *Code identified:* Perception of water services management in SPLM.

The response indicated that most participants knew who the WSA and WSP were, although a reasonable number were unaware of who SPLM was. Chapter 2 (cf. 2.8.4) states that this study found its theoretical grounding in the Social Contract Theory. The SCT was initiated when the residents of Kimberley voted to elect their representatives in the council of the local municipality and agreed to pay for their services. If residents are not fully aware of who their WSA/WSP is, they cannot fully uphold their part of the SCT. It can be deduced that residents are unaware of how to do it or should support SPLM processes. Examples of not supporting SPLM could be that the residents do not pay for services and utility, which influences the revenue stream of SPLM and negatively affects service delivery.

5.5.1.7 Statement 2

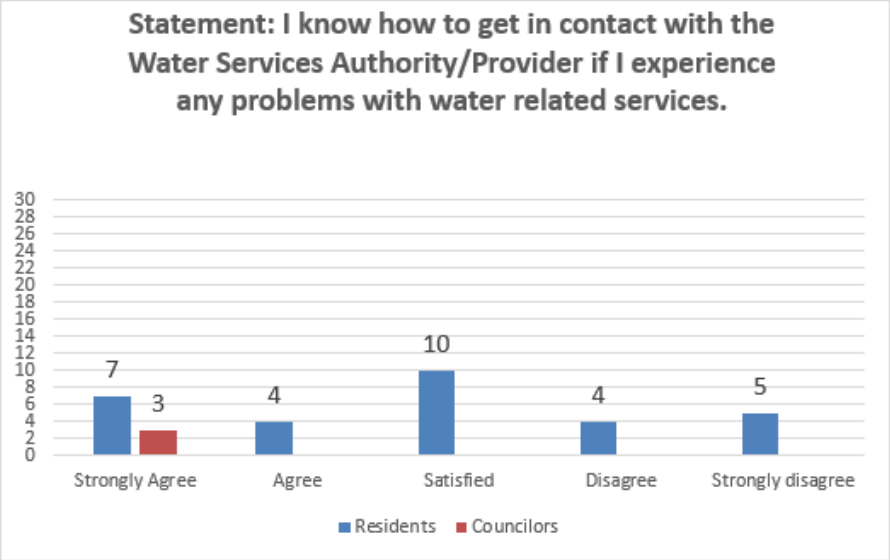


Figure 5.2: Statement 2 – I know how to get in contact with the WSA/WSP

Statement 2 also intended to determine participants' knowledge regarding SPLM. Here, the researcher determined how many participants knew how to get in contact with the WSA/WSP. Seven (23%) participants representing the residents, including all ward councillors, and three (100%) strongly agree. Four (13%) participants representing the residents agreed that they knew how to get in contact with WSA/WSP if they experienced any water-services-related problems, while four (13%) participants representing the residents disagreed, and five (17%) participants representing the residents strongly disagreed, meaning they did not know how to get in contact with the WSA/WSP. The majority of participants representing the residents, ten (30%), were satisfied with the statement.

- *Code identified*: Perception of water services management in SPLM.

It can be deduced that if participants are unaware of who SPLM is and how to contact them, they will be unable to report water services complaints, including leaking pipes/pipe bursts in their communities. This affects not only the participants' perception, as they would think that their municipality is ineffective at addressing water-related issues. It also increases the water demand on SPLM and reduces their effectiveness when responding to water-related issues. In addition, participants who do not know how to contact their WSA/WSP cannot fully uphold the SCT.

5.5.1.8 Statement 3

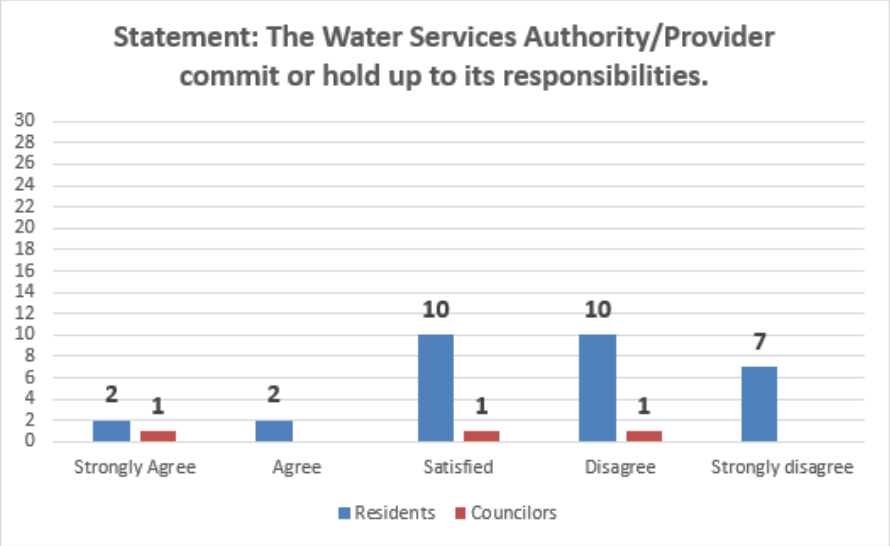


Figure 5.3: Statement 3 – Perceptions of the WSA/WSP commitment to its responsibilities

When asked if the WSA/WSP commits to or upholds its responsibilities, only two (2/30, 7%) participants represent the residents, and one (33%) ward councillor strongly agrees. Two (7%) participants representing the ward councillors agreed. Ten (33%) participants representing the residents and one ward councillor (33%) were only satisfied with the statement, while the majority of participants representing the residents, ten (33%), and one (33%) ward councillor disagreed. Seven (23%) participants representing the residents strongly disagreed.

- *Codes identified:*
  a) Perception of water services management in SPLM.
  b) Quality of water-related services.

Seventeen out of thirty participants (57%) did not agree with the statement. Therefore, it can be deduced that members of the community believed that SPLM did not commit to or uphold its responsibilities. It is thus possible to conclude that SPLM does not uphold its responsibilities within the SCT agreed upon with residents. This also goes against various legislative frameworks, such as those identified in Chapter 4, emphasising that municipalities should ensure effective and efficient service delivery. Furthermore, it can be deduced that SPLM does not practice the *Batho Pele Principles* identified in Chapter 3 (cf. 3.6.2) of this study.

5.5.1.9 Statement 4

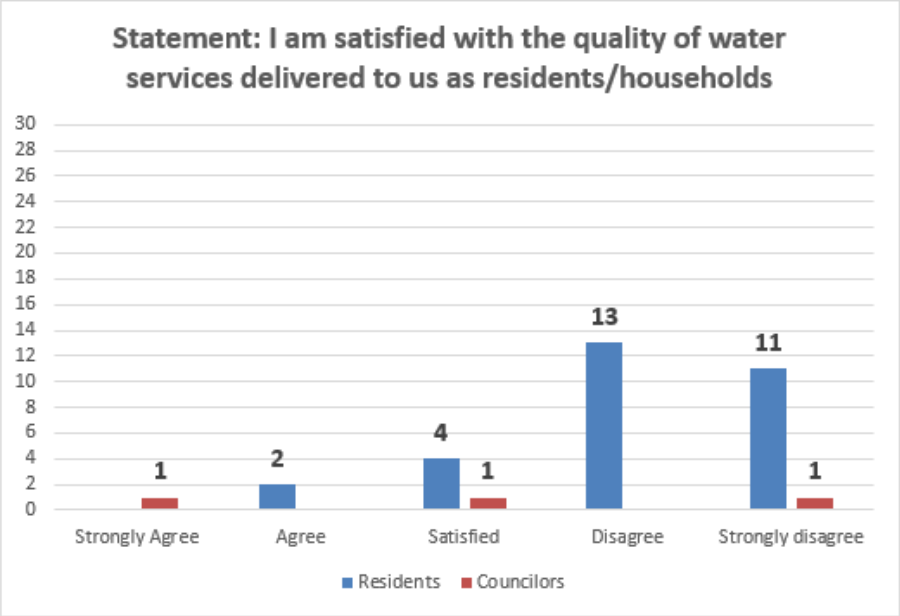


Figure 5.4: Statement 4 – Satisfaction with water quality and service delivery to residents/households

Most participants disagreed with the provided statement. Thirteen (43%) participants representing the residents disagreed, while eleven (37%) participants strongly disagreed. One (33%) participant representing the ward councillors strongly agreed with the statement, another participant (33%) representing the ward councillors was only satisfied, and the last ward councillor (33%) strongly disagreed. Only two (7%) participants representing the residents agreed, and four (13%) participants representing the residents were satisfied.

- *Codes identified:*
  a) Perception of water services management in SPLM.
  b) Quality of water-related services.

Here, it can also be deduced that SPLM does not deliver quality water services to the inhabitants of the broader Kimberley, as most participants disagreed with the statement provided. This also makes it possible to deduce that SPLM do not adhere to the legislative framework as identified in Chapter 4 or uphold the *Batho Pele Principles* identified in Chapter 3 (cf. 3.6.2) of this study.

5.5.1.10 Statement 5

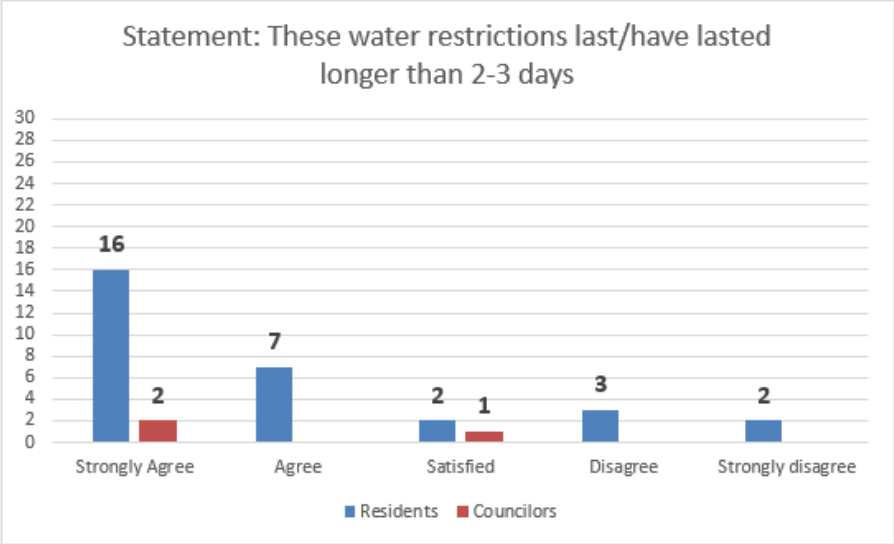


Figure 5.5: Statement 5 – Duration pertaining to water restrictions

Most participants agreed with the provided statement. Sixteen (53%) participants representing the residents and two (67%) participants representing the ward councillors strongly agreed that water restrictions last/have lasted longer than 2-3 days. Seven (7/30, 23%) participants representing residents in SPLM agreed, while two (7%) participants from the residents and one (33%) from the ward councillors were only satisfied. Three (10%) participants representing the residents disagreed, and two (7%) strongly disagreed.

- *Codes identified:*
  a) Perception of water services management in SPLM.
  b) Quality of water-related services.

It can be deduced that the water restrictions last/have lasted longer than 2-3 days, which inconveniences residents. According to the literature in Chapter 3 (cf. 3.8.4-3.8.9) and Chapter 4 of this study, adequate planning surrounding water services is vital. As a result of the high number of participants agreeing that water restrictions have lasted longer than 2-3 days, it can be deduced that SPLM should improve their planning to minimise these restrictions from occurring in the future.

5.5.1.11 Statement 6

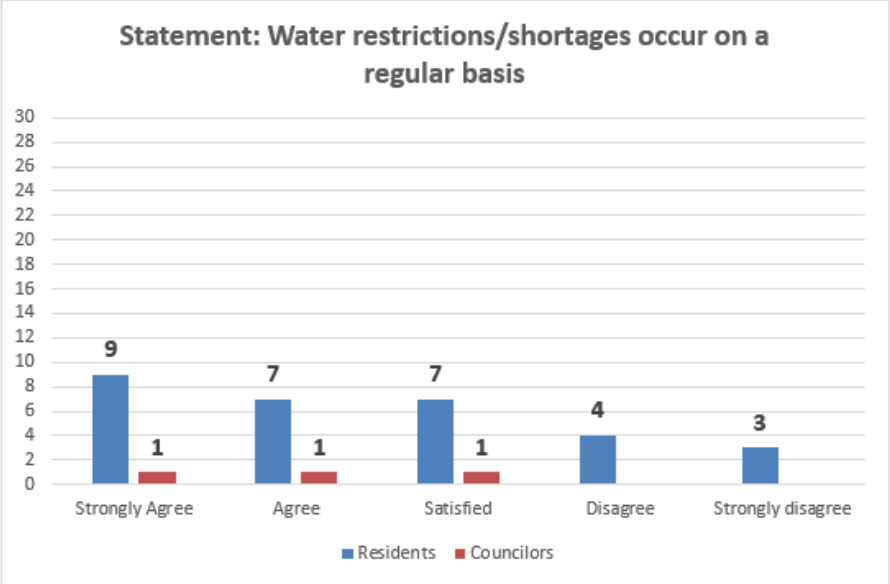


Figure 5.6: Statement 6 – Perception of water restriction/shortage frequency

Nine (30%) participants representing the residents and one (33%) representing the ward councillors strongly agreed with the statement. Seven (23%) participants from the residents and one (1/3, 33%) of the ward councillors agreed with the statement. Seven (23%) participants and one (33%) from the ward councillors were satisfied with the statement, while four (13%) participants representing the residents disagreed, and three (10%) participants representing the residents strongly disagreed.

- *Codes identified:*
  a) Perception of water services management in SPLM.
  b) Quality of water-related services.

As a result of most residents agreeing with or being satisfied with the statement, it can be deduced that water restrictions/shortages occur regularly. Again, this is against the right of access to water as enshrined in *The Constitution* (1996), amongst other legislative and regulatory frameworks identified in Chapter 4. This is also a breach of the SCT as residents pay SPLM for uninterrupted water supply and effective and efficient water services management.

5.5.1.12 Statement 7

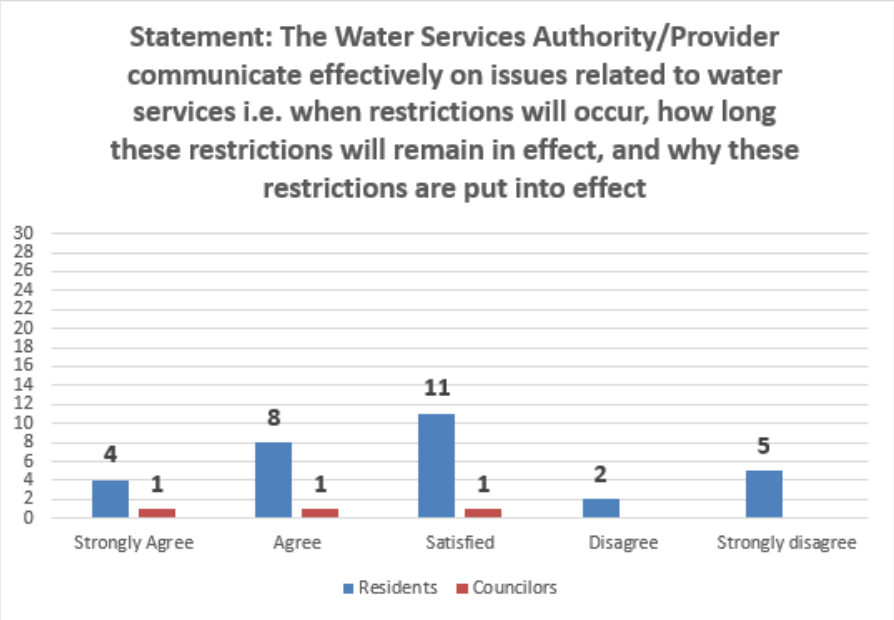


Figure 5.7: Statement 7 – Perceptions of communication by the WSA/WSP on water service-related problems

Most residents (37%) and one (33%) ward councillor were satisfied with the statement. Four (13%) participants represented the residents, and one (33%) ward councillor strongly agreed, while eight (27%) participants represented the residents and one (33%) ward councillor agreed. Two (7%) participants representing residents disagreed, and five (17%) participants representing the residents strongly disagreed.

- *Codes identified:*
  a) Perception of water services management in SPLM.
  b) Quality of water-related services.

As a result of most residents agreeing or being satisfied with the statement, it can be deduced that SPLM does communicate with residents when restrictions occur, how long they will remain in effect, and why they are put into effect. This is under communicative rationality, referred to in Chapter 1 (cf. 1.6). Communicative rationality refers to the interaction of two or more agents to find a mutual understanding regarding a specific topic (Niemi, 2005:516). Communicative rationality emphasizes the application of knowledge through language and action. Furthermore, Chapter 1 (cf. 1.6) also provides that this theory can aid in improving communication between SPLM and residents regarding water service delivery, i.e. SPLM will clearly explain to all residents affected by water restrictions why and when these restrictions will occur.

5.5.1.13 Statement 8

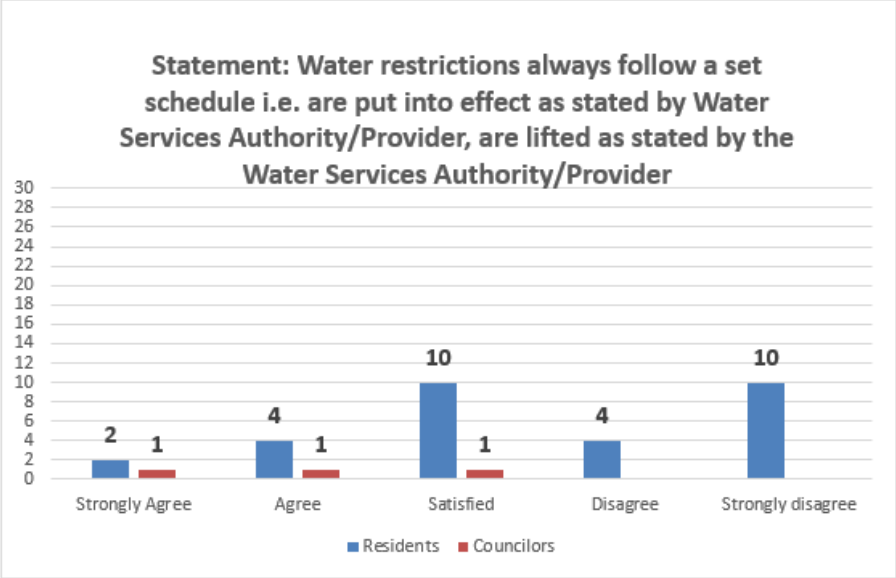


Figure 5.8: Statement 8 – Perception of the reliability of the set schedule by the WSA/WSP

With this statement, only two (7%) participants representing the residents and one (33%) ward councillor strongly agreed, and four (13%) participants representing the residents and one (33%) ward councillor agreed. Ten (33%) participants represented the residents, and one (33%) ward councillor was satisfied with the statement. Four (13%) participants representing the residents disagreed, and ten (33%) participants representing the residents strongly disagreed.

- *Codes identified:*
  a) Perception of water services management in SPLM.
  b) Quality of water-related services.

From the data above, it is possible to deduce that restrictions follow the proposed schedule; however, due to many residents disagreeing with the provided statement, fourteen (47%) deduced that the schedule provided by SPLM is not always accurate. When turn-around time is affected or changed, SPLM should alert residents as soon as possible to avoid further inconvenience.

5.5.1.14 Statement 9

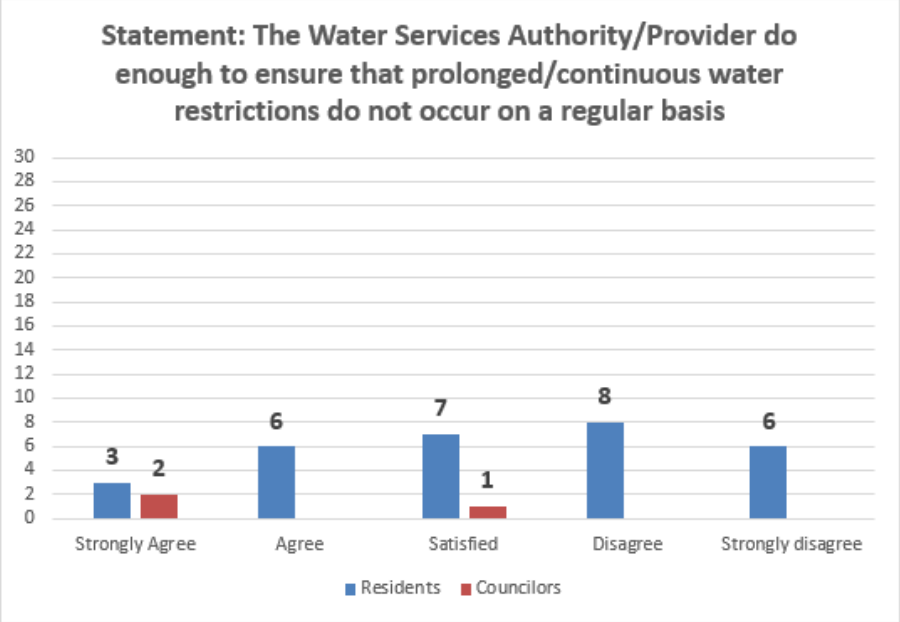


Figure 5.9: Perceptions on the frequency of prolonged water restrictions by the WSA/WSP

Three (10%) participants represent the residents, and two (67%) ward councillors strongly agree that SPLM does enough to ensure that water restrictions do not occur regularly. Six (20%) participants representing the residents agreed with the statement, while seven (23%) participants representing the residents and one (33%) ward councillor were satisfied with the statement. Eight (27%) participants representing the residents disagreed, and six (20%) participants representing the residents strongly disagreed.

- *Codes identified:*
  a) Perception of water services management in SPLM.
  b) Quality of water-related services.

It can be deduced that SPLM does apply efforts to ensure that prolonged/continuous water restrictions do not occur regularly. However, many residents (fourteen) (47%) disagreed with the statement, which means there is room for improvement on SPLM side.

These questions were based on the Social Contact Theory, The Social Exchange Theory, The Public Choice Theory, and elements of Communicative Rationality. Residents entered into SCT with SPLM, and as a result, they expect that SPLM will commit to or uphold its responsibilities as WSA/WSP. This means that they are provided with effective and efficient water services management as they pay for this. This is linked to the Social

Exchange Theory, which emphasises the dismay of residents with SPLM. Chapter 2 (cf. 2.8.3) argues that the social exchange theory requires a series of interactions or transactions that obligate complementary actions from another entity (Fan, Mahmood & Uddin, 2019:103). This implies that one party's specific action or behaviour in the exchange process imposes a mutual duty on the other party. Another deduction that can be made based on the theory of public choice is that residents believe that although they support SPLM and pay for municipal services, they gain no real value. They do not benefit as much as they are lawfully required to. It can also be deduced that SPLM is at risk of losing support from residents and that SPLM is not exerting the necessary effort to keep residents loyal, which would compel them to pay for water services. As previously stated, communicative rationality can improve the communication between SPLM and its residents. This should be prioritised as it can be deduced that these communication channels are sometimes not as effective and timely as they should be, which may lead to dire consequences for both SPLM and its residents. Many residents share a similar opinion regarding their perception of SPLM and the quality of their water services: unsatisfied.

Section C, PART 2 (Residents/Ward councillors): Likert-Chart questions

While Part 1 of the questionnaire intended to gain insight into the perception that residents and ward councillors might have of SPLM, Part 2 intended to gain insight into the water use practices of residents and ward councillors. Participants were given a question to which they had to respond with yes, no, sometimes and N/A.

5.5.1.15 Question 1

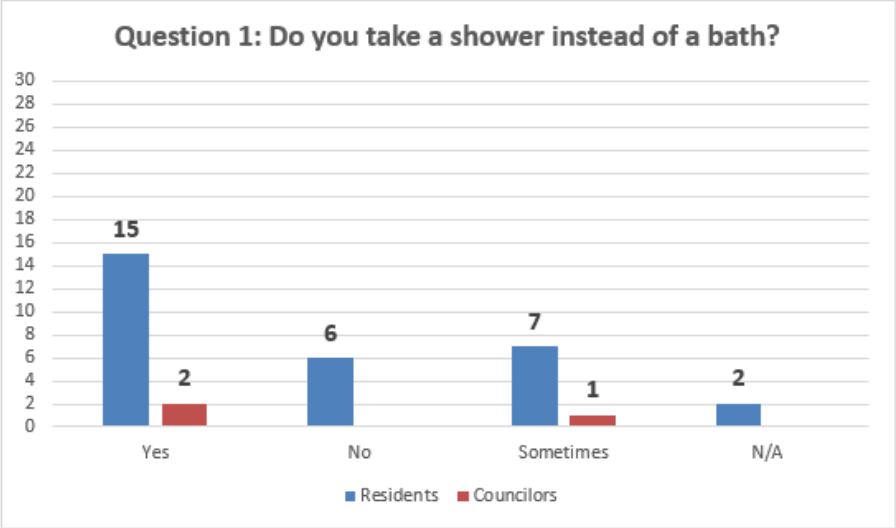


Figure 5.10: Question 1 – Bath or shower?

Fifteen (50%) of resident participants and two (67%) participants representing the ward councillors indicated taking a shower instead of a bath. Six (20%) participants from the residents said “no”, and seven (23%) participants representing residents replied “sometimes”, including one (33%) participant representing the ward councillors.

- *Code identified:* Accountable and water-sensitive community.

According to SA Homeowner Online (2023), when selecting a shower, comfort is derived from both cost-effectiveness and water efficiency. Regarding water and sewer expenses, bathing might cost up to five times as much as showering. It can be deduced that most residents are not only opting for the more budget-friendly option but also easing the water demand faced by SPLM.

5.5.1.16 Question 2

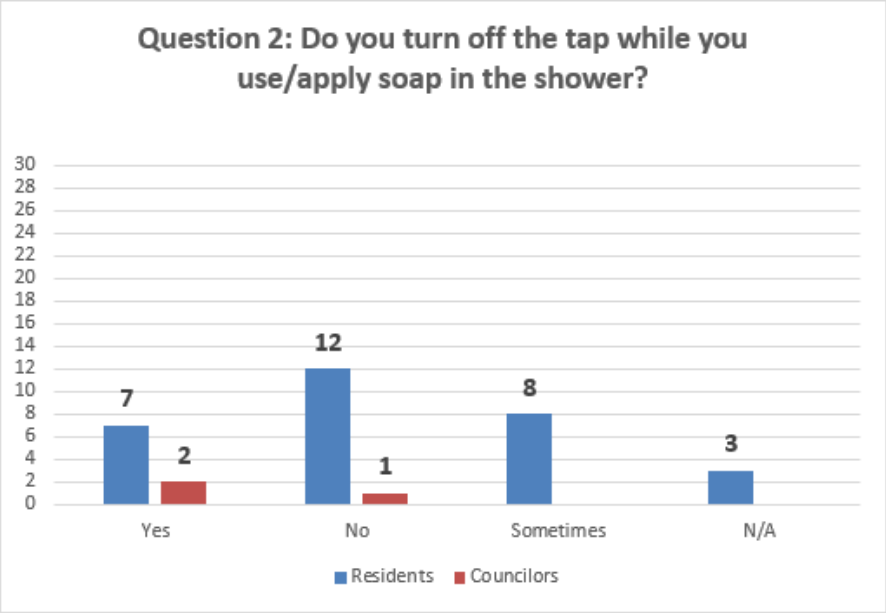


Figure 5.11: Question 2 – Turning off the tap while soaping in the shower

Twelve (40%) participants representing the residents and one (33%) ward councillor indicated that they do not turn off the tap while they apply soap in the shower. Seven (23%) participants representing the residents and two (67%) ward councillors indicated that they do turn the tap off. At the same time, they apply soap, while eight (27%) participants representing the residents indicated that they only do it sometimes.

- *Code identified:* Accountable and water-sensitive community.

The WRC (2024:17) states that saving water could be achieved by turning off the shower taps while you soap up, only opening them again to rinse off. If residents of the greater Kimberley follow this tip, it would both be beneficial for economic reasons and to ease the water demand placed on SPLM.

5.5.1.17 Question 3



Figure 5.12: Question 3 – Duration of shower

Most residents (twelve) (40%) and two ward councillors (67%) indicated that it does not take them longer than five minutes to shower. Eight (27%) participants representing the residents and one (33%) ward councillor indicated that it does take longer than five minutes to shower, while seven (23%) participants representing the residents indicated that this is only sometimes the case.

- *Code identified:* Accountable and water-sensitive community.

Ariston Group (2023) provides that for a 5-minute shower, consumption is around 75-90ℓ of water, which increases to 160ℓ of water for a 10-minute shower and 240ℓ of water for a 15-minute shower. Therefore, it can be deduced that residents who shower for 5 minutes or less are using water effectively and efficiently and are possibly saving upwards of 90ℓ of water per shower.

5.5.1.18 Question 4

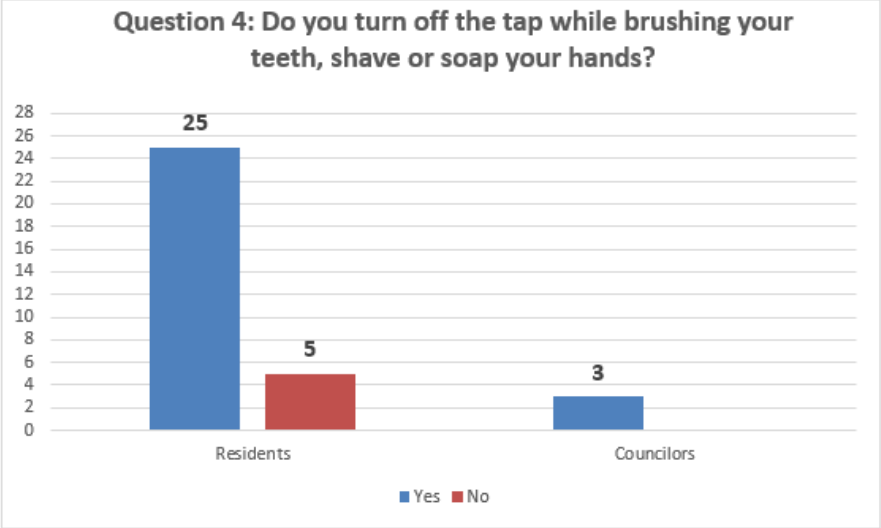


Figure 5.13: Question 4 – Saving water while brushing teeth and handwashing

Most residents (twenty-five) (83%) and all ward councillors (100%) indicated that they do turn off the tap while brushing their teeth. In comparison, five (17%) participants representing the residents indicated that they do not turn off the tap while brushing their teeth.

- *Code identified:* Accountable and water-sensitive community.

This is a very water-conscious action taken by residents. For example, if you turn off the tap every time while brushing your teeth, you may save an estimated amount of 12ℓ of water (Waterwise, 2024). It is possible to save upwards of 12ℓ of water each time by applying this logic to shaving and soaping your hands, which would benefit SPLM and its residents.

5.5.1.19 Question 5

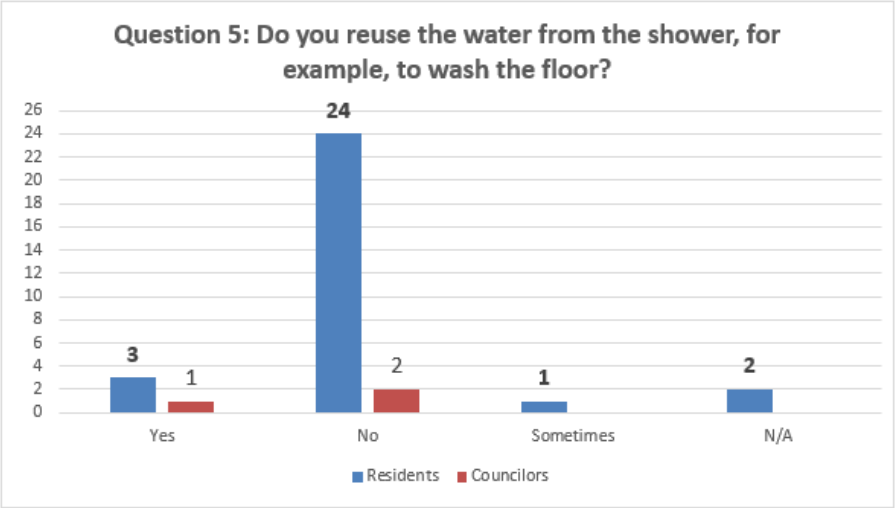


Figure 5.14: Question 5 – Re-using bath water to wash the floor

Twenty-four (80%) participants representing the residents and two (67%) ward councillors indicated that they do not reuse water from the shower. In comparison, three (10%) participants represented the residents, and one (33%) ward councillor did.

- *Code identified:* Accountable and water-sensitive community.

When water is collected while waiting to become hot, water that is not “too dirty” can be repurposed and referred to as grey water. For the Water Education Foundation (2024), grey water is previously used in commercial, industrial, and residential settings, including the leftover, untreated water generated from washing machines, bathtubs, and bathroom sinks. Furthermore, the Water Education Foundation (2024) states that substituting part of the water that would have been used for outdoor irrigation with grey water can help relieve pressure on municipal water supplies. Therefore, it can be deduced that residents opting to reuse grey water will decrease the demand for water services. The benefits extend past SPLM to the residents themselves as they will not be using as much water, which is cost-effective.

5.5.1.20 Question 6

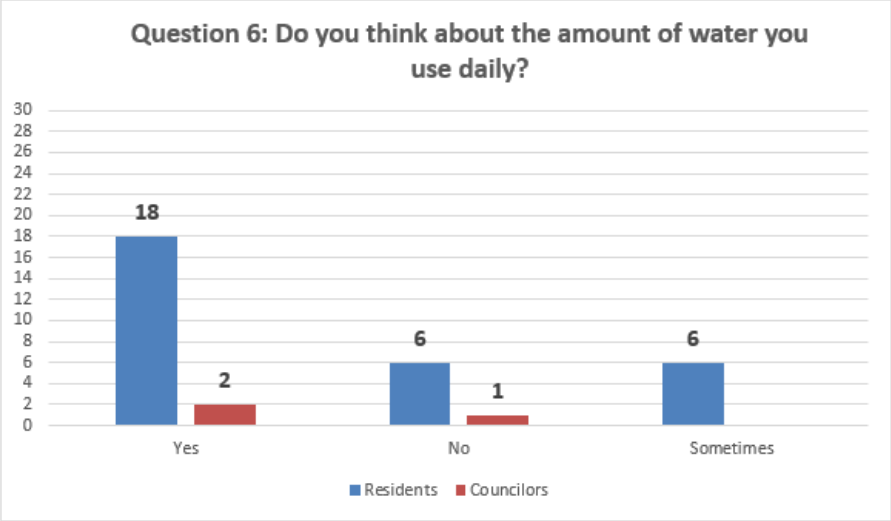


Figure 5.15: Question 6 – Thoughts on water usage

Eighteen (60%) residents and two (67%) ward councillors indicated that they think about how much water they use. Six (20%) participants represent the residents, and one (33%) ward councillor does not think about the amount of water they use, and six (20%) participants representing the residents only think about it sometimes.

- *Code identified:* Accountable and water-sensitive community.

It can be deduced from the responses that participants, to some extent, try to practice water conservation in a manner which is beneficial in terms of cost efficiency. This conservation method also eases water demand on SPLM, which benefits all parties.

5.5.1.21 Question 7

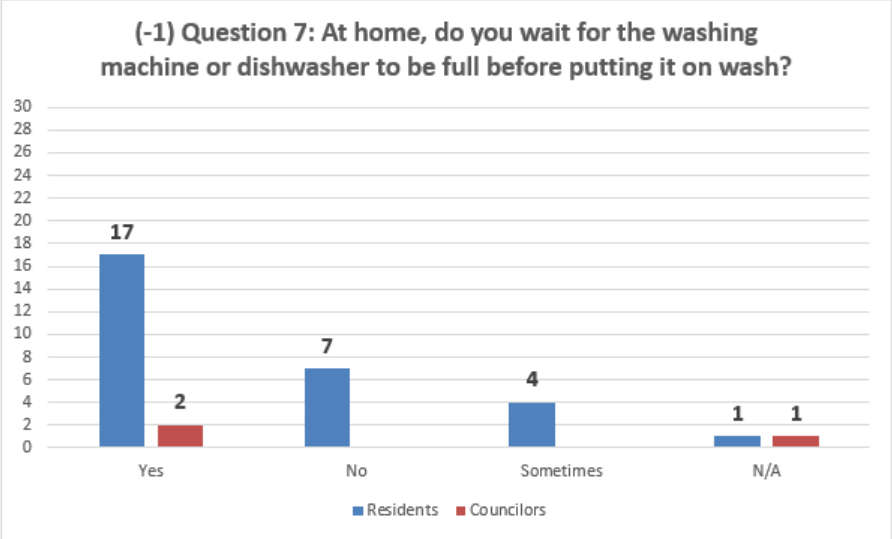


Figure 5.16: Question 7 – Using the washing machine

Seventeen (59%) participants representing the residents and two (67%) ward councillors indicated waiting for the washing machine/dishwasher to be complete before using it. At the same time, seven (24%) participants representing the residents do not wait, and four (14%) participants representing the residents only do it sometimes.

- *Code identified:* Accountable and water-sensitive community.

From the responses above, it is clear that participants practice water conservation where possible. According to the WRC (2024:22), advances in technology over the past 20 years have reduced the average water consumption of washing machines to about 50ℓ per wash or less. This means that residents who wait until their washing machine is complete would use an estimated amount of 50ℓ % water to completely do all their laundry instead of using 50ℓ % water for half a load, which is wasteful. The Cleanipedia Team (2023) provides that the average dishwasher water usage for a standard-sized dishwasher is around 15ℓ per load. The same logic can be applied here as with the washing machine. If residents wait until their dishwasher is complete, they will only use 15ℓ of water to wash all their dishes instead of using repeatedly using15ℓ of water for smaller loads.

5.5.1.22 Question 8

Question 8 intended to determine whether residents ensured their taps were closed properly. A hundred per cent (100%) of participants representing the residents indicated

that they do close taps properly, including all participants (100%) representing ward councillors.

- *Code identified:* Accountable and water-sensitive community.

A dripping tap can waste over 300ℓ of water a year (The Energy & Water Sector Education Training Authority, 2024). Therefore, participants practice water conservation following prescribed legislation by ensuring taps are closed properly. This behaviour is very beneficial for SPLM as it can reduce the water demand over the long term.

5.5.1.23 Question 9

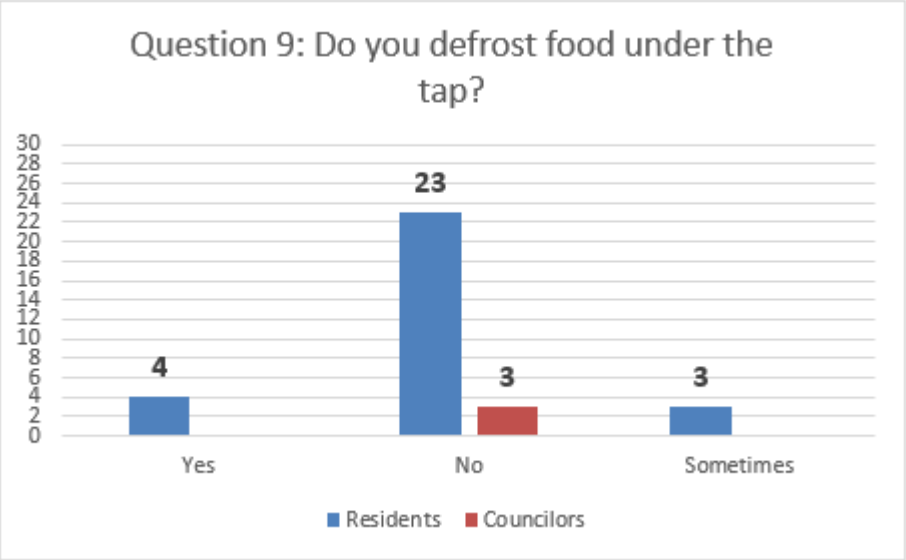


Figure 5.17: Question 9 – Defrosting food under a running tap

Twenty-three (77%) participants representing the residents and all ward councillors (100%) indicated that they do not defrost food under the tap. In comparison, four (13%) participants indicated that they do, and three (10%) participants indicated that they only do this sometimes.

- *Code identified:* Accountable and water-sensitive community.

Defrosting food under a tap is very wasteful and should be avoided as much as possible. Any water-conscious action taken by residents produces both short- and long-term benefits for themselves and SPLM. There are several ways to defrost food while conserving water. When defrosting or washing food, using a basin or large bowl full of

cold/hot water is more efficient than leaving the tap running, as this water can be repurposed to use in your garden or water house plants (Vinton, 2019). Residents must collect and reuse grey water whenever possible.

5.5.1.24 Question 10



Figure 5.18: Question 10 – Frequency of car washing

Most participants, representing the residents (80%) and all ward councillors (100%), indicated that they do not wash their cars more than once a week. In comparison, only one (3%) participant representing the residents indicated that they wash their cars more than once a week.

- *Code identified:* Accountable and water-sensitive community.

Castle Water (2024) states that washing your vehicle can use as much as 500ℓ of water; in addition, ExpressCarWash (2018) provides that the final rinse of your car can use up to 150ℓ of water or even 350ℓ of water. Thus, It is possible to deduce that residents who only wash their vehicles once a week save up to 500ℓ of water.

5.5.1.25 Question 11

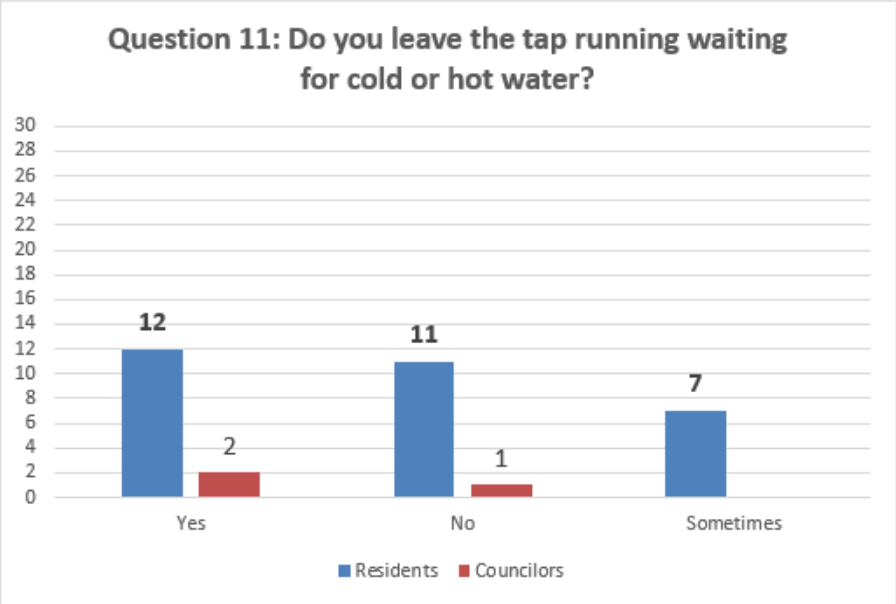


Figure 5.19: Question 11 – Leaving the tap running to regulate temperature

Twelve (40%) participants representing the residents and two (67%) ward councillors indicated leaving the tap running and waiting for cold or hot water. In comparison, eleven (37%) participants representing residents and one (33%) ward councillor indicated that they do not leave the tap running. Seven (23%) participants representing the residents indicated that they only do this sometimes.

- *Code identified:* Accountable and water-sensitive community.

Most participants leave the tap running while waiting for hot or cold water, which could lead to an increase in the demand for water from SPLM. This is also not beneficial to the residents as they will still have to pay for the water they have used. The importance of grey water is again highlighted as it has beneficial outcomes for residents and SPLM. Waiting for the tap to run cold can waste more than 10ℓ a day (WRC, 2024:22). Therefore, it can be deduced that a significant volume of grey water which could have been repurposed is lost.

5.5.1.26 Question 12

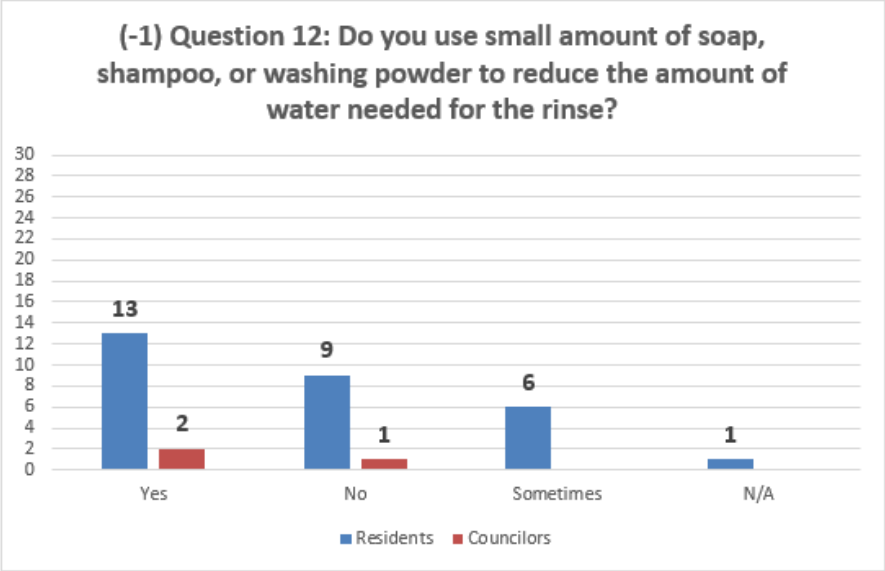


Figure 5.20: Question 12 – Limiting the amount of water used

Thirteen (45%) participants representing the residents and two (67%) ward councillors indicated using small amounts of soap, shampoo, or washing powder to reduce the water needed for the rinse. Nine (31%) participants represented the residents, one (33%) ward councillor indicated that they do not do this, and six (21%) participants representing the residents indicated that they only do this sometimes.

- *Code identified:* Accountable and water-sensitive community.

Being an accountable and water-sensitive community does not always require actions such as collecting grey water, which can be considered tedious. Being a responsible and water-sensitive community also includes small actions such as adequately closing taps. It can be assumed that the more soap, shampoo, or washing power you use, the more water will be needed for rinsing; therefore, residents who find other forms of water conservation tedious should consider making a slight adjustment when using soap for various activities.

5.5.1.27 Question 13

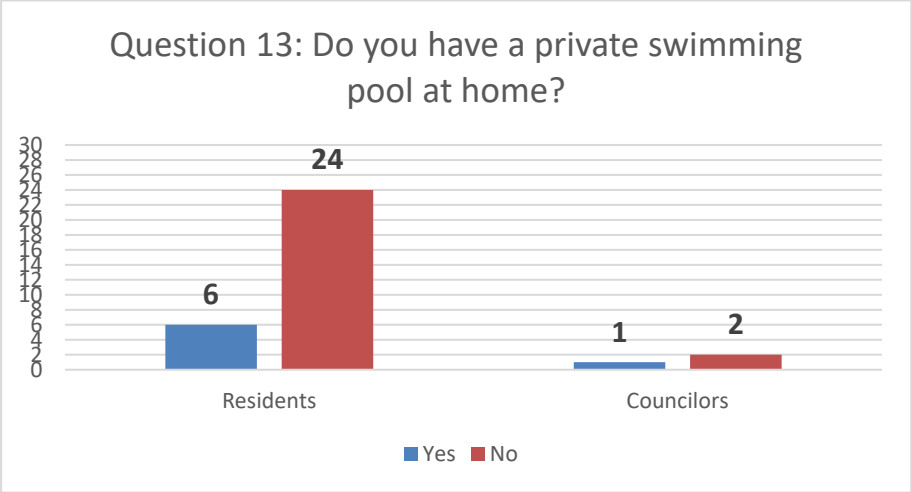


Figure 5.21: Question 13 – Private swimming pools at home

Twenty-four (80%) participants representing the residents indicated that they do not have a private swimming pool, and six (20%) participants representing the residents indicated that they do. In comparison, two (67%) ward councillors indicated that they do not have a private swimming pool, and one (33%) ward councillors indicated that they do have a private swimming pool.

- *Code identified:* Accountable and water-sensitive community.

Residents with private swimming pools have a more significant responsibility to save water than those without. It is, therefore, imperative to use water effectively and efficiently. There are several steps they can take to do this. For example, when swimming, residents should not purposefully splash water out of the swimming pool, they should be very conscious when emptying and refilling their swimming pool and only do so when necessary, and use a pool cover on very hot days to minimise evaporation of pool water.

5.5.1.28 Question 14

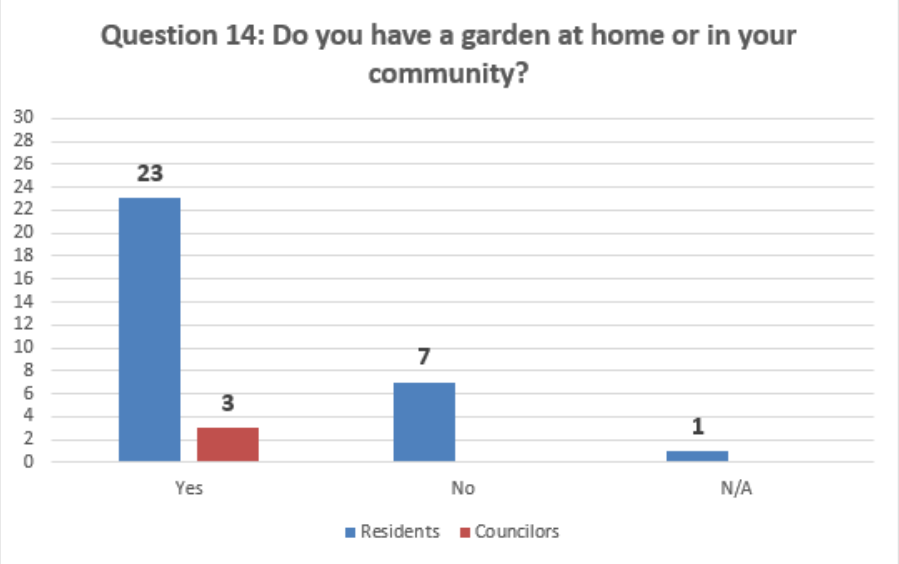


Figure 5.22: Question 14 – Indication of home/community gardens

Twenty-three (77%) participants representing the residents and all ward councillors (100%) indicated they have a garden at home or in their community. In comparison, seven (23%) participants representing the residents indicated that they do not have a garden at home or in their community.

- *Code identified:* Accountable and water-sensitive community.

Here, as with the private swimming pools, residents nurturing gardens should be conscious about how and when they water them. Residents can do this by watering their gardens during the afternoon or at night when the temperature is not as hot, and the garden can absorb water more effectively. In addition, the WRC (2024:24) suggests that plants with the same water requirements should be grouped together, facilitating correct watering and reducing possible wastage.

5.5.1.29 Question 15

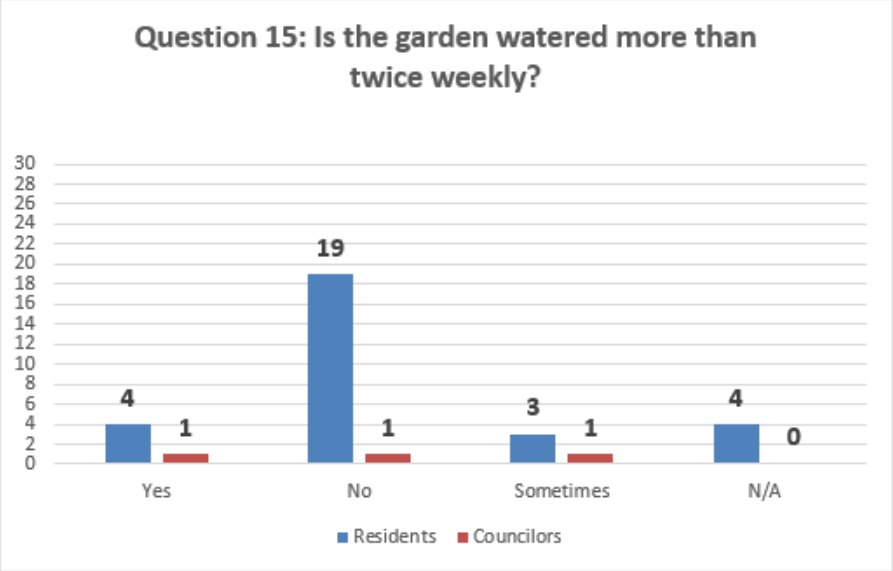


Figure 5.23: Question 15 – Frequency of watering the garden

Most residents (63%) and one (33%) ward councillor indicated they do not water the garden more than twice a week. Four (13%) participants representing the residents and one (33%) ward councillor indicated they water the garden more than twice a week. Three (10%) participants representing the residents and one (33%) ward councillor indicated that sometimes they water the garden more than twice a week.

- *Code identified:* Accountable and water-sensitive community.

As stated above, those with gardens are responsible for using water effectively and efficiently. In addition to the above-mentioned, the WRC (2024:24) also suggests that applying enough water to reach the roots of the plants is more beneficial than sprinkling every day, and in the long run, it uses less water.

These questions were based on the Decision Theory. Chapter 2 (cf. 2.8.1) provides that the decision theory is a theory about decisions (Hansson, 2005:5). It can be divided into two parts: the normative and descriptive theories. The normative theory focuses on how a decision ***should be made***. In contrast, descriptive theory focuses on how a decision ***is made*** (Hansson, 2005:6). Normative decision-making models, as proposed by Gati, Levin and Landman-Tal (2019:122), aim to characterise the processes involved in reaching the best decision. Airth (2024) views normative decision-making as predictive

decisions based on what should happen in an ideal setting. On the other hand, descriptive choices concentrate on the processes by which individuals appear to make decisions.

After analysis of this question, it can be deduced that most participants practice water conservation and are conscious when using the resource. This aligns with being an accountable and water-sensitive community. As the normative theory proposes, the ideal situation would be where all participants practice water conservation, prioritise it in their daily lives, and implement it everywhere they can as much as possible. However, as proposed by the descriptive theory and further data analysis, participants do not always make decisions prioritising water conservation. Residents can become even more accountable and more of a water-sensitive community by attempting to utilise grey water more than what they currently do. In addition, they can make small changes to how they use water in and around their houses, such as being conscious of how they use water when nurturing their garden or enjoying their swimming pools. Furthermore, it can be deduced that when residents decide to support SPLM and pay their utility fees, the decision is taken under uncertainty as residents do not fully know whether they will receive water services.

Section C, PART 3 (Residents/Ward councillors): Open commentary

This section provided participants from the residents and ward councillors with the opportunity to provide any relevant commentary regarding water services management rendered by the Sol Plaatjie Local Municipality. Participants made the following comments.

5.5.1.30 Comments by participants representing residents

"The water is constantly dirty, not drinkable at all. You have to buy water every second day, or you're risking your health. White garments are not white but cream."

- *Code identified:* Quality of water-related services.

"The whole of Kimberley streets are always full of water that's why danger of potholes are so very high that causes people's lives."

- *Code identified:* Quality of water-related services.

“They took forever to fix broken water pipes. Promises they never fulfil.”

- *Coded identified:*
  a) SPLM resources.
  b) Quality of water-related services.
  c) Perception of water services management in SPLM.

“The water plant is a white elephant; the plant does not work. Get qualified service providers to repair machinery.”

- *Codes identified:*
  a) SPLM resources.
  b) Quality of water-related services.
  c) Perception of water services management in SPLM.

“Working at the mall the water is always dirty, have to open taps to run before drinking it. When there is a repair schedule it always takes longer to repair which leaves us without water for days. Schools always have to close due to no water sometimes. As a resident of Kimberley, I feel that Sol Plaatjie do not deliver service as per our rights to always have clean water.”

- *Codes identified:*
  a) Quality of water-related services
  b) Perception of water services management in SPLM.

“Water supply is sometimes weak and give us a great concern about the health of the users. In most instances the water is dirty which make it impossible to drink and use for cooking purpose. It would be a great pleasure for the management to provide more clear water and make it easy, healthier to drink and for cooking purposes.”

- *Code identified:* Quality of water-related services.

“Clean drinking water is a basic human right, and necessity to survive. Sol Plaatjie’s water is not reliable and dirty. Residents need to buy clean drinking water. If they can have reliable clean drinking water which residents pay for, they will make residents very happy.”

- *Codes identified:*
  a) Quality of water-related services.
  b) Perception of water services management in SPLM.

“Our municipalities must always try to clean the water pumps regularly not wait for a long period of time not servicing it.”

- *Codes identified:*
    a) Quality of water-related services.
    b) SPLM resources.

"Dienste is van swak gehalte, geen kommunikasie met gemeenskap nie. Water drukking is sterk gedurende die dag en deur die nag baie swak. Somtyds is dit af sonder boodskappe deur gemeenskap leiers. Water uit die kraan is nie drinkbaar nie, want dit gee 'n slegte maag of diarree. Koop water is die nuwe term in die Kimberley gemeenskap weens swak dienste van Sol Plaatje."

- *Codes identified:*
    a) Quality of water-related services.
    b) Perception of water services management in SPLM.

"Services rendered by the Sol Plaatje Local Municipality are extremely poor. Running water from our taps are dirty to a point where you can actually see and smell the dirt we leave in toilets in that water, that's how bad we have it in Galeshewe. Water readings are not taken regularly, or I can say never from where I stay but your bill at the end of the month is extremely high and if residents don't pay, their electricity gets cut off."

- *Codes identified:*
    a) Quality of water-related services.
    b) Municipal revenue.

"The Sol Plaatje's water are sometimes clean and not dirty all the time. Water has white things inside the glass like alkaline or 'kalk'. It has a smell of sewerage sometimes."

- *Code identified:* Quality of water-related services.

"Sol Plaatjie Municipality is providing the residents with bad service or rather poor service when it comes to water. There are people who are unemployed who depend on tap water, who cannot afford to buy water for drinking purposes, they are forced to drink the dirty water Sol Plaatje provides them with."

- *Codes identified:*
    a) Perception of water services management in SPLM
    b) Quality of water-related services.

"Dirty water/water not purified. Frequent bursting of pipes. Unannounced water cut-off without back-up. Water not safe to drink."

- *Codes identified:*
    a) Quality of water-related services.

b) SPLM resources.

“Service delivery is on and off. It is sometimes bad that you had to be without water for more than 3-5 days.” Code identified: Quality of water-related services.”

“If Sol Plaatjie do the job like they should there will be less burst pipes and unnecessary water cuts.”

- *Code identified:* Quality of water-related services.

“The Municipality has failed us as residents due to providing us with dirty to no water.”

- *Codes identified:*
  a) Perception of water services management in SPLM.
  b) Quality of water-related services.

“The water management is not up to acceptable standards as a result, they face many challenges such as leaks, poor or no supply and frequent water outages. The impact is devasting for your poorer communities because they do not have access to alternative water services apart from water tankers, focus must be on old infrastructure and expansion of reservoir”

- *Codes identified:*
  a) Perception of water services management in SPLM
  b) Quality of water-related services.

“At some stage, the water from the local municipality was Blue Drop status. Currently due to aged infrastructure and ineffective infrastructure solutions by the municipality, the water cannot be trusted. Water is bought and that’s a norm. Water from the tap is for bathing, cooking, laundry, gardening, washing vehicles. This makes the water not healthy. It’s for domestic use not healthy use/consumption. The poor are at high risk. The municipal solution to building or upgrading Apartheid infrastructure is ineffective. This transcends in most of SA. We need a recovery plan urgently to solve the problem of water delivery and infrastructure to ensure safe Blue Drop status locally and countrywide.”

- *Codes identified:*
  a) Perception of water services management in SPLM.
  b) Quality of water-related services.
  c) SPLM resources.

“The municipality must ensure regular maintenance occurs. Ensure that water services are maintained in all areas. Infrastructure development should continuously be developed and implemented. Ensure water services reach in all areas”

- *Code identified:* SPLM resources.

"The chemicals in the water is horrible so it is not drinkable. Water pressure can also improve."

- *Code identified:* Quality of water-related services.

"Please note that this comment is made during a period when there hasn't been a lot of water provision interruptions. But I am not yet confident that they will not start again in the future. I think the service provider needs to find permanent solutions. If there needs to be maintenance done or pipes replaced, they should be done such interruptions cannot occur too often (as it used to occur on a monthly basis in the past) because that's evidence of poor work done."

- *Codes identified:*
  a) Perception of water services management in SPLM
  b) Quality of water-related services.
  c) SPLM resources.

"Sol Plaatjie Services overall, water included, are pathetic. No help even from ward manager. You are lucky if you can get a hold of the emergency numbers if you have a water problem."

- *Codes identified:*
  a) Perception of water services management in SPLM.
  b) Quality of water-related services.

While analysing the responses, the researcher observed that two of the themes are interlinked and significantly influence the third theme. The themes, Quality of water-related services and SPLM resources directly affect the Perception of SPLM. According to the responses, most participants representing the residents were not satisfied with the quality of water provided by SPLM. They shared a similar opinion on water and voiced that the taste, smell, and colour is not up to standard and in some instances, it could be considered unhealthy and not consumable. Most residents also agreed that the water infrastructure of SPLM is not up to standard and frequently experiences bursts and leaks. There is a general agreement that when conducting repairs and maintenance, SPLM ensures that it results in a prolonged, uninterrupted water supply. Additional concerns residents raise include the fact that they must purchase water regularly, which is not feasible in the long term. This is even more concerning since some residents cannot afford to purchase water for consumption regularly. A low quality of water-related services

paired with below-standard infrastructure has led to residents negatively perceiving SPLM. Through analysis and interpretation, the researcher deduced that residents believe that SPLM are ineffective and do not have confidence in them as a WSA/WSP.

5.5.1.31 Comments made by participants representing ward councillors

"We have to use water in a sustainable manner because we use it for many different things. Water quality has greatly improved and is no longer brown."

- *Codes identified:*
  a) Accountable and water-sensitive community.
  b) Quality of water-related services.

"Normally when we have water shutdowns our planning is not adequate because on several occasions, we missed the start-up times which doesn't sit well with residents. We also need to drastically improve on addressing water meter leakages and also ensure we avoid water waste which is currently below 50%. I believe with better water management we can aim at a loss of not more than 25% for the year."

- *Codes identified:*
  a) Quality of water-related services.
  b) Accountable and water-sensitive community.

Based on the statement: water restrictions/shortages occur on a regular basis. *"Water restrictions occur on a regular basis. Since I was in Kimberley from 2002 until the end of 2023. With the recovery plan and +/- R2 billion help from the government, there was a focus on leaks on the main lines from the Riverton Purification Plant to Newton Reservoir and the reading of the clarifiers and replacement of the sand of the sand filters at Riverton"*

- *Codes identified:*
  a) Quality of water-related services.
  b) Municipal revenue.

Based on the statement: these water restrictions last/have lasted longer than 2-3 days. *"Before 2024, yes. Sometimes as long as a week or 2 weeks"*

- *Code identified:* Quality water-related services.

"Kimberley water management teams are extremely poorly managed. The department is without a foreman for about 2 years. Make use of workers in the teams. There are leaks that have not been repaired for years. Pipes are outdated steel and cement asbestos. State funding is not for the replacement of pipes in neighbourhoods. This is an enormously

big problem with a bankrupt municipality with sometimes no funds for material for maintenance. Sol Plaatjie did not have the technical capacity to keep the water flowing"

- *Codes identified:*
  a) SPLM resources.
  b) Quality water-related services.
  c) Municipal revenue.
  d) Perception of SPLM.

Themes identified in the open commentary of ward councillors

The themes identified in the open commentary of ward councillors were Accountability and water-sensitive community, quality of water-related services, and SPLM resources.

From the open commentary, the researcher observed that most participants agreed that water-related services' quality has improved. This includes the quality of water itself and the supply thereof. One response stated that water restrictions/shortages mainly occurred between 2002-2023. However, most participants were also displeased with the quality of repairs, maintenance efforts, and water supply infrastructure. The theme, Accountable and water-sensitive community, referred to residents sustainably using water and avoiding wastage as much as possible. Being an accountable and water-sensitive community requires that residents use water sparingly, are conscious when using water, and ensure that they pay for municipal services provided by SPLM.

Regarding the resources in possession of SPLM**,** some of the responses provided by the ward councillors aligned with those provided during the semi-structured interview with municipal officials. One such response stated that although SPLM receive funding from the National Treasury, these funds are not necessarily used to address ordinary repair and maintenance. It can thus be deduced that municipal revenue streams are crucial in effective and efficient service delivery. Another response was that SPLM should strengthen its human resources as it lacked technical capacity. Without a reliable revenue stream, SPLM cannot function optimally and acquire the necessary staff, tools, and equipment.

Section C, PART 1 (Municipal officials): Likert-Chart questions

This section intended to better understand the water services delivery processes. The questions posed to municipal officials focused on the level of water resilience exhibited by SPLM.

5.5.1.32 Question 1

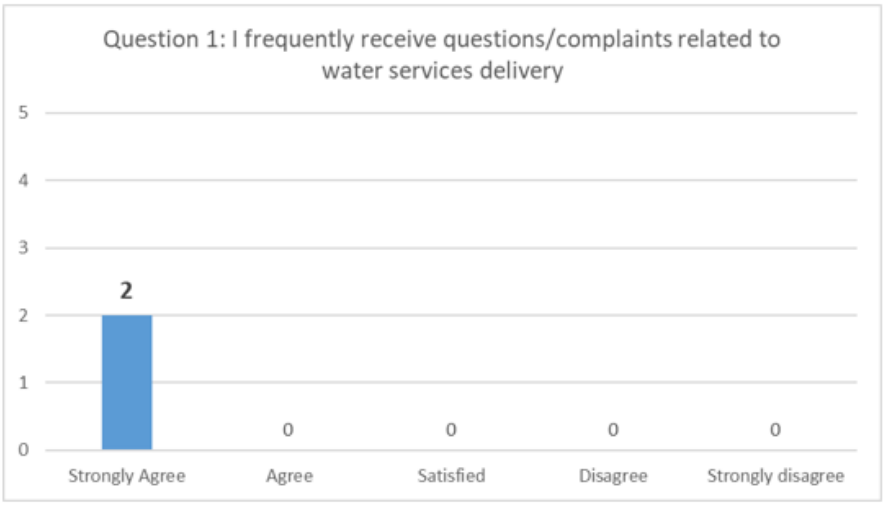


Figure 5.24: Question 1 – Frequently received questions/complaints related to water service delivery

Both participants (100%) responded to this question strongly agreeing, meaning they frequently receive questions/complaints about water service delivery.

- *Code identified:* Quality of water-related services.

It can be deduced that the inhabitants of Kimberley do suffer from a lack of quality water services. The central theoretical argument of this study was that if SPLM continues to experience major issues with delivering sustainable water services to its residents, it may become catastrophic unless resilient systems are explored. A radical response from residents could take the form of service delivery protests. This could damage public property and cause possible danger or loss of life. In addition, Chapter 1 (cf. 1.1) provides that individuals can also find it challenging to participate in societal activities such as going to school or work due to personal hygiene reasons. Explicitly, the lack of water is unconstitutional as it compromises the basic needs of individuals (*The Constitution,* 1996). Therefore, SPLM must ensure effective and efficient water services for the residents of Kimberley.

5.5.1.33 Question 2

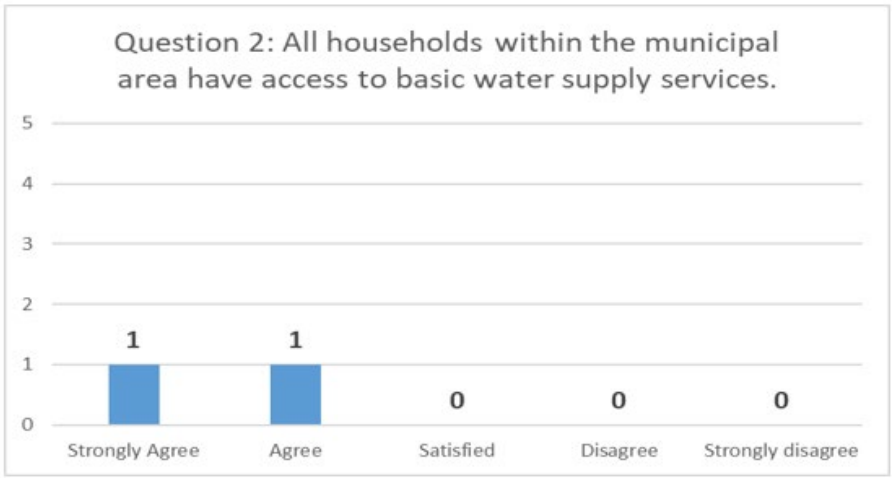


Figure 5.25: Question 2 – Household access to basic water supply

One participant (50%) indicated that they strongly agreed, while the other (50%) only agreed that all households within the municipal area have access to basic water supply services.

- *Code identified:* Quality of water-related services.

It can thus be deduced that although inhabitants may face water supply challenges, they have access to the resource. As stated above, SPLM must ensure effective and efficient water services to the residents of Kimberley to avoid dire consequences. The challenge of unreliable water services management by SPLM is also in direct violation of *the Constitution* (1996), among other legislative and regulatory frameworks that emphasize a reliable water supply to inhabitants.

5.5.1.34 Question 3

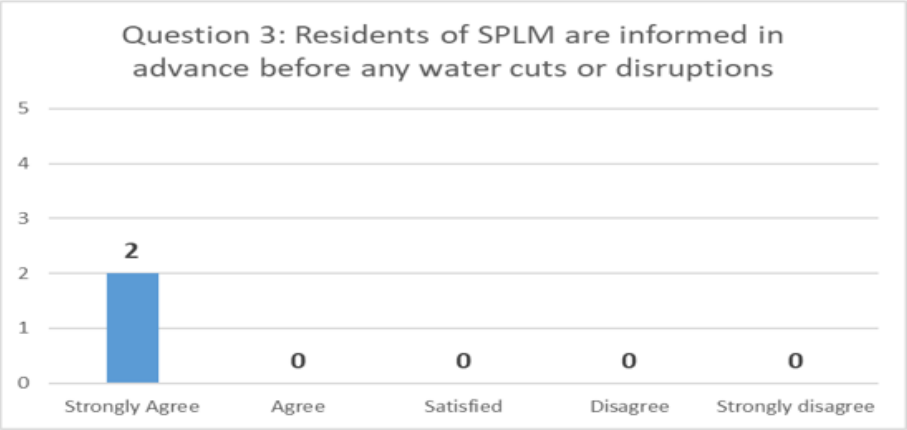


Figure 5.26: Question 3 – Perceptions of the communication from SPLM regarding water cuts or disruptions

One hundred per cent (100%) of participants strongly agreed that residents are informed before any water cuts or disruptions.

- *Codes identified:*
  a) Quality of water-related services.
  b) Perception of water services management in SPLM

This also follows the communicative rationality theory referred to in Chapter 1 (cf. 1.6), which provides that this theory can aid in improving communication between SPLM and residents regarding water service delivery. This pre-warning method is beneficial to residents as it allows them to prepare themselves by collecting as much water as possible and aligning their schedule with the schedule of SPLM water tankers, which is intended to provide some relief.

5.5.1.35 Question 4

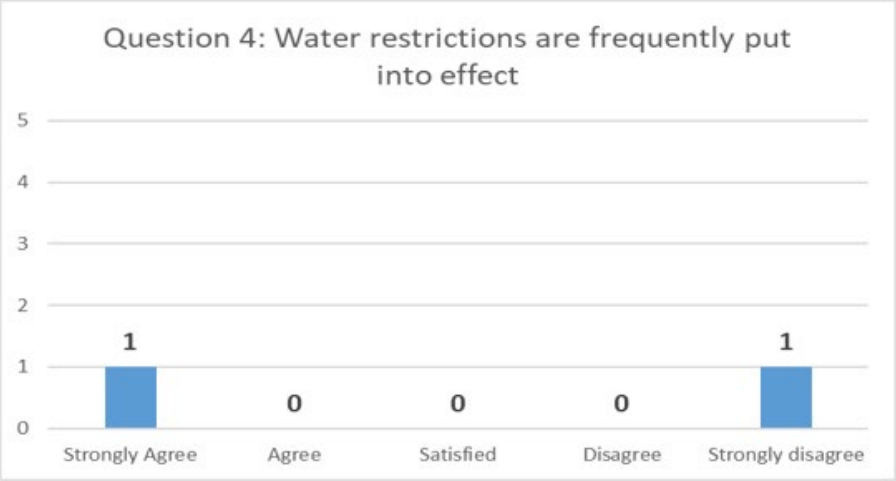


Figure 5.27: Question 4 – Perceptions of frequency of water restrictions

One (50%) participant indicated that they strongly agreed that water restrictions are frequently implemented, while the other (50%) strongly disagreed.

- *Code identified:* Quality of water-related services.

Although the responses differ, it is possible to deduce that water restrictions are frequently implemented. This aligns with the responses provided by participants (cf. 5.4.3.3, 5.4.3.4, 5.4.3.5, and 5.4.3.6). Most of the participants share the opinion that SPLM does not commit or uphold its responsibilities (cf. 5.4.3.3) and provided that most participants are not satisfied with the quality of water services delivered to them (cf. 5.4.3.4). Chapter 5 (cf. 5.5.3.5(specifically intended to determine whether water restrictions have lasted longer than 2-3 days) most participants agreed. Most participants agreed or were satisfied with the notion intended to determine whether water restrictions occur frequently (cf. 5.4.3.6).

5.5.1.36 Question 5

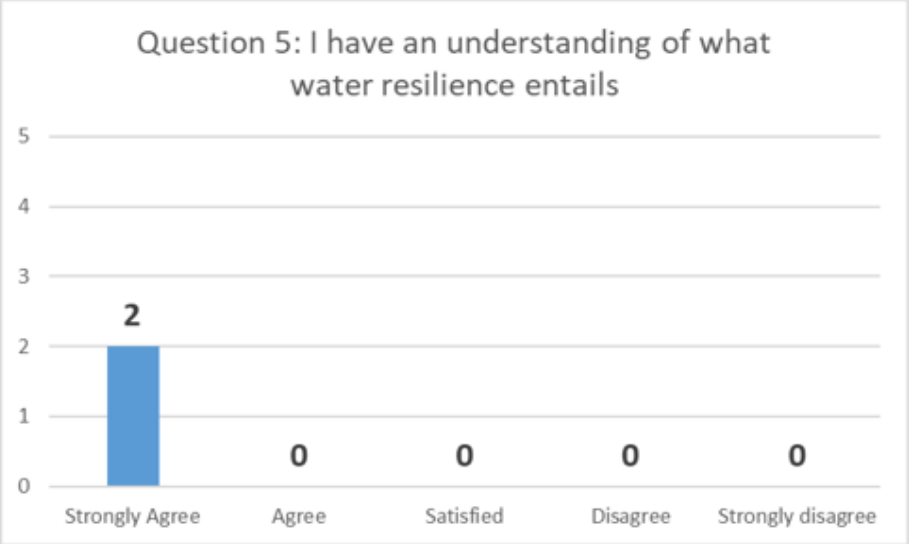


Figure 5.28: Question 5 – Perceptions on understanding of water resilience

Both municipal officials (100%) strongly agree that they understand water resilience.

- *Code identified:* Quality of water-related services.

Here, it is possible to deduce that if both SPLM employees strongly agree that they understand resilience, water restrictions and shutdowns should not occur as frequently. However, since these restrictions or shutdowns do occur, there is possibly a need for a deeper understanding and application of resilience in water services delivery. Chapter 1 (cf. 1.6) provides that the paradigm of Positivism is implicitly advocated for in water resource planning. The theory of Positivism emphasises the use of evidence to aid in forecasting and preparation; therefore, it can help improve the level of resilience exhibited by SPLM. This can be achieved by collecting evidence from the past and present on the causes behind water disruptions. For example, if pipe bursts commonly occurred over the last two years in a specific area, Data should be collected on what caused the pipe burst. An appropriate response can be implemented if the reason is a lack of maintenance or damage caused by residents.

5.5.1.37 Question 6

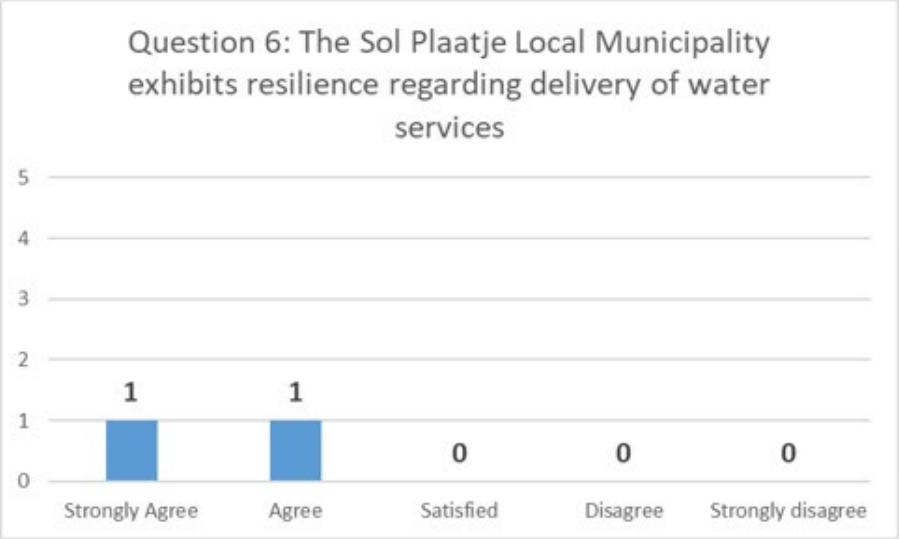


Figure 5.29: Question 1 – Perceptions on the resilience of SPLM regarding the delivery of water services

One (50%) participant strongly agreed that SPLM exhibits resilience regarding the delivery of services, while another (50%) merely agreed.

- *Code identified:* Quality of water-related services.

Both responses from participants are positive. It can, therefore, be deduced that although water restrictions and shutdowns may occur, SPLM is actively trying to become more resilient. The responses from municipal participants, however, contradict what residents are experiencing with frequent water cuts due to maintenance or water leaks. As stated above, SPLM should prioritise developing resilient responses and systems to ensure effective and efficient water services management.

5.5.1.38 Question 7

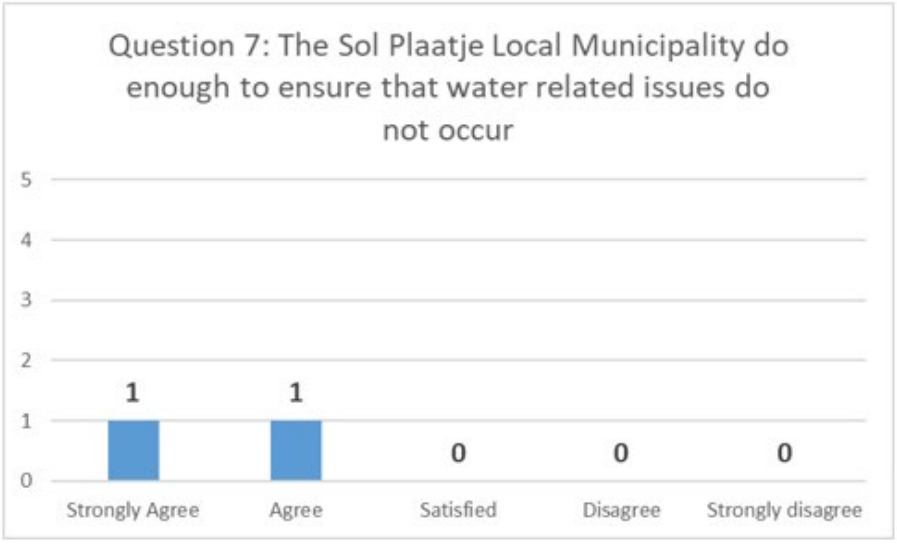


Figure 5.30: Question 7 – Perceptions on the prevention of water-related issues by SPLM

One (50%) participant strongly agreed that SPLM did enough to ensure that water-related issues did not occur, while the other (50%) only agreed.

- *Code identified:* Quality of water-related services.

It can be deduced that although water-related issues do occur, SPLM does take action to ensure that these issues do not occur or happen less frequently. The municipal official participants were divided regarding this statement, which is the reason they believe that enough is still not done to avert water cuts for the residents of Kimberley.

5.5.1.39 Question 8

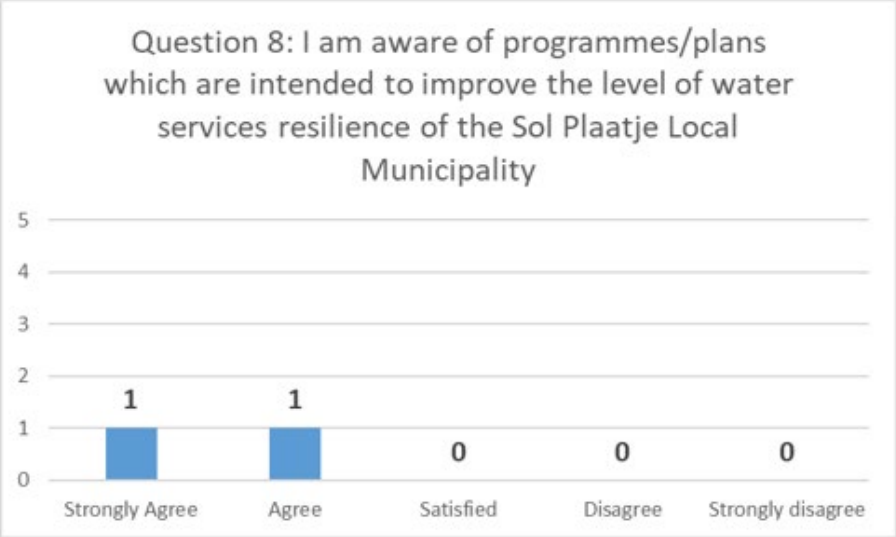


Figure 5.31: Question 8 – Awareness of programs/plans to improve the level of water service resilience by SPLM

Both participants agreed that they are aware of programmes/plans intended to improve the level of resilience of SPLM for water services. One (100%) participant strongly agreed, while the other (100%) only agreed.

- *Code identified:* Quality of water-related services.

This is important for the Public Choice theory, also known as the public value theory, discussed in Chapter 2 (cf. 2.8.2). The residents of Kimberley expect to see SPLM perform the tasks and hold the responsibilities entrusted to. Value-in-use' is based on users' perceptions and is created throughout and from the collaboration and interaction between the consumer and the provider in mutual exchanges during use, consumption or experience (Petrescu, 2019:1734). At its core, it includes the needs of citizens and ensures that the goods and services they receive from the government are of value to them as individuals and as a community. It is thus crucial that SPLM invest in programmes/plans intended to provide residents with an uninterrupted water supply if they desire the continued support of residents. Moore (1995:163) states that citizens expect the following from their governments: 1.) high-performing service-oriented public bureaucracies, 2.) public organisations that are efficient and effective in achieving desired social outcomes, and 3.) public organisations that operate justly and fairly and lead to just and fair conditions in the society at large. This theory thus focuses on the extent to which governments display the values for which the public holds them accountable. The

residents of Kimberley expect SPLM to improve water service delivery as they pay their utility fees. It can be assumed that the arrangement between SPLM and its residents is that when residents pay their utility fees, they will receive water services. However, this is not always the case, as water shortages are still frequent.

5.5.1.40 Question 9

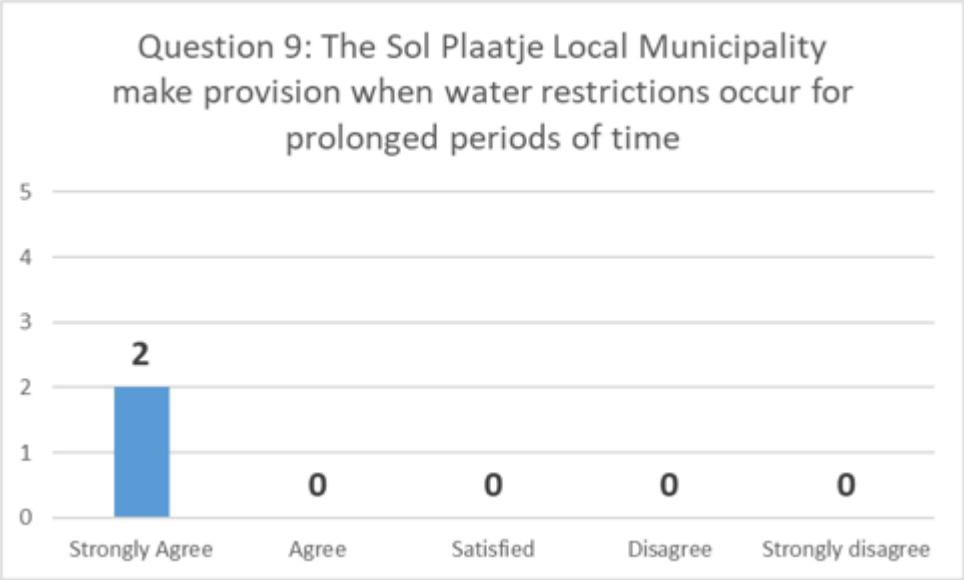


Figure 5.32: Question 1 – Perceptions of SPLM in making provisions during prolonged times of water restrictions

Both (100%) participants strongly agreed that SPLM makes provision when water restrictions occur for prolonged periods.

- *Codes identified:*
  a) Quality of water-related services.
  b) Perception of water services management in SPLM.

This is important as the assumed SCT between the residents of Kimberley and SPLM is that residents will only support SPLM if supplied with reliable, effective, and efficient water services management. As previously stated in Chapter 2 (cf. 2.8.4), SCT was initiated when the residents of Kimberley voted to elect their representatives in the local municipality council and agreed to pay for their services. Therefore, residents expect SPLM to meet their water supply needs in all circumstances.

5.5.1.41 Question 10

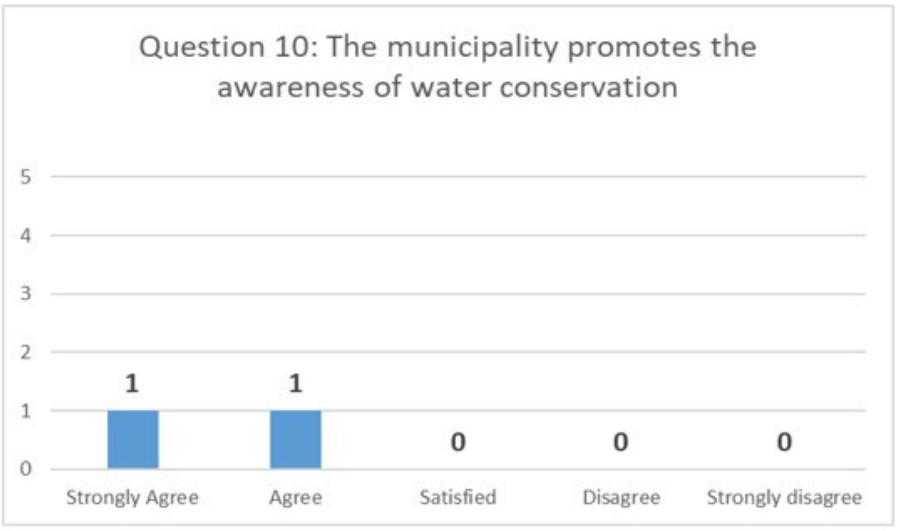


Figure 5.33: Question 10 – Perceptions on SPLM promoting awareness of water conservation

One (50%) participant strongly agreed that the municipality promotes the awareness of water conservation, while the other (50%) only agreed with the notion.

- *Code identified:* Perception of SPLM

The responses both favour the statement, which is a good sign that the municipality is making concerted efforts to follow government prescriptions to conserve water. SPLM should prioritise these efforts as they can result in less demand as a municipality and will positively impact the environment and the residents at large. Residents should be aware that they play a much more significant role than they are aware of. Co-operations by residents in this regard will lead to an accountable and water-sensitive community.

5.5.1.42 Question 11

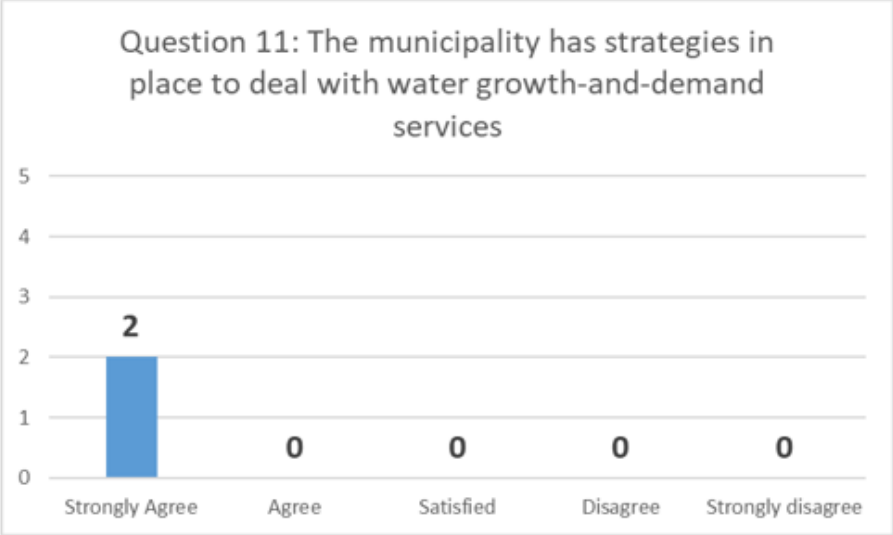


Figure 5.34: Question 11 – Perceptions on SPLM strategies to deal with water demand services

Both (100%) participants strongly agreed that the municipality has strategies to deal with water growth-and-demand services.

- *Code identified:* Quality of water-related services.

This is vital for continued water services delivery as the population of Kimberley continues to grow. As the population grows, other sectors will have a higher water demand to accommodate the growing population. An example would be that toilets at schools, businesses, malls, and shopping centres will be flushed more as more people use them. Due to frequent water cuts, it is doubtful that SPLM indeed has strategies to deal with water growth and demand services.

5.5.1.43 Question 12

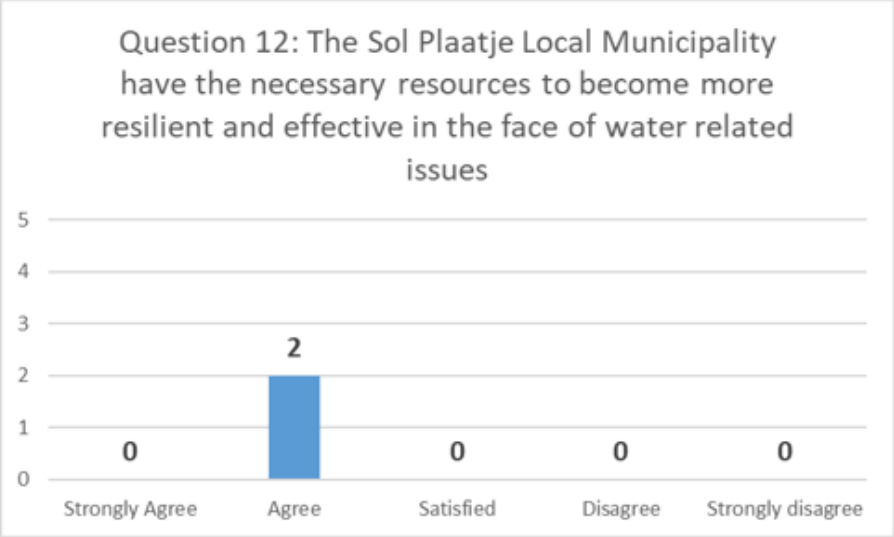


Figure 5.35: Question 12 – Perceptions on SPLM resource availability for water-related issues

Both (100%) participants agreed that SPLM have the necessary resources to become more resilient and effective in the face of water-related issues.

- *Codes identified:*
  a) Quality of water-related services.
  b) SPLM resources.

The responses from both participants are again questionable and doubtful. If the necessary resources were available to become more resilient, old and dilapidated infrastructure would have been replaced, but on the contrary, there is no budget for this critical task.

5.5.1.44 Question 13

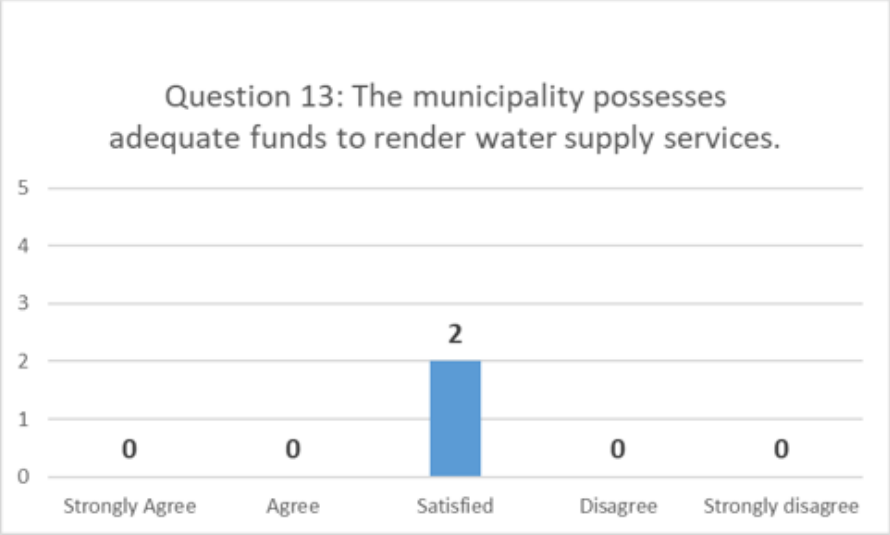


Figure 5.36: Question 13 – Perceptions on SPLM fund availability for water supply services

Both (100%) participants indicated that they agreed that the municipality possesses adequate funds to render water management services.

- *Code identified:* Municipal revenue

On the contrary, the deduction can be made that adequate water supply is not always available to residents of SPLM. If a sufficient budget is available, it should be spent well to improve water services management.

According to Public Choice Theory (cf. 5.4.6.12 and 5.4.6.13), as stated in Chapter 2 (cf. 2.8.2), authors working in the public choice tradition share two assumptions concerning local government. The first is the *self-interest axiom, which implies that, with their own devices, policy*makers will pursue their private interests rather than the public interest. Secondly, politicians and officials can be redirected towards the public interest if they are constrained by the pressure of *competition* (Boyne, 1997:57). As stated above, if an adequate budget and the necessary resources are available, residents should not be experiencing any water restrictions or water services-related challenges. However, since they experience these challenges, it is possible to deduce that SPLM does not utilise its resources as effectively and efficiently as possible. Furthermore, Chapter 2 (cf. 2.8.2) states that individuals entrusted by the public in terms of service delivery must be constrained constitutionally to minimise their ability to engage in activities which could negatively influence the state and the public. In addition, fully understanding how

individuals behave in political markets is critical so that members of a society can develop and implement institutional arrangements that effectively limit those who serve the public and prevent them from engaging in activities that reduce national welfare (Mbaku, 2008:430). Individuals, processes, and/or functions within SPLM which hinder effective and efficient water services management should be held accountable. Residents can also make their dismay known to SPLM so they can exert the necessary pressure to produce improved water services management.

5.5.1.45 Question 14

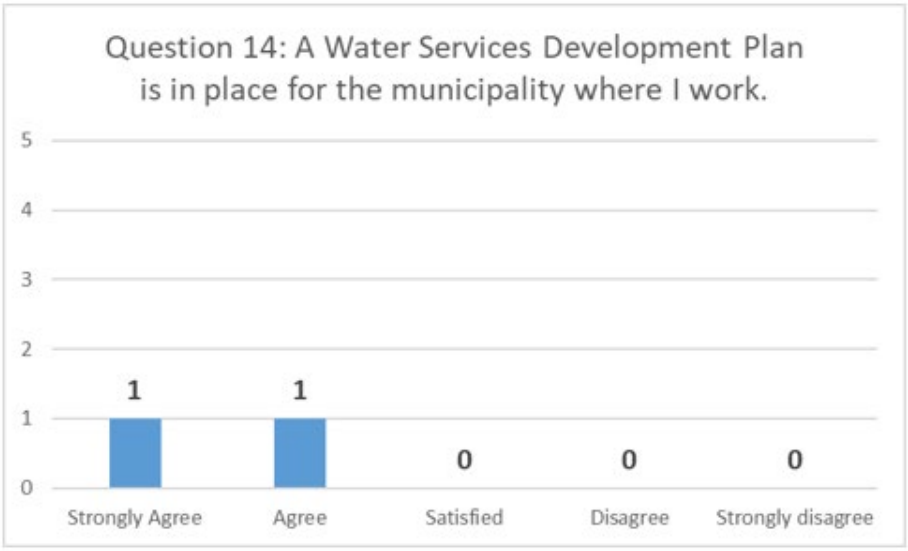


Figure 5.37: Question 14 – Perceptions on the availability of a Water Services Development Plan

One (50%) participant strongly agreed that a water services development plan (WSDP) is in place for SPLM, while the other (50%) merely with the question.

- *Code identified:* Quality of water-related services.

SPLM should take the necessary steps to determine how the execution of their WSDP can be best achieved. This would assist in optimising the municipality for improved effectiveness and efficiency in terms of water services management.

5.5.1.46 Question 15

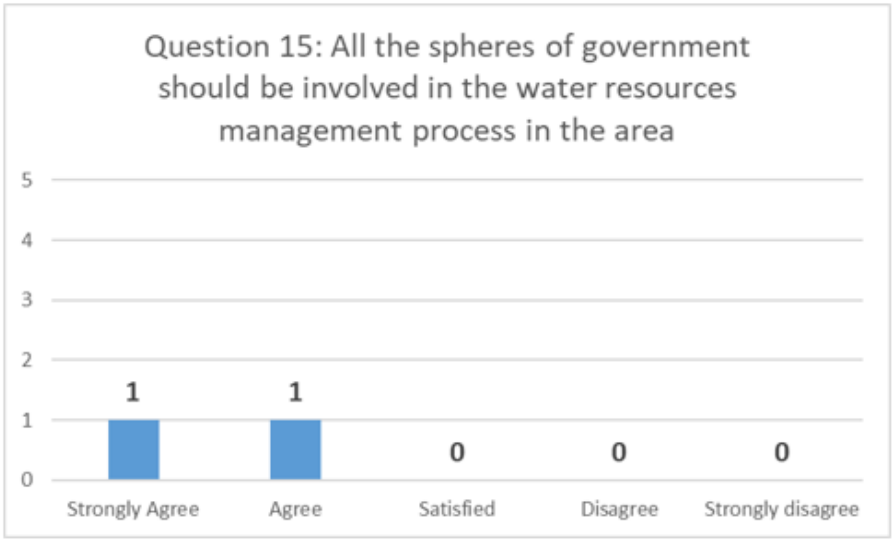


Figure 5.38: Question 15 – Perceptions of the involvement of all spheres of government

One (50%) participant strongly agreed that all spheres of government should be involved with the water resources management process in the area, while the other (50%) only agreed.

- *Code identified:* Quality of water-related services.

5.5.1.47 Question 16

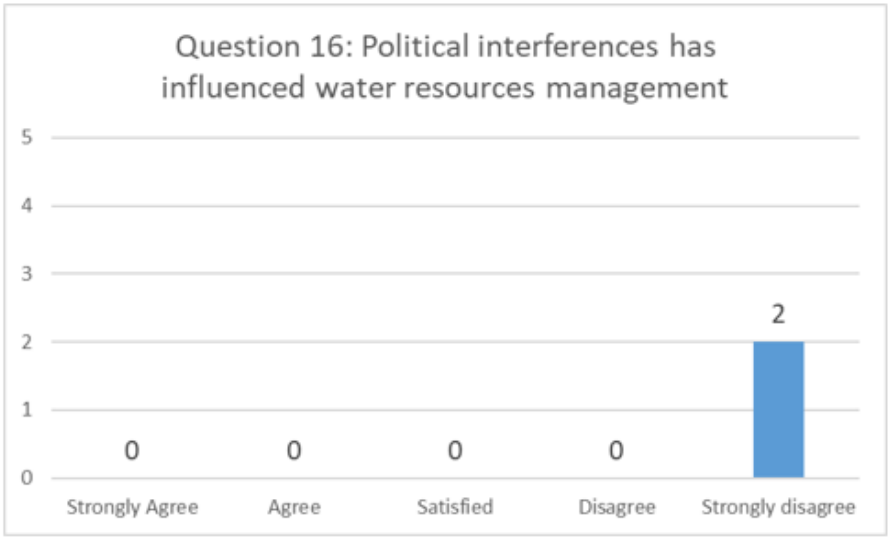


Figure 5.39: Question 16– Perceptions of political interference

Both participants (100%) strongly disagreed with the notion that political interference has influenced water resources management.

- *Code identified:* Quality of water-related services.

From the responses provided by participants, it is possible to deduce that SPLM has no political constraints and that internal forces and capacity constraints cause water services-related challenges. The aim was to test whether political interference by internal or external forces constrains SPLM (cf. 5.5.7.15 and 5.5.7.16). This comes from the literature presented in Chapter 1 (cf. 1.2). It provided that political interference can also be viewed as one of the woes many South African municipalities face. It also provided that the challenges experienced in local government relative to the political-administrative interface are delays due to political interference that led to massive service delivery backlogs, lack of accountability, and poor communication with communities as the 'big man syndrome' kicks in due to local leaders thinking that they have political protection and have become untouchable. In addition, there is corruption and fraud, with political 'mandates' that are illegal and have obscure origins leading to, among other things, negative audit opinions due to poor financial management, violent service delivery protests; scarcity of skills leading to limited municipal capacity; political issues, both within the municipality and intergovernmental engagements. These issues negatively impact governance and service delivery (Reddy, 2016:5).

5.5.1.48 Question 17

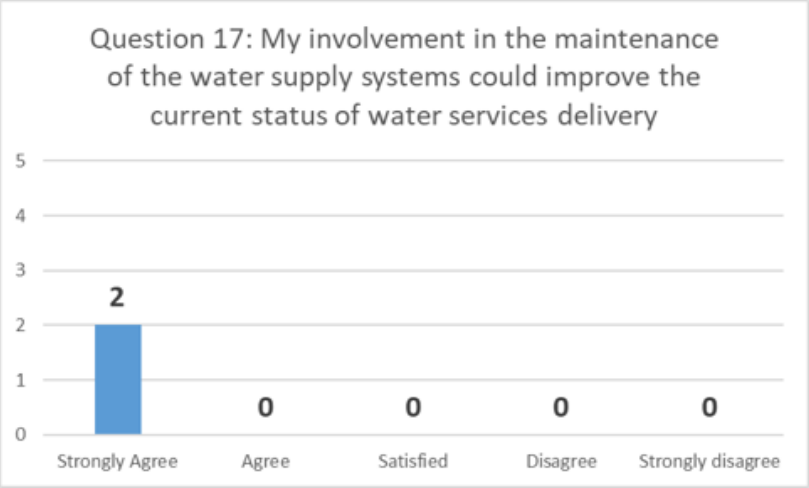


Figure 5.40: Question 17– Perceptions on involvement in maintenance of water supply systems

Both (100%) participants strongly agreed that in their capacity, they could improve the current status of water services delivery.

- *Codes identified:*
  a) Quality of water-related services.
  b) SPLM resources

Once again, this question was based on the SCT between the residents of Kimberley and SPLM and the Public value theory. SPLM should ensure that it employs qualified and skilled staff who understand what is expected of them and are committed to effectively rendering water services management, as residents expect this if they pay for services. Suppose staff members commit to their roles in terms of water services delivery. In that case, inhabitants will be the immediate beneficiaries, leading to more support from residents as they can see the value of their money.

5.5.1.49 Question 18

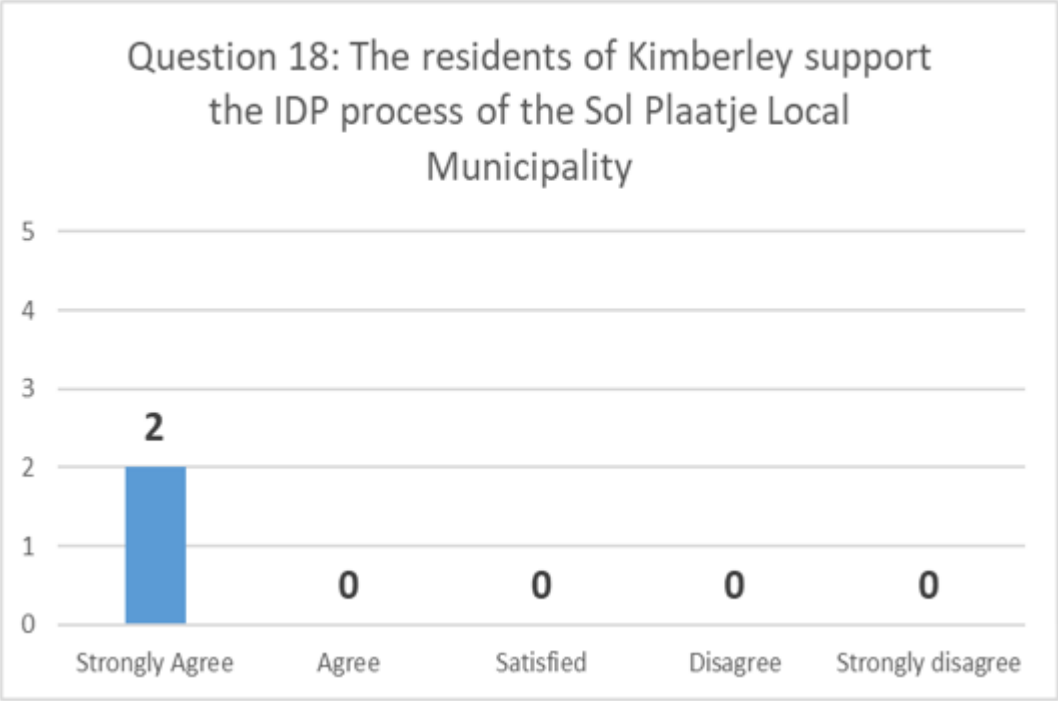


Figure 5.41: Question 18– Perceptions of support by Kimberley residents of SPLM IDP

Both (100%) participants strongly agreed that the residents of Kimberley support SPLM's IDP process. *Code identified:* Accountable and water-sensitive community

An IDP's purpose is to involve the entire municipality and its citizens in finding lasting solutions for long-term development, including effectively rendering services, especially to the poor. The support of the IDP by inhabitants of SPLM is testimony that they hope their quality of life would be improved by basic services such as water services.

5.5.1.50 Question 19

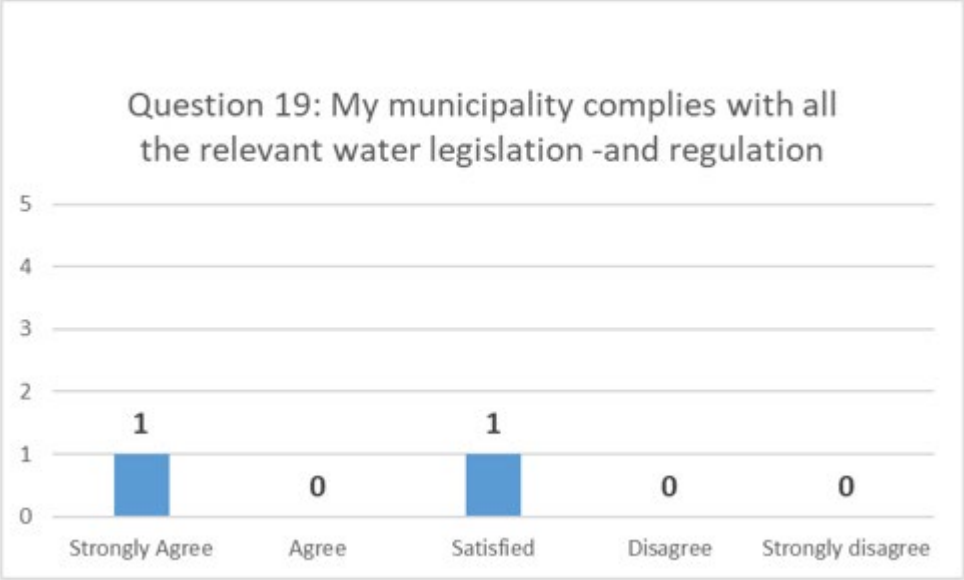


Figure 5.42: Question 19– Perceptions on SPLM compliance with water legislation

One (50%) participant strongly agreed that SPLM complies with all the relevant water legislation and regulations, while another (50%) was satisfied only. Both agreed that compliance was the order of the day. *Code identified:* Quality of water-related services

If SPLM complies with all the relevant water legislation and regulations, it can be deduced that inhabitants will not frequently experience water restrictions or shutdowns. This is, however, not the case, as many residents are not satisfied with the quality of water services delivered to them. It is also possible to deduce that SPLM violates various legislative frameworks provided in Chapter 3 (cf. 3.8.9), including:

- *Constitution of the Republic of South Africa* (1996): Chapter 7 discusses local government in detail. It provides the objectives of all municipalities, including that municipalities must ensure the provision of services to communities sustainably.

- National Water Act 36 of 1998: The purpose of this Act is to ensure that water resources are protected, developed, conserved, managed and controlled in such a manner that they are usable for current and future generations.
- Water Services Act 108 of 1997: The Act details the responsibilities of the government to ensure that water supply and sanitation services are provided efficiently and sustainably.
- Local Government: Municipal Structures Act, Act 117 of 1998: Defines the functions and powers between different categories and types of municipalities and is responsible for regulating internal systems, structures and municipal officials of municipalities and ensuring that electoral systems are in place.
- Local Government: Municipal Systems Act 32 of 2000: Defines the key principles, mechanisms and processes necessary for municipalities to improve local communities (social and economic aspects).

5.5.1.51 Question 20

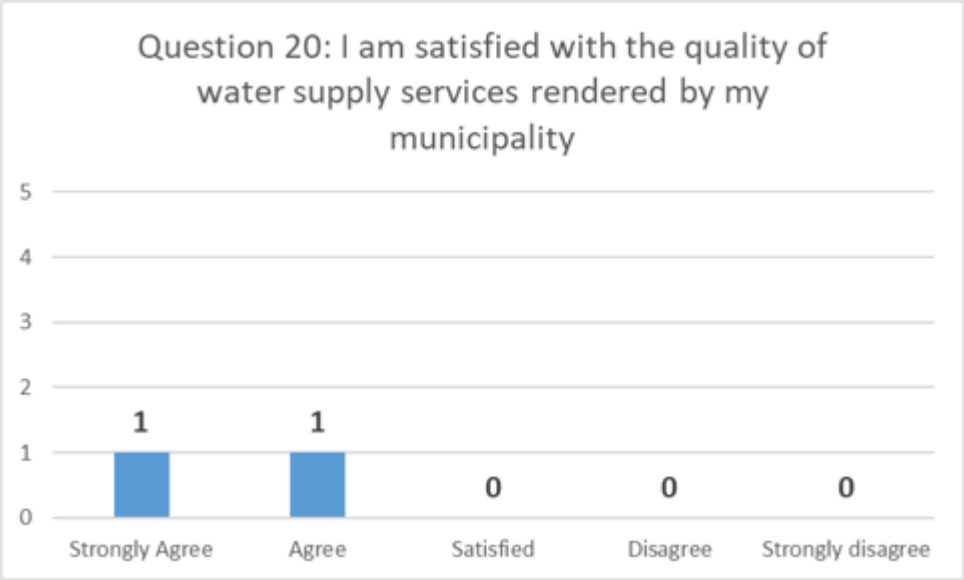


Figure 5.43: Question 20– Satisfaction of quality of water supply services by SPLM

One (50%) participant strongly agreed that they were satisfied with the quality of water supply services rendered by SPLM, while the other participant (50%) agreed.

- *Code identified:* Quality of water-related services.

It can thus be deduced that although residents may experience some challenges with water service delivery, SPLM take the necessary measures to ensure that inhabitants are still provided with water services. This is contradictory with a statement above that residents are sometimes left for prolonged periods without adequate availability of water.

Section D, PART 4 (Municipal officials): Open-ended questions

This section focused on open-ended questions relating to the level of water resilience exhibited by SPLM. The question posed is followed by the response provided by the municipal officials.

5.5.1.52 Question 1

Question: How long does it take to comment/respond to questions/complaints related to water services given by residents?

"Not more than 48 hours."

"1 day."

- *Codes identified:*
  a) Quality of water-related services.
  b) Perception of water services management in SPLM.

5.5.1.53 Question 2

Question: How long does it take to resolve water-related issues i.e. broken pipes which are used to supply residents with water?

"Not more than 48 hours."

"24 hours."

- *Code identified:* Quality of water-related services.

5.5.1.54 Question 3

Question: How do you ensure the integrity of equipment and machinery used for water services management? How often does maintenance occur?

"All our equipment are SABS approved. Maintenance of equipment occurs as regulated."

"Mechanical workshop/mechanical engineering section is in place. Also, contractors are used to effect maintenance."

- *Codes identified:*
  a) Quality of water-related services.
  b) SPLM resources.

5.5.1.55 Question 4

Question: How do you ensure water service-related operations comply with regulatory standards?

"We use guidelines from the Department of Water and Sanitation (Blue Drop), and we have our internal lab."

"Use of Blue and Green Drop requirements."

- *Code identified:* Quality of water-related services.

5.5.1.56 Question 5

Question: Have you encountered any water service-related operational challenges, if so, what were they and what mitigation strategies are in place to overcome operational challenges?

"Pump break-down and pipe bursts. If it takes more than 48 hours to fix the problem, we distribute water through tankers for residents."

"Frequent pipe bursts and sewer blockages, vandalism and misuse of infrastructure. Service Delivery Improvement Plan."

- *Codes identified:*
  a) Quality of water-related services.
  b) SPLM resources.

5.5.1.57 Question 6

Question: Are you aware of programmes/plans which are intended to make the Sol Plaatjie Local Municipality more resilient, if so, provide a brief description.

"We aren't aware of any specific problems, but as Sol Plaatjie Local Municipality we always ensure that we give residents quality water."

"Yes, WSDP, 5-year Water Services Reliability Plan, and Water losses Reduction Strategy."

- *Code identified:* Quality of water-related services.

5.5.1.58 Question 7

Question: Which provisions are made by the Sol Plaatjie Local Municipality when water restrictions occur for prolonged periods of time?

"We distribute the water through water tankers for residents and communicate it through our website."

"Water tankering and provisions of water tanks (JoJos) – stationary."

- *Codes identified:*
  a) Quality of water-related services.
  b) Perception of water services management in SPLM.

5.5.1.59 Question 8

Question: Do you have a unique, resilient or innovative approach to water storage?

"None in place but part of our Integrated Development Plan (IDP)."

"No."

- *Code identified:* Quality of water-related services.

5.5.1.60 Question 9

Question: What do you think is the best strategy to achieve sustainable water resources management?

"To adapt, new technologies and ensure all stakeholders play their part in ensuring that we have sustainable water."

"Implementation of WSDP!!!"

- *Codes identified:*
  a) Quality of water-related services.

b) Accountable and water-sensitive community.

5.5.1.61 Question 10

Question: What are the latest advances/methods in resilient water management? Is it possible for the Sol Plaatjie Local Municipality to incorporate these advances/methods?

"All stakeholders play a role in managing the water resources."

"No comment."

- *Codes identified:*
  a) Quality of water-related services.
  b) Accountable and water-sensitive community.

Application of TA provided at the end of Chapter 5 (cf. 5.4.8).

Section E, PART 5 (Municipal officials): Open commentary

This section allowed the participants to provide any relevant commentary. The following are all such comments made by participants:

"The Sol Plaatjie Local Municipality is trying by all means necessary to provide water to satisfactory quality and ensuring all relevant stakeholders are engaged."

"No comments made."

- *Codes identified:*
  a) Quality of water-related services.
  b) Accountable and water-sensitive community.

The themes observed in the responses from participants representing municipal officials included the Quality of water-related services, Perception of SPLM, and Accountable and water-sensitive community.

Regarding the quality of water-related services, participants stated that all their equipment is South African Bureau of Standards (SABS) approved and that maintenance on equipment occurs as regulated. Guidelines provided by the DWS, specifically the Blue and Green Drop requirements, ensure that SPLM remains compliant with all regulatory standards. Furthermore, mechanical workshops were put in place to assist relevant staff members, while contractors were also used to perform maintenance. According to the

participants, pump breakdowns, pipe bursts, sewer blockages, vandalism, and misuse of infrastructure all negatively influence quality water-related services. Regarding improved resilience, SPLM have the following plans and strategies: Service Delivery Improvement Plan, Water Services Development Plan, 5-year Water Services Reliability Plan, a Water Loss Reduction Strategy, and an Integrated Development Plan.

Furthermore, according to participants representing municipal officials, they respond to issues raised by respondents within 48 hours. It can be deduced that by responding within 48 hours, residents will have an improved perception of SPLM. Additionally, SPLM provides residents with water tankers and JoJo tanks during prolonged water restrictions. Information on all relief efforts and water restrictions is posted on SPLM website. These efforts also play a part in building a better relationship with inhabitants.

After analysing participants' responses representing municipal officials, it became evident that residents play a significant role in water services management and delivery.

The third theme is accountability and a water-sensitive community. A trend in the responses was that of role players; it can be assumed that residents are included and should be more involved and aware of their role in sustainable and resilient water services management.

All themes are interlinked and could determine another theme's "success" level. The quality of water-related services provided by SPLM and its resources (SPLM resources) are directly influenced by municipal revenue. If residents pay for municipal services, it will enable SPLM to improve their capacity in terms of staff and equipment, which is fundamental in improving the quality of water-related services and all SPLM resources. This will lead to an enhanced perception of SPLM. A possible byproduct of an improved perception could be increased support from residents, leading to an Accountable and water-sensitive community. When residents/inhabitants practice water conservation, they can relieve some of the water services pressure experienced by SPLM. An accountable and water-sensitive community will, in turn, have a positive impact on Municipal revenue, which will then have a positive effect on the quality of water-related services and the quality of SPLM resources.

Furthermore, municipal officials all emphasised that outside of infrastructure, strategies, plans, or programmes aimed at developing a more resilient municipality, residents play one of the most crucial roles and should claim responsibility for that role.

5.6 CHAPTER CONCLUSION

This chapter presented the data collected for this study. Furthermore, it presented an analysis of the collected data, the application of thematic analysis on the collected data, and the correlation between the codes and themes constructed by the researcher.

The following chapter will provide recommendations towards an improvement plan for water services management in SPLM. The findings, conclusions and recommendations will also be presented.

CHAPTER 6 :
CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

Chapter 6 concludes this study and discusses an improvement plan for water services management in SPLM. Furthermore, this chapter provides a summary of Chapters 1-5. A plan is tabled for improving water services management within SPLM. This is done firstly by discussing the resilience of water systems and services in SPLM; lastly, an emphasis is placed on the importance of planning and how effective planning can contribute to sustainable, resilient water services management in the long run in SPLM. The chapter concludes with sound recommendations and identifying areas for future research.

6.2 SUMMARY OF CHAPTERS AND EVALUATION OF RESEARCH OBJECTIVES

Chapter 1: This chapter provided the study's premise and included the study's introduction, background, and motivation. Furthermore, Chapter 1 discussed the research problem, questions, and objectives in detail. The methodology utilised in the study was also presented in detail in this chapter.

Chapter 1 addressed the main research objective of the study, namely, to determine the challenges to resilient water services management in SPLM.

Chapter 2: Water services management and other key terms were discussed in this chapter. The role of municipalities as WSA and WSP were also addressed to provide relevant context. In addition, an in-depth discussion focused on observations regarding water services management within SPLM. Chapter 2 also addressed the following research objective of the study: To expound the theories, principles and practices of resilient water services management.

Chapter 3 examined various definitions and the elements which constitute resilient systems. An international and domestic perspective on resilience was also provided. The chapter reviewed public planning, essential to advancing water services management. Chapter 3 explored the worldwide shift towards water-resilient sustainable cities.

Chapter 4 had the sole purpose of presenting the statutory and regulatory frameworks that guide the functioning of water services rendered by municipalities, along with the added responsibilities of WSAs, WSPs, or both. Chapter 4 explored the following research objective of the study: To analyse the existing legislation and regulation, including the strategies aimed at ensuring resilient water management services.

Chapter 5 presented the empirical findings of the study. The chapter included a presentation of the findings and results and an analysis of the data. The data included the opinions and perspectives of the participants representing the residents, ward councillors, and municipal officials within SPLM affected by water services management. Chapter 5 explored the following research objective of the study: To determine the challenges to resilient water services management in SPLM.

Chapter 6 is the final chapter of the study. This chapter summarises all the study chapters and proposes recommendations for an improvement plan for resilient water services management in SPLM. Lastly, the chapter provides recommendations regarding the way forward to ensure resilient water services management in the long run for SPLM.

6.3 IMPROVING RESILIENCE IN WATER SERVICES MANAGEMENT

As stated in Chapter 2 (cf. 2.2.4), resilience is a counterpart to the concept of vulnerability, not only as a means of coping with external changes or shocks, but also of responding actively and positively to risk (Giddens, 2009:163). Furthermore, resilience is linked to both preparations for minimising disruptions and measures to cope with them once they have occurred (Lu & Stead, 2013:201). The significant capabilities of a resilient system include the following: 1.) withstanding capability—withstanding system disruptions and maintaining normal functionality under the disruptions; 2.) absorptive capability—immediately absorbing the disruptions and minimising system damage; 3.) restorative capability—quickly recovering to the normal or acceptable state; and 4.) adaptive capability—adapting to the changing conditions and uncertain disruptions (Shin, Lee, Judi, Parvania, Goharian, McPherson & Burian, 2018:5). In Chapter 3 (cf. 3.4). It was reiterated that while there is no single approach to defining water-related resilience, building resilience in the water services sector is often loosely framed as contributing to improved water security in the face of climate change on the one hand, and reduced vulnerability to water-related risks and hazards on the other (Rodina, 2018:3).

An operational definition of resilience and water resilience was also provided in Chapter 2 (cf. 2.2.4) of this study, which stated that resilience refers to the ability of a system to undergo a disturbance, adapt to said disturbance to mitigate similar effects in the future, while maintaining full or partial functioning. Resilience in water systems would imply that water services such as supplying water to residents would not cease in the event of a disturbance, i.e. pipe burst, because provisions have been made for the water supply to continue. In this instance, it is argued that if the water supply is interrupted, its duration is shortened.

Improving water services management and developing resilience in SPLM is possible by replacing or repairing old and deteriorating water supply infrastructure, expanding the human resources of SPLM, and letting residents take ownership of their role as responsible water consumers. This is discussed below.

6.3.1 Replacement of old and deteriorating water infrastructure

The literature presented in Chapter 3 (cf. 3.7) indicated that residents were unsatisfied with the quality of water services they received from SPLM. More specifically, the timeline provided in Chapter 3 (cf. 3.7.1) outlined a timeline of water disruptions experienced by residents between 01 September 2021 and 19 April 2024. Based on the timeline provided, it can be deduced that water disruptions were mainly caused by old and deteriorating water supply infrastructure, leading to pipe bursts and unnecessary loss of water volumes. Additionally, during the empirical phase of this study, observations were conducted to gain a first-hand perspective on the issue. Water disruptions were observed on 11, 14, 15, 14, and 25 July 2024.

In addition to this, Chapter 5 (cf. 5.5.3.5) of this study provided that the majority of residents (23/30, 77%) and ward councillors (2/3, 67%) agreed with the statement, *"These water restrictions lasted/have lasted longer than 2-3 days."* Also, Chapter 5 (cf. 5.5.3.6) provided that the majority of residents (16/30, 53%) and ward councillors (2/3, 67%) agreed with the statement, *"Water restrictions/shortages occur on a regular basis."* Seven participants representing the residents and one ward councillor were satisfied with the statement. It can thus be deduced that the water supply infrastructure of SPLM is old and deteriorating. Residents and ward councillors also raised concerns regarding old and deteriorating water supply infrastructure in Chapter 5 (cf. 5.5.5.1 and 5.5.5.2). The

comments indicated that residents were frustrated with the service standards of SPLM, the timeframe, and the lack of communication when repairing water issues.

Responses by participants confirmed that the water supply infrastructure is old and deteriorating in SPLM. In response to the question, *"How do you ensure the integrity of equipment and machinery used for water services management? How often does maintenance occur?"* municipal officials argued that the SABS approves all equipment, equipment maintenance occurs as regulated, mechanical workshop/mechanical engineering section is in place, and contractors are used to effect maintenance (cf. 5.5.7.3). Although these measures are in place, the challenges of unreliable water supply continue. The study, therefore, recommends that SPLM prioritise, as a matter of urgency, the replacement, maintenance, or repairs of these infrastructures to ensure their long-term durability and functioning. Additionally, SPLM should ensure the municipality has the technical staff, tools and materials to address water-related issues. These tools and materials should also be sourced from suppliers who provide products that meet the SABS standards without any deviation. Recruiting or identifying skilled and qualified experts in this field should also be a priority. Attending to the aforementioned would decrease the amount of water disruptions experienced by residents while also improving the overall water services management in SPLM.

6.3.2 Human resource capacity

Analysis of the collected data for the study identified that SPLM lacks a strong human resource presence? in various aspects of water services management. The lack of adequate human resource capacity was alluded to in Chapter 5 (cf. 5.3). Chapter 5 (cf. 5.5.5.1 and 5.5.5.2) also highlighted that SPLM should expand and improve its human resources capacity.

It can thus be deduced that there are obstacles in this regard. One knowledgeable I Interviewees, response to questions 5 and 6 (cf. 5.3), suggested that one of the most significant challenges faced by SPLM is in the field of human resources function and its capacity. The interviewee stated that SPLM does not have enough people and teams and included that Kimberley is a big city, which can further exacerbate this shortage. Furthermore, the interviewee explained that SPLM requires at least twelve pipe fitting teams and currently only has seven.

The lack of sufficient, effective, and efficient human resources in SPLM is also highlighted by residents in Chapter 5 (cf. 5.5.5.1) of this study.

It is evident that SPLM face a severe challenge in terms of their human resources capacity function. Therefore, these shortages can be considered a significant obstacle hindering effective and efficient water services management. This contradicts the response provided by municipal officials (cf. 5.5.7.12), in which they posited that SPLM has the necessary resources to become more resilient and effective in the face of water-related issues and challenges. As a result, it is advised that the appointment of additional staff may resolve the lack of water services management personnel. The current employees ofSPLM should, meanwhile, be equipped with adequate training and development as a short-term solution to the current challenge.

Frequent workshops should thus be held for employees to develop their professional and technical capabilities.

As Chapter 3 (cf. 3.6.2) states, SPLM could utilise an indirect approach to improve water services management and develop resilience to reignite the *Batho Pele Principles.* Following these principles, public servants would ensure citizens receive quality service delivery. There are eight *Batho Pele principles* as outlined in Chapter 3 (cf. 3.6.2). Based on the responses of residents and ward councillors and what the *Batho Pele principle* represents, the following deductions were made:

- **Consultation (cf. 5.5.3.1):**

  Statement: I know who the WSA/WSP of Kimberley is.

  Most participants agreed. Many participants were only satisfied with, or disagreed with the statement.

  Recommendation: The study advises that the capacity of SPLM call centre be expanded to assist residents in reporting water leakages and losses. Additionally, SPLM should provide residents with an online forum/platform which they can use to engage with service providers. The study considers that “ward groups” on platforms such as Facebook and WhatsApp are already operational. Therefore, the service provider should actively use these groups. I Improved communication between SPLM and its residents would provide services that would improve water services management and possibly change residents' perceptions of SPLM. Why is there a blank page belkow?

- **Service standards (cf. 5.5.3.3):**

Statement: The WSA/WSP commits to or upholds its responsibilities.

Most participants disagreed.

Statement: I am satisfied with the quality of water services delivered to us as residents/households.

Most participants disagreed. Participants indicated that they were not satisfied with service standards.

Recommendation: As stated above (cf. 6.3.1), the only way to ensure residents have quality and reliable water supply is to ensure the necessary infrastructure is effectively and efficiently replaced or maintained for long-term functionality.

- **Access (cf. 5.5.3.5):**

  Statement: These water restrictions last/have lasted longer than 2-3 days.

  Most participants agreed. It was deduced that residents do not always have access to water due to water restrictions. Furthermore, in Chapter 5 (cf. 5.5.5.1), residents highlighted that although they may have access to water for domestic use, they would not likely consume it due to its quality.

  Recommendation: The only solution to improve access to water is to ensure that the water supply infrastructure is adequately maintained. Additional approaches for ensuring water supply during restrictions would be to provide residents with the deployment of water tankers on a reliable schedule.

- **Courtesy (cf. 5.5.5.1):**

  Most participants were displeased with the level and quality of water services provided by SPLM. Residents believe that SPLM does not treat them with respect and consideration regarding water service availability.

- **Information (cf. 5.5.3.7):**

  Statement: The WSA/WSP communicate effectively on issues related to water services, i.e. when restrictions will occur, how long these restrictions will remain in effect, and why these restrictions are put into effect.

  Most participants were only satisfied with the statement, and a significant amount disagreed.

Statement: Water restrictions always follow a set schedule, i.e. are put into effect as stated by the WSA/WSP, are lifted as stated by the WSA/WSP.

Most participants were only satisfied with or disagreed with the statement. It was deduced that residents do not always receive timely and accurate information regarding possible water restrictions or shortages and duration.

Recommendations: 1.) SPLM should improve its communication channels with residents; and 2.) Residents should be informed of possible water restrictions or shortages and the reasons and estimated duration. Furthermore, are there any changes in the turnaround time for addressing and resolving issues? In that case, residents should also be updated along with the provisions that will be in place to supplement the water supply.

- **Openness and transparency:**

  An approach that SPLM can follow in this regard is to inform residents about the water disruptions in their area. Suppose residents are fully informed about why water restrictions, or shortages, may occur. In that case, it is possible to deduce that they will be more understanding than when these water restrictions or shortages arise unannounced. SPLM should, therefore, prioritise the challenges of communicating with residents to provide them with timely and accurate information regarding any water-related issues.

- **Redress:**

  Access, courtesy, and redress: all require the same approach, i.e. to be fully addressed. To redress the consequences of a lack of resilience and satisfactory water services management, SPLM must ensure that water supply infrastructure is adequately maintained and operated to improve water services management.

- **Value-for-money:**

  After analysing the responses provided by residents in Chapter 5 (cf. 5.5.5.1), it can be deduced that residents do not feel they are receiving value for their money. Concerns regarding the quality and availability of water were frequently raised. Some residents were dismayed by the fact that they had to purchase bottled water for consumption. In addition to access, courtesy, and redress, value for money can only be guaranteed through one approach. As previously stated, this approach

involves SPLM ensuring that water supply infrastructures are properly maintained and operated to induce improved water services management.

The *Batho Pele principles* might not directly lead to improved resilience; however, if applied as advised, they could lead to an improved experience in terms of water services management.

Sections 6.3.1 and 6.3.2 of Chapter 6 were based on this study's central theoretical statement. The central theoretical statement in Chapter 1 (cf. 1.5) posits that if SPLM continues to experience significant issues with delivering sustainable water services to its residents, it may become catastrophic, unless resilient systems are available. The Public Value Theory also guides sections 6.3.1 and 6.3.2 of Chapter 6, The Social Exchange Theory, and the Social Contract Theory. Chapter 2 (cf. 2.8.2) posits that the Public Value Theory, at its core, includes the needs of citizens and ensures that the goods and services they receive from the government are of value to them as individuals and as a community. Currently, residents find no value for money from SPLM as their water needs are unmet.

Regarding the Social Exchange Theory (cf. 2.8.3), Fan *et al.* (2019:103) argue that the Social Exchange Theory requires a series of interactions or transactions that obligate complementary actions from another entity. It implies that one party's specific action, or behaviour in the exchange process, imposes a mutual duty on the other party. Thus, SPLM is at risk of losing the support of residents. This is because residents do not receive the services as per Schedule B of *The Constitution* (1996), and lastly, regarding the Social Contract Theory. Chapter 2 (cf. 2.8.4) noted that the Social Contract Theory was initiated when the residents of Kimberley voted to elect their representatives in the local municipality council and agreed to pay for their services, for example*,* in terms of water supply. However, SPLM does not always uphold their end of the contract, as the water cuts and shortages in the jurisdictive area of the municipality can witness it.

6.3.3 The resident as a role player

The third part of the proposed idea for improved water services management emphasizes the involvement of SPLM residents. Residents should be fully aware of their crucial role in the overall water services management process. As deduced in Chapter 5 (cf. 5.5.3.1), not all residents are fully aware of their responsibilities.

By informing residents they are key stakeholders in water services management and not only as consumers, but their perspective regarding resource conservation awareness of this role, should also be facilitated through the ward councillors and other official channels of communication by SPLM, such as information leaflets or their official website. SPLM should thus empower, enable, and encourage their ward councillors to engage with residents frequently. During these engagements, ward councillors should provide residents with as much information as possible regarding SPLM, their objectives, how the residents play a role in achieving them, the obstacles faced by SPLM, and what residents can do to assist in overcoming them. SPLM should use other official communication channels to reach residents who cannot participate in these engagements face-to-face.

These roles were alluded to during the semi-structured interviews (cf. 5.3), with a municipal official acting, in a senior management position s at SPLM. The interviewee continuously highlighted the importance of residents and the various ways they can assist SPLM in becoming more effective and, in turn, more resilient. The importance of residents was also highlighted by ward councillors (cf. 5.4.5.2). The importance of all stakeholders, which can be assumed to include residents, was also highlighted in the responses of the municipal officials in Chapter 5 (cf. 5.5.7.5, 5.5.7.9, 5.5.7.10, and 5.5.8).

The interviewee continuously highlighted the fact that residents should pay for municipal services as these levies are what finance effective water services management and municipal operations (cf. 5.3). More specifically, the responses provided for questions 1, 2, 3 and 6 highlighted the importance of payment of services and the consequences of non-payment for services. During Question 1, the interviewee stated that ordinary repairs and maintenance, depend on revenue collection, or internal revenue, which is always a challenge because SPLM is not collecting enough. Residents are not paying for services. A similar concern was also raised in the response to Question 2, which included that payment for water services, is currently at about 56%, which can be considered low. The response to the third question also emphasised that the municipality works on revenue and revenue collected, which means that non-payment will suppress service delivery. Non-payment of services and its impact on service delivery was highlighted again in the response to Question 6. It can thus be deduced that paying for municipal services is an important responsibility that residents must fulfil. Ward councillors and SPLM should frequently communicate the importance of payment for services. Residents should be fully aware that non-payment influences the quality of SPLM water services management. If residents do not pay for services, SPLM cannot purchase the necessary tools and

equipment for maintenance and repairs. Non-payment may also affect SPLM's ability to attract and retain a pool of skilled employees capable of ensuring resilient water services management.

In addition to paying for municipal services, residents should also be aware that a prerequisite of an effective, efficient, and resilient SPLM is a community that holds itself and others accountable. In Chapter 5 (cf. 5.5.5.2), a ward councillor indicated that residents must use water sustainably, due to its importance for various activities. Vandalism and misuse of water infrastructure were also recurring problems in SPLM's residential areas. From the abovementioned, it is clear that residents should be more conscious about water use and in instances where deviant behaviour is witnessed, it should be reported to authorities. As previously stated, residents are not merely consumers of water resources but should make conscious decisions when using water. Being an accountable and water-sensitive community means that residents use water resources sustainably and do their part to maintain water infrastructure by not vandalising or misusing said water infrastructure.

Water conservation and the reporting of water services-related issues were also emphasised during the semi-structured interview in Chapter 5 (cf. 5.3). The interviewee, in his/her response to Question 2, provided that residents should use water sparingly, understanding that water is a scarce resource and should be used for necessities and not as a “nice to have”. In their response to Question 6, the interviewee emphasised the importance of an accountable and water-sensitive community by providing that in terms of overall resilience, residents have to use water sparingly and apply water conservation at a household level. If residents are conscious when using water, it will decrease the strain placed on old and deteriorating water infrastructure that has yet to be replaced or repaired. Regarding reporting water services-related issues, the interviewee in their response to Question 2, provided that residents should report any water leaks timeously.

Another way residents can assist SPLM is by minimising unnecessary water usage and greywater use. In Chapter 5 (cf. 5.5.5.2), it was confirmed that thirteen (43%) participants do not turn off the tap while they apply soap in the shower, and eight (27%) participants indicated that they only do this sometimes. This is the first area in which residents can minimise water usage. Although this may be considered an inconvenience, the benefit is that it will decrease the demand for water supply while also decreasing the strain on old water infrastructure that has yet to be replaced or repaired. Furthermore, Chapter 5 (cf.

5.4.4.3) indicated nine (30%) participants took over five minutes to shower. Seven (23%) participants stated this is sometimes the case. Residents who only shower for 5 minutes or less may save upwards of 90ℓ of water per shower. Most participants (83%) turn off the tap while brushing their teeth, shaving, or soaping their hands (cf. 5.5.4.4). Residents can save upwards of 12ℓ each time. Seven (24%) participants do not wait for their washing machine/dishwasher to be complete before using it, and four (14%) indicated that this is only sometimes this case (cf. 5.5.4.7). Residents who wait until their washing machine is fully loaded, would use an estimated amount of 50ℓ of water to do all their laundry entirely. They will only use 15ℓ of water to wash all their dishes. It was determined that water usage could be minimised by applying a small amount of soap to reduce the amount of water necessary for rinsing (cf. 5.5.4.12). Another way in which residents can minimise water usage is by watering their gardens effectively and efficiently. These include grouping participants with the same water needs together and ensuring that the amount of water you apply is enough to reach the roots of plants.

As stated above, residents should use grey water whenever possible. As defined in Chapter 5, grey water was previously used in commercial, industrial, and residential settings, including the leftover, untreated water generated from washing machines, bathtubs, and bathroom sinks (cf. 5.5.4.5 and 5.5.4.11). It was noted that some participants reused water from the shower and that twenty-six participants in total did not reuse water (cf. 5.4.4.5). When enquiring whether participants left the tap running while waiting to regulate the water temperature, it was noted that fourteen participants in total leave the tap running while a further seven participants indicated that this is only sometimes the case (cf. 5.5.4.11). Residents can collect and reuse the water from taps while waiting for it to reach their desired temperature. Suppose participants wait for water to reach this temperature in the shower. In that case, they can use a bucket to collect all the grey water and use it for several activities such as mopping floors, washing their vehicles or watering their garden. This logic can be applied throughout the households.

Lastly, regarding residents' role in water conservation, SPLM can print and distribute information leaflets with tips and guidelines on how residents can become more accountable and water-sensitive communities. The questions provided to residents can be rephrased as tips and guidelines. An example would be a question like the one in Chapter 5 (cf. 5.5.4.2), which asked, *“Do you turn off the tap while you use/apply soap in the shower?* This question can be rephrased as *“Remember to turn off the tap while you use/apply soap in the shower*.” Another example in Chapter 5 (cf. 5.5.4.3) would be the

question, *"Does it take you more than five minutes to shower?"* This question can be rephrased as *"Remember to limit your showers to five minutes or less"*. Additionally, along with each tip or guideline, a summary of the purpose and benefit of the action can also be explained.

Chapter (cf. 6.3.3) was based on the Decision and Social Contract theories. Chapter 2 (cf. 2.8.1) of this study provided that the Decision Theory can be divided into two parts: the normative and descriptive theories. The normative theory focuses on how a decision ***should be made***. In contrast, descriptive theory focuses on ***how a decision is made*** (Hansson, 2005:6). Residents need to make a conscious decision to support SPLM by paying for municipal services and using water sustainably. Furthermore, it can be deduced that when residents decide to support SPLM and pay their utility fees, the decision is taken under circumstances of uncertainty as residents do not fully know whether or not they will receive water services. These decisions influence the social contract theory. The responsibility of SPLM in the social contract with its residents is to render water services to them if they pay for them. It can be deduced that residents do not uphold their end of the social contract with SPLM when they do not pay for services, which negatively influences water services management. Another responsibility of the residents in the social contract with SPLM is to use water sustainably. Thus, residents must be fully aware of and understand their role in the conservation of water services management and the improvement thereof.

In addition to developing resilience to improve water services management, the study also proposes that SPLM should prioritise and strengthen their planning regarding aspects of service delivery.

6.4 AN IMPROVEMENT PLAN FOR RESILIENT WATER SERVICES MANAGEMENT IN THE SOL PLAATJE LOCAL MUNICIPALITY

Planning, as defined in Chapter 3 (cf. 3.8.2) by Hall and Tewdwr-Jones (2020:3), is a general activity involving making an orderly sequence of actions that will lead to achieving a stated goal or goal. A more intensive form of planning is strategic planning. Chapter 3 (cf. 3.8.3) outlines that strategic planning aids in the precise definition of a business or organisation's long-term goals and illustrates how current efforts and goals will contribute to their accomplishments (Martins, 2024). The author explains that if goals and objectives are the destination on a map, the strategic plan can be considered the navigation system

(Martins, 2024). Furthermore, water planning seeks to make adjustments to both the social context and the resource base to sustain the yield of the resource base and to provide for society's needs (cf. 3.8.5) (Parker & Penning-Rowsell, 2024:12). Water plans may involve adjustments to the resource base, such as installing man-made storage capacity, and adjustments to the social context by, for example, offering incentives for economical use of water leading to a change in the attitude of users (Parker & Penning-Rowsell, 2024:12). A breakdown of how planning can be used for resilient and improved water services management, is provided below.

6.4.1 Strategic planning during the budgeting process

The study proposes that SPLM use rigorous strategic planning to identify all challenges faced by the water services sector and related service delivery. This can be categorised into Municipal budgeting and Water supply infrastructure.

Firstly, SPLM should revise and strengthen its budgeting processes concerning municipal budgeting. During a semi-structured interview (cf. 3.5), an interviewee posited that SPLM received funding from the National Treasury of R2.5 billion to address the water infrastructure over the next seven years. These funds are, however, not to be used for ordinary repairs and maintenance as they are dependent on the revenue collection or the internal revenue of SPLM. The participant confirmed that state funding is not for replacing pipes in neighbourhoods (cf. 5.5.5.2). This is an enormously big problem with a bankrupt municipality with sometimes no funds or material for maintenance.

This contradicts the responses from participants representing the municipality, who were satisfied with the statement that the municipality possesses adequate funds to render water supply services (cf. 5.5.7.13). It was deduced that if the municipality possessed sufficient funds to render water supply services, water restrictions/shortages would not occur as frequently. Furthermore, there would not be a shortage of capable, skilled staff to address water-related challenges. Procuring the necessary tools and material, required to address water services issues, would not be a problem.

By revising and strengthening its budgeting process, SPLM could ensure that funds are allocated and utilised for its intended purpose. Suppose the National Treasury allocates funds to SPLM, in this instance, R2.5 billion. In that case, adequate and precise planning is crucial in addressing challenges such as replacing bulk water infrastructure, or the maintenance and repair thereof. Experts in this field should determine which infrastructure

is most likely to cause a disruption to the water supply and prioritise the replacement of such underground pipes. Budget allocation and expenditure should be based on well-informed decision-making supported with evidence as to why specific actions should be taken.

Concerning ordinary maintenance and repairs, SPLM should encourage residents to become more conscious of water resources and not be apathetic consumers. As stated in Chapter 6 (cf. 6.3.3), if residents are informed about their crucial role in water services management, their attitude may change. It was deduced that residents could only support SPLM in paying for municipal services if they were happy with the services rendered. An approach SPLM can follow in this regard is to inform residents of the details regarding a water disruption in their area. For example, if a pipe burst creates a water shortage for residents, a skilled expert in the field should explain the costs of addressing the issue, leading a better understanding of how services are rendered and budgeted. An increase in support from residents will lead to an increase in municipal revenue, making improving water services management possible.

6.4.2 Strategic planning during resource acquisition and allocation

Lastly, in terms of strategic planning, SPLM should determine the municipality's needs. Through strategic planning, SPLM can determine where the gaps are within the municipality and what steps could be taken to address these. This would make budget allocations more specific, further reinforcing the necessity of revising and strengthening the budgeting processes within SPLM.

6.5 RECOMMENDATIONS

The recommendations provided below are derived based on the main ideas mentioned above. The recommendations would address the most pertinent problems in water services management within SPLM.

Recommendation 1: Regarding old and deteriorating water supply infrastructure, the study recommends that SPLM and its experts in the field determine which water supply infrastructures are most vulnerable and may lead to a disruption of water supply to residents. After this has been determined, a more active approach should be taken regarding the identified infrastructure's replacement, maintenance, or repairs. Dilapidated

infrastructure should thus be replaced without delay. Furthermore, all materials and tools that SPLM would use to replace or repair the water services infrastructure should meet the standards of the SABS without any deviation.

Recommendation 2: Capacitating and retaining human resources for water services management is equally important. Therefore, it is recommended that SPLM expand its human resources capacity to attract skilled individuals with the necessary skills, knowledge, and qualifications. In addition to recruiting skilled experts in water services management, SPLM should also create opportunities for the professional development of already appointed staff. SPLM should also reignite the *Batho Pele Principles* to get staff to commit to excellence in the delivery of water services management, ensuring the highest possible standards in water service delivery.

Recommendation 3: The role of residents in conserving and consuming water services in SPLM is vital in the water cycle. Residents should be informed of any developments regarding the management and availability of the resources in SPLM. As Chapter 1 of this study outlines, South Africa is a semi-arid country, meaning that this scarce resource needs the involvement of all role-players and stakeholders for sustainable use. SPLM should communicate about any water crisis to residents by distributing leaflets with guidelines and tips on becoming an accountable and water-sensitive community. As the link between the municipality and residents, Ward councillors should play an active role in engaging with residents regarding important water services management matters. Online platforms and forums could be utilised to distribute crucial information regarding water services management and related issues. The resilience of water services management in SPLM could thus be achieved and maintained by educating and sensitising residents to their essential role in the water cycle and overall water services management.

Recommendation 4: Planning is a critical function of government. In this regard, it is advised that SPLM follow an evidence-based approach to include planning during the municipal budgeting process and resource acquisition and allocation of vital water infrastructure. By applying strategic planning, it is possible to determine the shortages within SPLM in terms of resources for water services management. In addition, through strategic planning, SPLM could determine which water supply infrastructure requires urgent attention for repair or replacement to avoid water loss and non-availability of the resource to residents at large.

6.6 RECOMMENDATIONS FOR FUTURE RESEARCH

Based on the literature review and empirical investigation of this study, the following are recommended for future research:

- Due to the limited scope of this dissertation, this study did not include other municipalities in the Frances Baard District Municipality (FBDM) but focused only on SPLM. The findings can, therefore, not be generalised. In future, the resilience of water services management in the other three local municipalities (Dikgatlong, Magareng, and Phokwane local municipalities) should be researched to explore if different challenges are experienced.
- It was discovered that SPLM has room for improvement in water services management. Therefore, future studies should investigate outdated and dilapidated water services infrastructure and the shortage of skilled personnel to render water services management effective. The lack of human resource skills seems to be a significant constraint.

6.7 CHAPTER CONCLUSION

This chapter aimed to provide recommendations for an improvement plan for water services management in SPLM. The proposed ideas to improve and develop resilience within SPLM included emphasizing an active approach to the replacement, maintenance, or repairs of water supply infrastructure, expanding the human resource capacity of SPLM, and empowering residents to become conservationists of water resources and not merely users. Furthermore, the chapter recommends that strategic planning be utilised during the municipal budgeting, resource acquisition, and allocation of relevant water services infrastructure.

The key findings for each chapter were also summarised in this chapter and all the chapters presented in this dissertation. The overall purpose of this chapter was to demonstrate the achievement of this study's research objectives. The study concludes that water services management within SPLM has room for improvement. Therefore, a practical plan for delivering resilient and sustainable water services in the future was presented.

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APPENDICES

ANNEXURE A: ETHICAL APPROVAL LETTER

Private Bag X1290, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Fax: 018 299-4910
Web: http://www.nwu.ac.za

Basic and Social Sciences Research Ethics Committee (BaSSREC)

Faculty of Humanities Ethics Office for Research, Training and Support
Tel: 018 285 2457

Email: Ethabor.Idemudia@nwu.ac.za

Senate Committee for Research Ethics
Tel: 016 103 4446
Email: Fezlwe.Mseleni@nwu.ac.za

14 June 2024

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the **Basic and Social Sciences Research Ethics Committee (BaSSREC)** on **12/06/2024**, the Basic and Social Sciences Research Ethics Committee hereby **approves** your study as indicated below. This implies that the North-West University Senate Committee for Research Ethics (NWU-SERC) grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: An improvement plan for water services management in the Sol Plaatje Local Municipality.

Study Leader/Supervisor (Principal Investigator)/Researcher: Prof. M. Diedericks

Student/Research Team: G. Solomons (30061385)

Ethics number: N W U - 0 0 9 8 0 - 2 4 - A 7

Institution | Study Number | Year | Status

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Application Type: Single Study

Commencement date: 12/06/2024 **Risk:** Low risk

Expiry date: 12/06/2025

Approval of the study is initially provided for a year, after which continuation of the study is dependent on receipt and review of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation.

Special in process conditions of the research for approval (if applicable):

General conditions:

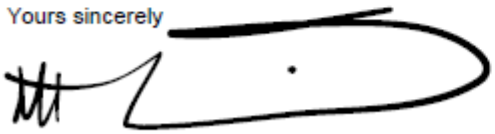
While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:

- *The study leader/supervisor (principal investigator)/researcher must report in the prescribed format to the BaSSREC:*
  - *annually (or as otherwise requested) on the monitoring of the study, whereby a letter of continuation will be provided, and upon completion of the study; and*
  - *without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.*

- *The approval applies strictly to the proposal as stipulated in the application form. Should any amendments to the proposal be deemed necessary during the course of the study, the study leader/researcher must apply for approval of these amendments at the BaSSREC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.*
- *Annually a number of studies may be randomly selected for an external audit.*
- *The date of approval indicates the first date that the study may be started.*
- *In the interest of ethical responsibility, the NWU-SCRE and BaSSREC reserves the right to:*
  - *request access to any information or data at any time during the course or after completion of the study;*
  - *to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the study are revealed or suspected;*
    - *it becomes apparent that any relevant information was withheld from the BaSSREC or that information has been false or misrepresented;*
    - *submission of the annual (or otherwise stipulated) monitoring report, the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and / or*
    - *new institutional rules, national legislation or international conventions deem it necessary.*
- *BaSSREC can be contacted for further information or any report templates via BaSSREC-Admin@nwu.ac.za.*

The BaSSREC would like to remain at your service as scientist and researcher, and wishes you well with your study. Please do not hesitate to contact the BaSSREC or the NWU-SCRE for any further enquiries or requests for assistance.

Yours sincerely



Prof. E. Idemudia

Chairperson NWU Basic and Social Sciences Research Ethics Committee

ANNEXURE B: PERMISSION LETTER FROM SPLM



SOL PLAATJE MUNICIPALITY

OFFICE OF THE MUNICIPAL MANAGER
KANTORO YA MOTSAMAISI WA MASEPALA
KANTOOR VAN DIE MUNISIPALE BESTUURDER

Private Bag X5030,
Kimberley 8300
Tel: (053) 830 6911
Fax: (053) 833 1005
www.solplaatje.org.za

Ref. No./Verw:

Enquiries / Navr: SB Matlala/mjn (053-8306101)

13 June 2024

Mr G Solomons
Masters Researcher
North West University

Dear Mr Solomons

email: gmsolomons@gmail.com

RE: REQUEST TO CONDUCT RESEARCH AT SOL PLAATJE MUNICIPLAITY

Your letter we received on 13 June 2024, with regards to the above-mentioned request has reference. Considering the above, you are hereby granted permission to conduct research as outlined in your request letter.

Kindly liaise with the relevant participants for the study namely:

Mr Blessing Mukosi: Water and Sanitation, tel 0538306324/6321
Mr Sabelo Mkhize: Compliance Manage, tel 0538306681
Mr Manda Ntshanyang, tel 0715669698

I hope you find the above in order. All enquiries with regard to the above-mentioned permission may be directed to the Municipal Manager.

Kind regards

SB MATLALA
MUNICIPAL MANAGER

The City that Sparkles

ANNEXURE C: INFORMED CONSENT

Basic Social Sciences Research Ethics Committee (BaSSREC)

DATE14 June 2024

BaSSREC Authorisation



PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

Title of the research project	An improvement plan for water services management in the Sol Plaatje Local Municipality
Ethics number	**NWU-00980-24-A7**
Principal investigator	Grant Solomons
Student number	30061385
Address	**21 Simon Street, Hadison Park, Kimberley, 8301**
Email address	**gmsolomons@gmail.com**
Contact number	**0846309057**

You are being invited to take part in a research project that forms part of my master's studies Master of Arts in Public Management and Governance at the North-West University, Potchefstroom campus. Please take some time to read the information presented here, which will explain the details of this project. Please ask the researcher any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research is about and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part. Prior to publication of the study's results (or the point that publication is in process), you may also withdraw the data you generate.

This study has been approved by the **Basic and Social Sciences Research Ethics Committee (BaSSREC) of the Faculty of Humanities of the North-West University (NWU Potchefstroom Campus)** and will be conducted according to the ethical guidelines and

principles of the international Singapore Statement on Research Integrity (2010) and the ethical guidelines of the National Health Research Ethics Council. It might be necessary for the research ethics committee members or relevant authorities to inspect the research records to make sure that we (the researchers) are conducting research in an ethical manner.

What is this research study all about?

- This study is an investigation of the **water services management of Sol Plaatje Local Municipality and how resilient those water services are. The study is also an investigation of how community members respond to, and perceive the Sol Plaatje Local Municipality as well as the water use practices of community members and will involve the use of semi-structured interviews, questionnaires, observations, and document analysis.**
- The researcher has been trained to use the methods mentioned in the previous sentence.
- Approximately 30 participants will be included in this study. 5 community members from the following residential areas will be approached to participate: Carters Glen, Hadison Park, Galeshewe, Roodepan, New Park, Southridge. This study will also include relevant staff members from the Sol Plaatje Local Municipality. Currently, the researcher intends on interviewing the following individuals within the Sol Plaatje Local Municipality: City engineer: Water and Sanitation; Compliance manager: Water and Sanitation; Plant manager: Riverton; Relevant MMC for Infrastructure; Relevant ward councillors of the six identified wards
- The objectives of this research are:
    - To explore the shift worldwide towards water-resilient sustainable cities
    - To analyse the existing legislation and regulation, including the strategies aimed at ensuring resilient water management services
    - To expound the theories, principles, and practices of resilient water services management
    - To determine the challenges to resilient water services management in the Sol Plaatje Local Municipality
    - To provide recommendations by way of an improvement plan for water services management in the Sol Plaatje Local Municipality

Why have you been invited to participate?

- You have been invited to participate **because you are experts in your field and could provide valuable information in relation to the water services management of Sol Plaatje Local Municipality or you reside in one of the following areas: Carters Glen, Hadison Park, Galeshewe, Roodepan, New Park, or Southridge**
- You have also complied with the following inclusion criteria: **Hold the right position in relation to water services management within Sol Plaatje Local Municipality or reside in one of the above-mentioned areas.**
- You will be excluded if you do not hold the relevant position within the Sol Plaatje Local Municipality or do not reside in the one above-mentioned areas.

What will your responsibilities be?

- You will be invited to participate in the noted study by means of semi-structured interviews and questionnaires.
- You will have two weeks to indicate whether you would be willing to participate.

- You will be requested to sign this Informed Consent Statement before the commencement of the study.

Will you benefit from taking part in this research?

- The direct benefits for you as a participant will probably be that you can aid in identifying challenges faced by Sol Plaatje which deter effective and efficient water services delivery.
- The indirect benefit will probably be that you could possibly contribute to the body of knowledge seeking to improve water service delivery and the resilience of water delivery systems.

Are there risks involved in your taking part in this research and how will these be managed?

The possible risks in this study, and how these will be managed, are summarised in the table below:

Possible risk	Mitigation strategy
There will be no health or hazardous risks when distributing the questionnaires or conducting the semi-structured interview	Not applicable because there will be no risks. Participants can participate from the comfort of their homes/offices.
Emotional distress of the participants.	Participants need not have fear as all data will only be utilised to achieve the study's goals.
Tiredness and discomfort.	Participants can complete the questionnaires at their own pace and availability.
Lack of privacy and comfort during interviews and questionnaires due to questionnaire due to being alarmed that answers provided will be used against them.	This will be addressed by assuring participants that confidentiality would be provided and that their responses would remain anonymous.

- *However, we do believe that the benefits to you and to science (as noted in the previous section) outweigh the risks we have listed. If you disagree, then please feel free not to participate in this study. We will respect your decision.*
- *Should we learn, in the course of the research, that someone is harming you, or that you are intending to harm someone, then we must tell someone who can help you/warn the person you are intending to harm.*

Who will have access to the data?

The following procedures will be observed in line with the Protection of Personal Information Act (POPIA):

Principle	How will this be done?	When will this be done?
Anonymity	Anonymity will be ensured as only geographical data (age, race, in which of the identified areas you reside) will appear on the questionnaire	This information is provided at the beginning of the questionnaire.
Confidentiality	The researcher will not disclose any information gained from an interviewee deliberately or accidentally in ways that	During the recruitment process. Before the fieldwork commences. During the fieldwork.

	might identify an individual, organisation and location.	After the fieldwork has been completed During analysis and the write-up of findings. During the reporting of findings. During the publication of findings in the form of articles.
Data storage	All data collected for the purpose of the research will be stored safely in electronic format/hardcopy format for a period of five years after which it will be destroyed. The primary investigator will ensure data that both hard-(printed) and soft copy (electronic) are safely locked away and password-protected, respectively. At the analysis stage, as will be the case throughout, the use of coding will reinforce participants' non-identification, hence upholding the assurance of confidentiality and anonymity.	During the recruitment process. Before the fieldwork commences. During the fieldwork. After the fieldwork has been completed During analysis and the write-up of findings. During the reporting of findings. During the publication of findings in the form of articles.
Privacy	*Privacy* will be ensured by not probing unnecessarily if you do not wish to discuss particular matters.	During the recruitment process. Before the fieldwork commences. During the fieldwork. After the fieldwork has been completed During analysis and the write-up of findings. During the reporting of findings. During the publication of findings in the form of articles.
Transcription/coding of data	I will not use a *transcriber* for the purpose of the transcripts after the interview. I will not use a *statistician/coder* for the purpose of the transcripts after the interview.	*If the primary investigator is responsible for transcribing/coding the data*: The primary investigator will be responsible for transcribing the data. Therefore, no other person will have access to the data. The primary investigator will be required to sign a NWU Confidentiality Agreement before the study commences. *If a subject expert (e.g. transcriber/language editor/coder/statistician) assists with/takes responsibility for transcribing/coding the data*:

		This person will be responsible for transcribing the data. Therefore, no other person will have access to the data. This/These person will be required to sign a NWU Confidentiality Agreement before the study commences.
Translation/interpreter services	Questionnaires will be provided to participants in Afrikaans/English	During the recruitment process. Before the fieldwork commences.

Collection of only relevant personal information:

Collection of only relevant personal information	I, the principal investigator, will only collect personal biographical and opinion-related data about the topic I/we are studying.	Shortly list the *biographical* and *opinion-related* (*main themes*) information that will be collected for the purpose of the study: • Gender • Age • Race • Residential area • Relevant experience in rendering water services

What will happen to the data?

The data from this study will be reported in the following ways: In all of this reporting, you will not be personally identified. This means that the reporting will not include your name or details that will help others to know that you participated.

This is a once-off study, so the data will not be re-used

Will you be paid/compensated to take part in this study and are there any costs involved?

No, you will not be paid/compensated to take part in the study. Participation is entirely voluntary.

How will you know about the findings?

- Once the examination process of the study has been successfully completed, the research project will be published on relevant platforms i.e. the NWU Library website and the study will also be made publically available. The findings of the study can also be shared with participants upon request

Is there anything else that you should know or do?

- You can contact the researcher (Grant Solomons) on 084 630 9057 and at gmsolomons@gmail.com if you have any further queries or encounter any problems.

- You can contact the chair of the Basic Social Sciences Research Ethics Committee (Prof Erhabor Idemudia) at 018 389 2899 or Erhabor.Idemudia@nwu.ac.za if you have any concerns or complaints that have not been adequately addressed by the researcher.
- You will receive a copy of this information and consent form for your own records.

Declaration by participant

By signing below, I _____ agree to take part in a research study entitled: "An improvement plan for water services management in the Sol Plaatje Local Municipality".

I declare that:

- I provide *informed consent*.
  - Thus, I have read and understood this information and consent form and it is written in a language with which I am fluent and comfortable.
  - Thus, I have had a chance to ask questions to both the person obtaining consent, as well as the researcher (if this is a different person), and all my questions have been adequately answered.

- I provide *voluntary consent*.
  - Thus, I understand that taking part in this study is voluntary and I have not been pressurised to take part.
  - Thus, I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
  - Thus, I am aware of the fact that I may request that the researcher does not continue with said recording if I request it.

- I provide *specific consent*.
  - Thus, I understand that what I contribute (what I report/say/write/draw/produce visually) could be reproduced publically and/or quoted, but without reference to my personal identity.

Signed at (*place*) _____ on (*date*) _____ 20 _____

_____ _____

Signature of participant **Signature of witness**

- You may contact me again ☐ **Yes** ☐ **No**
- I would like a summary of the findings of this research ☐ **Yes** ☐ **No**
- I would like feedback on my functioning/wellbeing as reflected in the questionnaires I completed ☐ **Yes** ☐ **No**

The best way to reach me is:

Name & Surname: _____

Postal Address: _____

Email: _____
Phone Number: _____
Cell Phone Number: _____

In case the above details change, please contact the following person who knows me well and who does not live with me and who will help you to contact me:

Name & Surname: _____

Phone/ Cell Phone Number /Email: _____

_____

Declaration by person obtaining consent (if not the researcher/primary investigator)

I *(name)* _____ declare that:

- I explained the information in this document to _____
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter.

Signed at (*place*) _____ on (*date*) _____20 ____

_____ _____

Signature of person obtaining consent **Signature of witness**

Declaration by researcher/primary investigator

I *(name)* _____ declare that:

- I explained the information in this document to _____
- I encouraged them to ask questions and took adequate time to answer them.
- I am satisfied that they adequately understand all aspects of the research, as discussed above
- I did/did not use an interpreter.

Signed at (*place*) _____ on (*date*) _____20 _____

Signature of researcher	**Signature of witness**

Declaration by researcher and participant

Personal face-to-face interviews during Covid-19 restrictions (*if applicable*)

Additional declaration by participant in those instances where the participant requests to participate in a personal face-to-face semi-structured interview:

By signing below, I _____, acknowledge the following information related to the required measures regarding Covid-19:

I declare that:

- It is my personal choice and preference to participate in a personal face-to-face semi-structured interview with the researcher.
- This requires that I consent to the following strict measures to safeguard the personal health and safety of myself and that of the researcher/interviewer/primary investigator:

  - I consent to the researcher taking my temperature before the interview using a thermometer. ☐ **Yes** ☐ **No**
  - I confirm that my temperature measured at _____ degrees. ☐ **Yes** ☐ **No**
  - I consent to use the three-ply mask provided by the researcher. ☐ **Yes** ☐ **No**
  - I consent to wear the three-ply mask for the full duration of the interview. ☐ **Yes** ☐ **No**
  - I consent to the researcher sanitising the interview context using a sanitiser with an 80% alcohol content before the commencement of the interview. ☐ **Yes** ☐ **No**
  - I consent to the researcher using a sanitiser with an 80% alcohol content before and during the interview if required. ☐ **Yes** ☐ **No**

Signed at (*place*) _____ on (*date*) _____ 20 ____

_____ _____

Signature of participant **Signature of researcher**

ANNEXURE D: INTERVIEW AND QUESTIONNAIRE SCHEDULE WITH SPLM OFFICIALS



QUESTIONNAIRE

This questionnaire contains five sections.

Section A: *Consent form to partake in the study*

Section B: *Biographical Information please tick where applicable*.

Section C: *Likert-scale questions, you are required to fill in the most applicable answer by following the instructions on each section.*

Section D: *Open-ended questions, relating to the level of water resilience exhibited by the Sol Plaatje Local Municipality.*

Section E: *This section allows the participant to provide any relevant commentary*

SECTION A: CONSENT FORM

This questionnaire seeks to collect data regarding the level of water resilience exhibited by the Sol Plaatje Local Municipality.

Please take note of the following:

- Anonymity of participatory results and confidentiality are guaranteed.
- The information provided will be used for research purposes only.
- Your participation in this study is voluntary and you have the right to withdraw at any given time.
- Time of completion of the Likert-scale questionnaire is dependent upon the participant. 2 weeks will be provided for overall completion.

Hereby, the participant agrees to take part in a research study entitled: An improvement plan for water services management in the Sol Plaatje Local Municipality.

Participant's response to participate in study: YES NO

Date:……

SECTION B: BIOGRAPHICAL INFORMATION

This section contains questions on your biographical information for statistical purposes. Please tick where applicable.

1. Gender

MALE		**FEMALE**	

2. Age

UNDER 25	**26-35**	**36-45**	**46-55**	**ABOVE 55**

3. Please indicate your level of education?

Matric	
Higher certificate	
Diploma	
Bachelor's degree	
Honours	
Masters	
PhD	
Other ----------	

4. Which of the following categories suits you?

Senior management	
Middle management	
Professional	
Specialist	
Administrative	
Technician	
Other _____	

5. Years of service in the current position

Current position	**Less than 5yrs**		**6-10**		**11-15 yrs**		**16-20 yrs**		**21-25 yrs**	

SECTION C: LIKERT-SCALE QUESTIONS

Statements regarding knowledge of water services delivery processes.

This section asks questions regarding the level of water resilience exhibited by the Sol Plaatje Local Municipality. Please indicate to what extent you agree with the following statements by marking the appropriate box with an 'x' (cross).

5 strongly agree, 4 agree, 3 satisfied, 2 disagree, 1 strongly disagree

I frequently receive questions/complaints related to water services delivery	**1**	**2**	**3**	**4**	**5**
All households within the municipal area have access to basic water supply services.	**1**	**2**	**3**	**4**	**5**
Residents of SPLM are informed in advance before any water cuts or disruptions	**1**	**2**	**3**	**4**	**5**
Water restrictions are frequently put into effect	**1**	**2**	**3**	**4**	**5**

I have an understanding of what water resilience entails	**1**	**2**	**3**	**4**	**5**
The Sol Plaatje Local Municipality exhibits resilience regarding delivery of water services	**1**	**2**	**3**	**4**	**5**
The Sol Plaatje Local Municipality do enough to ensure that water related issues do not occur	**1**	**2**	**3**	**4**	**5**
I am aware of programmes/plans which are intended to improve the level of water services resilience of the Sol Plaatje Local Municipality	**1**	**2**	**3**	**4**	**5**
The Sol Plaatje Local Municipality make provision when water restrictions occur for prolonged periods of time	**1**	**2**	**3**	**4**	**5**
The municipality promotes the awareness of water conservation	**1**	**2**	**3**	**4**	**5**
The municipality has strategies in place to deal with water growth-and-demand services	**1**	**2**	**3**	**4**	**5**
The Sol Plaatje Local Municipality have the necessary resources to become more resilient and effective in the face of water related issues	**1**	**2**	**3**	**4**	**5**
The municipality possesses adequate funds to render water supply services.	**1**	**2**	**3**	**4**	**5**
A Water Services Development Plan is in place for the municipality where I work.	**1**	**2**	**3**	**4**	**5**
All the spheres of government should be involved in the water resources management process in the area	**1**	**2**	**3**	**4**	**5**
Political interferences has influenced water resources management	**1**	**2**	**3**	**4**	**5**

My involvement in the maintenance of the water supply systems could improve the current status of water services delivery	**1**	**2**	**3**	**4**	**5**
The residents of Kimberley support the IDP process of the Sol Plaatje Local Municipality	**1**	**2**	**3**	**4**	**5**
My municipality complies with all the relevant water legislation -and regulation	**1**	**2**	**3**	**4**	**5**
I am satisfied with the quality of water supply services rendered by my municipality	**1**	**2**	**3**	**4**	**5**

SECTION D: OPEN-ENDED QUESTIONS:

This section contains open-ended questions relating to the level of water resilience exhibited by the Sol Plaatje Local Municipality.

1. **How long does it take to comment/respond to questions/complaints related to water services given by residents?**

_____
_____
_____
_____

2. **How long does it take to resolve water related issue i.e. broken pipes which are used to supply residents with water?**

_____
_____
_____
_____

3. **How do you ensure the integrity of equipment and machinery used for water services management? How often does maintenance occur?**

4. **How do you ensure water service-related operations comply with regulatory standards?**

5. **Have you encountered any water services-related operational challenges, if so, what were they and what mitigation strategies are in place to overcome operational challenges?**

6. **Are you aware of programmes/plans which are intended to make the Sol Plaatjie Local Municipality more resilient, if so, provide a brief description**

7. **Which provisions are made by the Sol Plaatje Local Municipality when water restrictions occur for prolonged periods of time?**

8. **Do you have a unique, resilient or innovative approach to water storages?**

9. **What do you think is the best strategy to achieve sustainable water resources management .**

10. **What are the latest advances/methods in resilient water management? Is it possible for the Sol Plaatje Local Municipality to incorporate these advances/methods?**

SECTION E: OPEN COMMENTARY

This section allows the participant to provide any relevant commentary

THE END……. THANK YOU FOR YOUR PARTICIPATION

ANNEXURE E: QUESTIONNAIRE SCHEDULE WITH RESIDENTS/WARD COUNCILLORS



QUESTIONNAIRE

This questionnaire contains four sections.

Section A: *Consent form to partake in the study*

Section B: *Biographical Information please tick where applicable*.

Section C: *Likert-scale questions, you are required to fill in the most applicable answer by following the instructions on each section.*

Section D*: Likert-scale questions, you are required to fill in the most applicable answer by following the instructions on each section.*

Section E: *This section allows the participant to provide any relevant commentary*

SECTION A: CONSENT FORM

This questionnaire has two focal points. The first is on the Sol Plaatje Local Municipality and their role as Water Services Authority and Water Services Provider. The second focal point is on your water usage.

Please take note of the following:

- Anonymity of participatory results and confidentiality are guaranteed.
- The information provided will be used for research purposes only.
- Your participation in this study is voluntary and you have the right to withdraw at any given time.

- Time of completion of the Likert-scale questionnaire is dependent upon the participant. 2 weeks will be provided for overall completion.

Hereby, the participant agrees to take part in a research study entitled: An improvement plan for water services management in the Sol Plaatje Local Municipality.

Participant's response to participate in study: YES NO

Date:…….

SECTION B: BIOGRAPHICAL INFORMATION

This section contains questions on your biographical information for statistical purposes. Please tick where applicable.

6. Gender

MALE		**FEMALE**	

7. Age

UNDER 25	**26-35**	**36-45**	**46-55**	**ABOVE 55**

8. Residential area

……

SECTION C: LIKERT-SCALE STATEMENTS

This section pose statements with regard to Sol Plaatje Local Municipality and their role as Water Services Authority and Water Services Provider. Please indicate your answer by ticking the appropriate box.

5 = strongly agree, 4 = agree, 3 = satisfied, 2 = disagree, 1 = strongly disagree

I know who the Water Services Authority/Provider of Kimberley is.	**1**	**2**	**3**	**4**	**5**
I know how to get in contact with the Water Services Authority/Provider if I experience any problems with water related services.	**1**	**2**	**3**	**4**	**5**
The Water Services Authority/Provider commit or hold up to its responsibilities.	**1**	**2**	**3**	**4**	**5**
I am satisfied with the quality of water services delivered to us as residents/households	**1**	**2**	**3**	**4**	**5**
Water restrictions/shortages occur on a regular basis	**1**	**2**	**3**	**4**	**5**
These water restrictions last/have lasted longer than 2-3 days	**1**	**2**	**3**	**4**	**5**
The Water Services Authority/Provider communicate effectively on issues related to water services i.e. when restrictions will occur, how long these restrictions will remain in effect, and why these restrictions are put into effect	**1**	**2**	**3**	**4**	**5**
Water restrictions always follow a set schedule i.e. are put into effect as stated by Water Services Authority/Provider, are lifted as stated by the Water Services Authority/Provider	**1**	**2**	**3**	**4**	**5**
The Water Services Authority/Provider do enough to ensure that prolonged/continuous water restrictions do not occur on a regular basis	**1**	**2**	**3**	**4**	**5**

SECTION D: LIKERT-SCALE QUESTIONS

This section asks questions regarding your water usage as well as on water resources related topics. Please indicate your answer by ticking in the appropriate box.

Do you take a shower instead of a bath?	**Yes**	**No**	**Sometimes**	**NA**
Do you turn off the tap while you use/apply soap in the shower?	**Yes**	**No**	**Sometimes**	**NA**
Does it take you more than five minutes to have a shower?	**Yes**	**No**	**Sometimes**	**NA**
Do you turn off the tap while brushing your teeth, shave or soap your hands?	**Yes**	**No**	**Sometimes**	**NA**
Do you reuse the water from the shower, for example, to wash the floor?	**Yes**	**No**	**Sometimes**	**NA**
Do you think about the amount of water you use daily?	**Yes**	**No**	**Sometimes**	**NA**
At home, do you wait for the washing machine or dishwasher to be full before putting it on wash?	**Yes**	**No**	**Sometimes**	**NA**
Do you make sure the taps are closed properly?	**Yes**	**No**	**Sometimes**	**NA**
Do you defrost food under the tap	**Yes**	**No**	**Sometimes**	**NA**
Do you wash your car more than once a week?	**Yes**	**No**	**Sometimes**	**NA**
Do you leave the tap running waiting for cold or hot water?	**Yes**	**No**	**Sometimes**	**NA**

Do you use small amount of soap, shampoo, or washing powder to reduce the amount of water needed for the rinse?	**Yes**	**No**	**Sometimes**	**NA**
Do you have a private swimming pool at home?	**Yes**	**No**	**Sometimes**	**NA**
Do you have a garden at home or in your community?	**Yes**	**No**	**Sometimes**	**NA**
Is the garden watered more than twice weekly?	**Yes**	**No**	**Sometimes**	**NA**

SECTION E: OPEN COMMENTARY

PLEASE PROVIDE ANY RELEVANT COMMENTARY REGARDING WATER SERVICES MANAGEMENT RENDERED BY THE SOL PLAATJE LOCAL MUNICIPALITY

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THE END……

THANK YOU FOR YOUR PARTICIPATION!

CARMEN NEL
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CERTIFICATE OF LANGUAGE EDITING

This certifies that I have edited the research report detailed below.

Title:

"An improvement plan for water services management in the Sol Plaatje Local Municipality"

by

Grant Solomons

Regards

Carmen Nel

Carmen Nel
4 December 2024