Chapter 6

Resilience in a Complex Adaptive Environment: Water Scarcity and Adaptation in Khayelitsha, South Africa

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Part One

> 'I am 54 years of age, male; I live with my daughter, my son in law and my two granddaughters. No, the government does not give us appropriate access to water. The government does not give us enough water for us to live comfortably. We walk to get water due to the lack of taps inside the yard. Yes, water causes many diseases, especially in the areas that have communal taps one can get sick anytime. Eish, brother, nkuzima (it's tough), I do not know what can happen without this business.'

This above excerpt is from an intense conversation that took place in 2018 with Sive during fieldwork in Khayelitsha. Our conversation took 60 minutes and ranged from food to water usage, and many other topics. In passing, Sive raises several issues concerning service delivery. Perhaps the most pertinent was the question of water – which is increasingly becoming an element of contestation specifically in an informal settlement. The issues arising from the conversation undeniably represent the focus of this chapter. This chapter provides much illumination into people adaptation; the challenges residents are confronted with as well as vulnerabilities when it comes to access water specifically through a communal tap.

1 Introduction

Despite the effort to flatten the curve and the engagement between the government and residents of informal settlements, the global indicators imply that Covid-19 continues to threaten global

social and economic structures and water management in many instances remains a pipe dream. With the global economic crisis, the overstaying at home due the lockdown and the rise in infection, and the uncertainty of global change, water access through communal taps with or without proper sanitation is no longer simply about reducing negative impacts imposed by the Covid-19 pandemic but rather the ability of residents to negotiate, reconcile and operate in an environment which enables them to survive and remain resilient over time. A paradigm shift is needed by which President Ramaphosa calls for the South African government to better understand its role in the system in which it operates in terms of its interactions within/between social and environmental elements to better ensure that the water provision does not deteriorate beyond certain thresholds where it can no longer recover from risk events.

In August 2021, President Ramaphosa announced changes to his cabinet arguing that 'water is our country's most critical natural resource' and decided to separate the water and sanitation ministry which will ensure that all citizens have access to water. According to the World Wildlife Fund (WWF), water demand is set to reach 17.7 billion m^3 by 2030 – up from 13.4 billion m^3 in 2016 which outstripped the country's capacity to secure and provide to its citizens. Furthermore, Covid-19 has forced the municipalities and the Department of Human Settlements, Water and Sanitation to re-look at free essential water provision to its people and ensure that everyone has access to this most basic of rights. Also, to provide the necessary infrastructure for said provision. Conversely, the announcement by President Ramaphosa demonstrates that after 27 years into a democratic the government's efforts were failing to encourage the long-term adoption of improved practices. Instead, it appears to be perpetuating the same challenges without addressing the root causes of why the government is failing to achieve long-term activity change. The South African National Development Plan and researchers agree on the shaping of a coherent policy and urge the City authorities to engage with residents to assist them better understand the functioning and impact that they have on the social environment in which they operate.

Covid-19 has again exposed the lack of infrastructure and the supply of water and adequate sanitation facilities to the most

vulnerable people living in the informal settlements and has continually changed the way residents see, understand and consume water. Based on the assumption that it will be possible to achieve better results with a couple of adjustments, one of the most severe challenges facing South Africa is the lack of or limited supply of water resources and sanitation (Chitonge et al. 2019). With water, sanitation and hygiene being the first ammunition to fight against the spread of the virus, this is indeed a problem that requires a holistic approach to find a long-time solution and save people's lives.

This ethnographic chapter merely focuses on the diverse adaptive measures that residents of Khayelitsha employ. It combines both theory and practice underpinnings of resilience, looking at how residents respond to water scarcity.[1] The contemporary research of resilience has some elements that have developed in different fields that, in turn, have generated definitions of the concept relevant to the context and content of the problem its addresses (Joseph 2016). Few kinds of research, however, have examined resilience in both its theory and application across the different disciplines. Additionally, Covid-19 has highlighted the challenges facing South Africa and will help fast-track the upgrading of infrastructure and the uninterrupted supply of good quality water and sanitation to all its residents.

Using a qualitative research methodology, the chapter focuses on resilience in a complex adaptive environment using Khayelitsha as a case study to demonstrate how resilience continues to shape how water is distributed, accessed and used in informal settlements. The argument presented is that residents of informal settlements, particularly shack dwellers, are consuming water close to the survival rate and change to water access can be detrimental to their health. This chapter comprises two parts. Part One provides the introduction, background and the methodology used, and establishes the problem and the contribution of the book. It further covers the topography of water and the remedial action to the crisis; it lastly summarises the historical context of Khayelitsha followed by a brief theory on resilience. Part Two includes the case study and discusses the different ways of using water and considers conversations that took place during fieldwork at the respondent's home and the communal water tap, and the conclusion. These conversations provide insight into how the water crisis affects residents' livelihoods

and needs. Briefly, the chapter focuses on water scarcity, resilience theory and offers detailed descriptions and characteristics of issues of concern, as well as adaptive measures.

How, then, does adaptation relate to resilience in this chapter? According to Martin-Breen and Anderies (2011), adaptation due to climate change does not fundamentally evaluate behaviour but describes it. Behaviour may reflect short or long-term perceptions of local climate conditions. Adaptation may also be undertaken by policy makers, sectors, individuals, communities or environments. It should be noted that two other variants of 'adaptation' can be found in the literature on climate change.

First, it may be used in the same understanding of 'actions that enhance adaptive capacity with respect to climate change'. Secondly, it is occasionally used to describe what is otherwise named 'mitigation of climate change' (e.g., in Parry 2002) that is, to describe change occurred in order to minimise the magnitude of climate change or related climatic occurrences. Resilience as a concept in this chapter underscores people's awareness of the water crisis in Cape Town, including necessary adjustment in its daily consumption. Resilience also captures the activities that surround the necessity for change as a result of water scarcity. It relates to the exploration of the people's reactions to their experiences and postulations as they grapple with the reality of water scarcity. The names provided in this chapter are pseudonyms to increase the quality of the people's responses, because of the total confidentiality of all the information people have provided. Residents in Khayelitsha have been struggling with water for quite some time (see Kongo 2019; O'Brien 2014; Robins 2013a, 2013b: Taing et al. 2014).

Residents of Khayelitsha are trapped in unstructured defined residential neighbourhoods; entire unequal demographics have inherited spatially defined access to water, health, welfare, income and occupation. Such limited access has severely sparked people's mobility. While the consequences of the social hierarchy are evident in the spatial inequalities between informal settlements and suburbs, what is not immediately noticeable are the psychological effects on the individual and the community. Being compelled to live in an environment lacking water and sanitation often has negatively affected the environmental perceptions and attitudes of many shack

dwellers. As Luthar and Cicchetti (2000) suggest, resilience in the study of developmental psychology is distinguished not by its focus on adaptation in general, but rather adaptation in the presence of adversity or in hazardous environment or conditions. Covid-19 marked the beginning of a new era characterised by the erection of new settlements and more intense intra-mobility, migration flows from within Khayelitsha with the population that is becoming increasingly dense and dynamic. Residents' narratives serve as a foundation through which to utilise resilience theory on the water and evaluates how their experience may inspire others who are under similar predicaments. It is with the hope that the complexity of the findings will make a significant contribution to the book and also be useful for different scholars as they are examining resilience as a relevant concept to theirs.

2. The Topography of Water in South Africa and Cape Town

Globally, it has become clear that the allocation of water resources in most areas is less a problem of physical water scarcity than a challenge of economic water scarcity (see Metha 2014). The uneven distribution of water across the planet also poses a challenge (Oyebande 2001). In Africa, the accumulation of water and ecological deficits over nearly four decades of droughts has subjected the environment to a high level of degradation and vulnerability. Drought and climate variability worsen the fragility of the continent and make water resource development a challenge (DEA 2011; WWF-SA 2016; DWS 2017). In South Africa, the insufficient levels and coverage of water services plague both rural and urban communities, creating health challenges (DEA 2011).

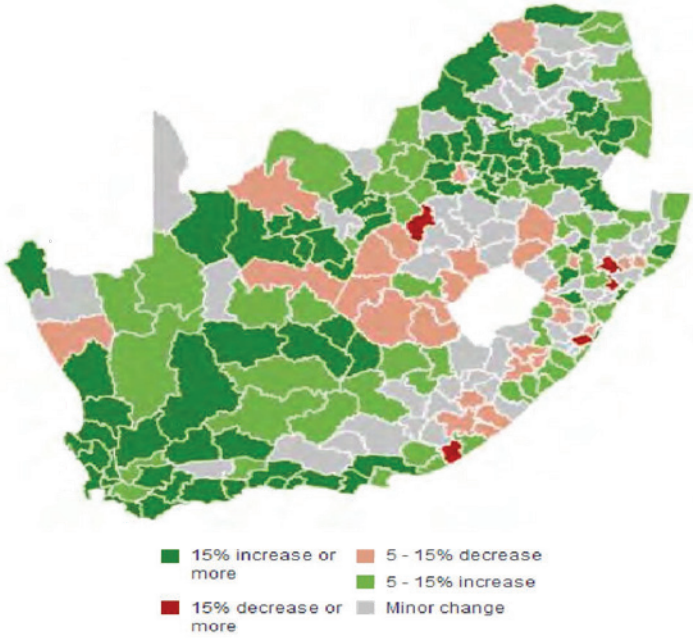
In comparison to other countries around the globe, South Africa has an average of 500 mm annual rainfall, and 843 m^3 water per annum. Thirty per cent of yearly rainfall runoff is mostly from surface water, with a large amount of water coming from groundwater (WWF SA 2016; DWS 2017). The World Resources Institute, South Africa, proclaimed the country a water-scarce environment[2] that is experiencing water scarcity (Reig, Shiao and Gassert 2013). Water is a source of life and essential for human necessity (Cothren 2013; Brookes and Carey 2015; WWF-SA 2016; DWS 2017). Because water

is a shared resource, the increasing scarcity will directly affect South Africa's health and socio-economic development (DEA 2011). The proponents of water have argued that water facilitates social living and human life sustenance, it plays a crucial role in society and promotes social living and human life sustenance (Chitonge 2010; Chitonge et al. 2019; Johnson, South and Walters 2016). Based on the current situation, South Africa will experience a water deficit of 17% by 2030, and climate change contributes to the scarcity and drought (WWF-SA 2016; DWS 2017). South Africa faces an urgent challenge that needs immediate solutions.[3] The challenge, however, is that people tend to adapt to change only when there is a crisis. In South Africa, there is a clear imperative for continued and increased water infrastructure, which extends to those on the periphery (Rodina and Harris 2016). However, the speed and scale of population growth and urbanisation in South Africa are placing a great deal of pressure on the capacity of governments to adequately plan and meet the needs of the growing number of people in informal urban settlements (see UN Habitat 2011).

Figure 1 highlights the population growth changes in different municipalities between 2001 and 2011. The Free State, which had many districts, experienced a decrease in population.

As shown in Figure 1, Cape Town's population increased by 15% between 2001 and 2011. Cape Town obtains roughly 400 million litres of water from its dams. While service delivery remains a challenge, the migration processes exert pressure on service delivery in the economic centres in the country (PICC 2012). Cape Town's population increased from about 2.4 million in 1995 to an estimated 4.3 million in 2018. On the other hand, dam storage only increased by 15 per cent over the same period. While the Berg River Dam is one of the most critical water sources for the City (it began to store water in 2007), it has been the only significant addition to water storage infrastructure since 1995. Thus, water development is not keeping pace with population growth.

Figure 1: Map illustrating population growth in South Africa between 2001 and 2011



Source: Statistics South Africa, 1996. The People of South Africa Population Census, 2011 Census in brief

Table 1 shows that from 2014 to 2017, there was a gradual decrease in water levels from about 300%. There was a slight increase in water levels in 2018 at the same time, dam levels almost doubled from 2017, but they are still half of the 2014 levels. However, the data above shows that the availability of water resources in Cape Town is declining. Another key indicator is the year-to-year storage statistics. The city water storage was at 101% in 2014, 69% in 2015, 55% in 2016 and 29% in 2017, while there was a slight improvement in 2018. From 2019 to 2021 Cape Town experienced good rain, thus it can be tracked how much water has been stored in the main dams supplying the city compared to the previous years.[4]

Table 1: City of Cape Town dam water levels November 2021
Water dam storage

MAJOR DAMS	CAPACITY		%	%	%	%	%	%	%
	ML	2021	2020	2019	2018	2017	2016	2015	2014
BERGRIVER	130 010	100.2	100.7	100.1	99.3	68.2	62.0	83.5	100.9
STEENBRASS	33 517	93.6	95.0	99.4	85.7	53.3	63.3	79.7	101.2
STEENBRASS	31 767	98.7	93.1	92.7	69.8	100.8	100.3	102.5	100.6
THEEWATERSKLOOF	480 188	101.7	99.8	75.4	57.2	26.1	48.9	70.8	103.1
VOELVLEI	164 095	98.0	95.2	90.0	94.8	28.0	53.6	48.3	100.6
WEMMERSHOE	58 644	95.3	93.3	94.8	91.0	48.9	68.7	68.7	99.8
TOTAL STORED	898 221	893 456	885392	757 998	663678	338544	496 582	627 229	915 698
% STORAGE		99.5	98.6	84.4	56.9	29.3	55.3	69.8	101.9

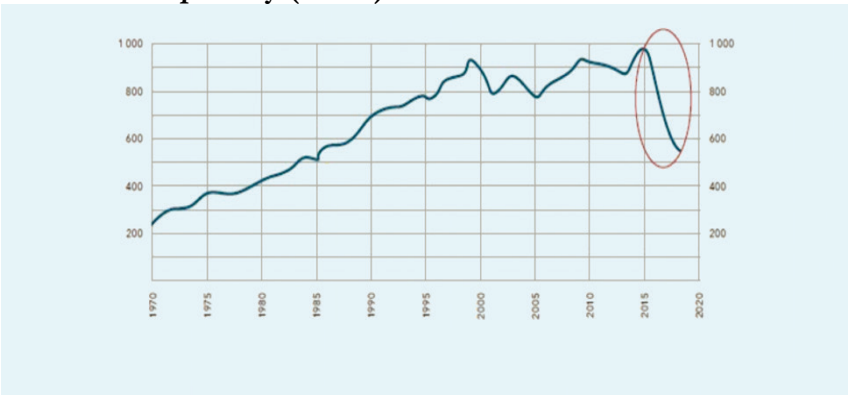
Source: City of Cape Town, 2021

Findings depicted in Figure 2 reveal underlying trends in average water usage in a million litres per day (MLD), measured by the treated water supplied (includes losses) in Cape Town. The line graph depicts an upward trend in water usage for the period running from 1970 to the end of the 20th century. This period witnessed a gradual rise in water usage in Cape Town, from an average of slightly above 200 million litres per day (MLD) in 1970 to a daily average of above 900 million litres. It translates to more than 350% growth in water usage between 1970 to 1999. The period saw Cape Town's black population increasing more than three times faster than the whites and almost twice as fast as the coloureds (Wilkinson 2000). A series of investments were made to expand and enlarge the water supply infrastructure further away from Cape Town because the government wanted to provide water to the growing population.

This rise in water usage can, therefore, be attributed to the growth in the black population. The water losses level also rose in the same period, as inferior pipes often leaked water, thereby generating water bills far beyond what users could pay (Smith 2004; Von Schnitzler 2008). These water losses prompted protests, including refusal to pay

for water and other services that were deemed inadequate, for instance, pipe leaks (Maphela and Cloete 2020).

Figure 2: Water consumption as measured by the treated water supplied (includes losses), average for each year in million litres per day (MLD)



Source: City of Cape Town. Total water consumption in Cape Town Since 1970 to 2020

A sharp decline in water consumption occurred in mid-1999, crossing to the early 2000s, from above 900 litres per day on average to below 800 litres on average per day in 2005. The decrease in water losses also compounded this due to the reduction of instances of leakages. After enacting the National Water Act in 1998, the government introduced formal water conservation and demand management (Enqvist and Ziervogel 2019; Ziervogel 2019a, 2019b). The early 2000s represented a change of course for the city, both in response to the 1998 National Water Act and an increasingly constrained supply in its remote areas. The remarkable reduction in water demand was achieved by public awareness campaigns, repairing leaks, strong; and water-based commodification on market-based pricing (Brown and Magoba 2009; Smith 2004). The results were impressive, but to the detriment of the most vulnerable residents with the large part of the growing population residing in informal settlements where most residents rely on public taps and use less than a third of the water that residents in the wealthy parts of the city do (DWS 2018a; Rawlins 2017).

From 2005 to 2015, another significant rise in water consumption was attributable to negligence by the residents to stick to the standards and regulations of the 1998 National Water Act. The figure shows that during the period running from 2015 there has been a substantial decline in water losses and water usage. The period reported at least a 50% decline in average daily water usage in Cape Town. From 2015 to 2017, water use was reduced by over 40%. At the same time, both the population and the economy continued to grow. Water has also become much more expensive, which affects use (Bond 2019). The period encompasses the most recent drought where water usage got far below the average usage per person in the other South African metros (Ziervogel and Parnell 2014; Wolski 2018). During this period (2015 to current), households, businesses and institutions are investing in alternative sources of supply (such as groundwater, rainwater tanks and reuse).

Viljoen's (2016) study found that, depending on the income category, the households had varying levels of access to alternative sources of water. In the informal settlements, 8% of the participants reported using rainwater and 25% used grey water (Viljoen 2016). Almost half of the participants in low-income households (40%) had access to alternative water resources, including spring water and groundwater, in addition to rainwater and grey water, and the households using ground water consumed up to 79% less than those using other alternative water resources. Only 30% of the medium/high income households had alternative water resources, with 14% using rainwater and 13% groundwater (Viljoen, 2016).

2.1. Water Scarcity and Restriction as Remedial Action to the Crisis

There are various ways of measuring water scarcity which are all accepted measures. If water scarcity occurs in a substantial area and affects many people in the area, the city becomes a 'water-scarce' environment. However, Rijsberman (2006: 6) argues that it is challenging to define the concept, as several factors are involved in determining whether to classify an environment as a water-scarce. Ennis-McMillan's (2001) study influenced how the researcher approached his research into water scarcity by providing another characteristic of the issue. Ennis-McMillan's (2001) work on the

importance of water can be beneficial in examining the consequences of water scarcity, as he studied the importance of water in Mexico City, and explored the community's daily life and the meaning they give to the drinking water. Through his examination, Ennis-McMillan (2001: 373) shows how the people's reality on uncertainty was related to disruptions in water usage. His research further exemplifies the importance of having an adequate water supply and probes the social and biological challenges if there is a lack of necessary water supplies. Ennis-McMillian's (2001) illustration is appealing to this case study because it applies the concept that water scarcity does not have a single or universal definition. In the context of South Africa, water scarcity is a result of poor governance and water policy, lack of insufficient surface and groundwater resources, and inadequate funds allocated for water exploration and service delivery projects.

In 2017, the City of Cape Town approved Level 5 water restrictions. Level 5 restrictions prohibit the use of municipal drinking water for non-essential purposes. Water restrictions for domestic usage increase pressure on household management. Level 6B restrictions came into effect on 1 February 2018, along with punitive tariffs for water consumers. Level 6B restricted citizens to reduce the usage of water from 75 litres per person further a day to 50 litres. Furthermore, the City of Cape Town unveiled its preparation for Day Zero with operational plans for 180 water collection stations. According to the city's programmes, Day Zero means 75% of the City's water taps will be turned off, excluding those in hospitals, business or industrial areas and informal settlements. The rest of the communities will access water at one of the 180 water collection stations. Besides the City of Cape Town was developing plans to access groundwater and build a desalination plant to complement its traditional water sources. There is no concrete evidence on how residents of Khayelitsha responded to the prevailing water crisis.

'Day Zero' was an expression used by the City of Cape Town municipality to refer to the anticipated date when they would turn off the water running from most of the taps (Tandwa 2018). During that period, people's behaviour changed, like their taking shorter showers and the collection and reuse of greywater (Mahr 2018; Poppick 2018). As a form of resilience to the crisis, some people purchased and

installed rainwater tanks and sunk boreholes. There were also reports exposing a kind of water delinquency to which there was 'water police' to issue fines for 'water waste' such as car washes or watering lawns. Some people, particularly those in the affluent areas, opposed the city's pressures to save water. Organisations opposed the privatisation of water (Dougan 2018). These different responses reflected the difference in the lived reality for people across the city concerning the problem.

These mitigation efforts to prevent 'Day Zero' had fostered even more inequality in an already unequal society. Many residents of Khayelitsha do not have full municipal services because some of their places are unrecognised 'informal settlements'. With a significant number of the residents already frustrated with the service delivery, at the same time trying to hustle for personhood, most were not able to engage with the municipality's print campaigns that attempted to explain the implications of the crisis. As a result, a knowledge gap exists, leaving the residents, who are most affected by the water-saving campaigns, with the least knowledge and understanding of their harsh reality. They are replacing lawns and plants needing much water with substitutes needing less water, and they are also investing in water-saving devices such as low flow taps, water-saving showerheads and smaller toilet cisterns. Other behaviour and conduct, such as taking shorter showers and using shower water to flush toilets, is likely to change over time, but not to pre-drought norms. The drought has changed Cape Town's relationship with and handling of water. However, the challenge remains to reach a sustainable level of wise water use.

Khayelitsha means 'new home' (Tshehla 2002). Notoriously known for its rapid growth, Khayelitsha is one the biggest townships in South Africa after Soweto in Gauteng Province and Mdantsane in the Eastern Cape Province (Ndengwa et al. 2004: 5). The history of Khayelitsha entangles with the challenge for urban permanence of Africans in Cape Town. As Ntsebeza (2019) points out, this historical challenge exemplifies a lot of African people in the Western Cape. Khayelitsha was declared in parliament in1983, as low-cost housing and formalised shack development project to be established in an area about 25 km away from the City Centre for both 'legal' and 'illegal' black Africans, located on the south-eastern part of the

metropolis in underused army training camp (Ndengwa et al. 2004:5). The area emerged as poor and overcrowded, with underdeveloped and poorly maintained essential services such as water and sanitation and lack of infrastructure. This disparity resulted in overburdened facilities and the emergence of characteristic socio-ethnic and socio-economic asymmetries. These asymmetries have created an urban morphology which places residents at the City's perimeter – often at great distances from their places of work (Ntsebeza 2019). On the other hand, the then minority white municipal areas had lesser populations to serve with much higher concentrations of economic activity and adequate infrastructure.

One of the significant challenges to water infrastructure development in Khayelitsha is the township's large population and fast growth that outstrips service delivery. Many households still use the bucket system for toilet facilities with no flush toilets. The municipality supplies water, but the absence of individual household taps forces residents to access water through communal taps (O'Brien 2014). Some residents collect water in 25-litre containers from the communal taps. Nevertheless, they manage household activities such as washing clothes, cooking, bathing children and catering with the limited water provided to them. What captivates the lack of service delivery is water leakage, broken communal taps and toilets in an undesirable condition that some had become as refuse dumpsites. There is the maintenance of toilets in some areas where some of them are proportionally assigned to five families per toilet. These shared toilets are more likely to have a level of maintenance, as families secure them with the locks. This kind of landscape is not unique to Khayelitsha but similar to other informal settlements such as Philippi, Imizamo Yethu in Hout Bay, Dunoon and Joe Slovo. In the context of the case study of Khayelitsha, scarcity is unsatisfied demand, tensions between consumers and competition for water over insufficient flows related to access to the communal tap.

2.2 Point of Fracture on Resilience

It is challenging to define resilience because it describes properties of either an isolated object or a system. Clarification is needed of what is being considered before one can ask about any property it possesses, including resilience. However, the World Resources

Institute (2008) attempted to define resilience as 'the capacity to change in the face of change'. For residents to be able to propose mitigation measures for foreseen risks, they need to better understand the critical points of resilience in the environment in which they operate to remain sustainable. In the Khayelitsha context, resilience, in this chapter, refers to the ability of residents to absorb disturbance (i.e., a risk) and still retain its essential function and structure regarding the usage of water. Managing resilience is all about understanding the social context in which Khayelitsha exists with particular attention to the drivers/risks that would cause water scarcity to cross thresholds between alternative regimes – knowing where the limits might enable residents to enhance aspects of their operation to ensure that the residents maintain their resilience. In this chapter, resilience is not about the ability of residents to bounce back but rather the residents' capacity to absorb disturbance and continue with their livelihood. Strategic resilience is not about responding to a one-time crisis. It is about having the ability to change before the case for change becomes desperately obvious.

Water provision through communal taps is becoming an integral component of local government to respond to service delivery as it is according to the local authorities the mechanism used to address uncertainties and hazards. However, in the light of global change it has become more evidential that all health risks are multifaceted and interconnected and cannot be tackled in isolation from each other. There is a greater need for an integrated and systemic approach to health risk to better prepare both the government and its residents to address increasing levels of uncertainty and intensity of risk events, their time frame, and the dynamic, probabilistic and, often, nonlinear natures of the states of all natural and constructed environments on which the system's vulnerability and resilience depends. The challenge for governments is to better understand the interconnectedness of their risk landscape by means of understanding the social and environmental system in which they operate. (Gunderson et al. 2010). This will allow them to manage for resilience which will enhance the likelihood of sustaining desirable pathways for continued growth in a changing and unpredictable environment.

Proponents of resilience maintain that sustaining a system requires analysis and understanding of feedback and, more generally, the dynamics of the interrelations between the government institution and residents for the integrated understanding of humans in nature. This interrelationship is referred to what Nyamnjoh (2018) termed conviviality. Nyamnjoh (2018) shows that conviviality reassures the empowerment of individuals and groups, which involve a conciliation, and contestation of agentive forces within a community of states. Nyamnjoh (2018) provides us with a way to think of and understand people and social relations through the notion of what he calls 'conviviality relationship'. The engagement and communication between both parties can work toward a better understanding of the risks and scale of uncertainty to their operations, thereby facilitating better planning for sustainability, resilience and adaptation within Khayelitsha.

The current water management approaches have commonly viewed environmental risk in isolation from the interlinked social system in which they exist. Conviviality indicates that one cannot separate these systems and still obtain a representative view and understanding of the impact and implications of the interactions of each component as part of the broader system. Thus, the proper unit of study and action in which to address water scarcity and sustainability is the linked social-environment system approach. In this regard, the government needs to appreciate that as residents and societal institutions they are embedded in the cyclical processes of the social-environment system in which they operate.

In order for the government to be able to propose mitigation measures for foreseen risks, they need to better understand the key points of resilience in the social-ecological system in which they operate so as to remain sustainable. By understanding how and why the system as a whole is changing, residents will be better placed to build a capacity to work with change, as opposed to being a victim of it. In the context of Khayelitsha, managing resilience is all about understanding the social context in which the residents exist, with particular attention to the drivers/risks that would cause the system to cross thresholds between alternative regimes (Gunderson et al. 2010). Knowing where the thresholds might lie will enable the government to enhance aspects of its operation so as to ensure that

the system maintains its resilience. As Walker et al. (2004) put it, resilience is not about the ability of a system to bounce back but rather the system's capacity to absorb disturbance and still behave in the same way. Strategic resilience is not about responding to a one-time crisis. Carpenter and Brock (2008) have described resilience as not about rebounding from a setback as a 'broad, multifaceted, and loosely organized cluster of concepts, each one related to some aspect of the interplay of transformation and persistence'. In the words of Walker et al. (2004), it is about continuously anticipating and adjusting to deep, secular trends that can permanently impair the environment of a core water supply. It is about having the capacity to change before the case for change becomes desperately obvious.

The complexity of the challenges currently facing the residents in Khayelitsha, especially in terms of fundamental uncertainty around water, requires a shift in the way water distribution and how they understand resilience. There is a need for a friendly approach in water distribution strategies which can better address complexity, dynamics and uncertainty for municipality operational and sustainability planning (Rodina and Harry 2016).

Part Two

3. Basic Needs Consumption

Residents of Khayelitsha find themselves trapped in racially defined residential neighbourhoods, and entire racial demographics have inherited a spatially defined access to water, health, welfare, income and occupation (Rodina and Harris 2016). Their struggle of how to reconcile, be recognised with local realities for many years is crucial. The interpretation of their lived realities though these narratives have taken different/many forms and challenge the debate and literature around water. The results are, however, mixed but residents still decry the distribution of water by the municipality do not satisfy and reflect if at all, their lived realities of living with a limited amount of water.

The first question in the interview was to get information about what residents considered to be their basic needs for water. Most respondents stated that drinking, bathing, cooking, laundry and

washing dishes were their needs. A middle-aged woman from the 35 to 59 age group responded that her need for water is for her child. Her response demonstrated that she considered the water needs of her child as a main priority. Another woman in the same age group spoke about caring for her children and how she must have different strategies for using water. Another usual response was, 'The basic need of water is for my kidneys,' which was the response of a male pensioner aged 60 to 75.[5] Although some of them did not provide the exact amount of water usage, their responses demonstrated that their basic consumption needs are crucial in the following categories: personal hygiene, cooking, health and, lastly, drinking.

The second question sought to understand the residents' daily water usage for basic needs. This question was uncomfortable and challenging in terms of getting direct responses from the people who did not primarily understand the problem. The rephrasing of the question to how much water they felt they wasted if any, provided some clarity. Out of the 36 informants, 20 provided a percentage and a measurement in litres. On average, some stated that 80% of their total water use is for basic needs. Based on the 25-litre containers used by residents as a guide, the daily water need is perceived to be 50 litres per person per day. In the context of scarcity and adaptation, the results demonstrate that residents consume water close to the survival rate of water consumption which makes it challenging to adapt further.

Based on the interviews, the chapter reports on a difference in the unit of measurement of water usage. Respondents preferred to use buckets rather than litres as measurement. As an essential reference, the standard size of the buckets in Khayelitsha, according to respondents, can hold 25 litres of water. The analysis of data is through respondents' responses based on individual gender and age. The average estimated daily usage of water, as well as the average daily need for water, according to respondents' responses, was calculated using a 25-litre container as a measurement.

The average daily water consumption among the sample was one container of 25 litres, equating to 25 litres per person per day. One-third of the respondents indicated that they use 50 litres of water per day or less, and the rest of the group stated that they use an average of between 50 and 100 litres per person per day. However, there were

three exceptional cases from three male entrepreneurs running car wash businesses. These men indicated that they could not quantify the number of litres they used per day, arguing that they probably needed more than 350 litres. When asked further about their water needs, they responded that they valued their car wash businesses because that was the only source of income.

Consequently, they were not concerned about the issue of water scarcity. Most people who were reluctant to respond to this question argued that they did not perceive water consumption as something that can be easily quantified. Omitting the outliers, the respondents could account reasonably well for their water usage, and their answers appeared accurate. Given that the constitutional right for free essential water is 25 litres per person per day (DWF 2007), this chapter shows that besides the limited amount of water, many residents of this informal settlement can fulfil their basic needs within the current water restrictions. Since some of them share a communal tap, the individual limits of using water do not apply directly to them.

Out of the nine informants in the UT section, an informant in the age group 18 to 34 estimated that their daily water usage is 50 litres a day. The remaining respondents responded using 25-litre buckets as their standard measurement. Two elderly couples aged between 60 to 75 could not estimate the amount of water consumed per day. Still, they indicated that their families used two buckets of water as well as a smaller container that they filled when necessary (excluding the water for personal hygiene). Another middle-aged female from the 35 to 59 age group indicated that she used four buckets of 25 litres a day and went to the tap only when necessary, while two females aged between 18 to 34 indicated that they collected water at different times during the day to fill up one bucket each. One of the females was unsure whether her bucket had a capacity of 15 or 25 litres. From an observation point of view, the usage of water is shallow. Therefore, it becomes challenging to emphasise on adaptation. There is an official statistic that has confirmed what the data have captured in terms of water usage (see Viljoen 2016).

4. Water Usage in Khayelitsha

Through observation, residents collect water daily, 'hanging around' the tap several times in a day. Many of them do not have showers facilities, and they use buckets when bathing. As residents' proximity to the communal water taps differs, those nearby may use one 25-litre bucket or container to collect water, while those staying further away use two buckets of the same size to avoid frequenting the tap too often. The use of water differs in many ways from saloon owner to car wash. A group of men that own car wash businesses and frequent the communal water tap to collect water often any time needed. Women selling meat and other entrepreneurs provide an understanding of the amount of water consumed in making chips (see Sive demonstration in section 4.4).

Table 2: Daily water use by age group in litres per activity

	Young aged from 18-34	Middle-aged from 35-59	Elderly aged from 60-75
Personal hygiene	50 l	50 l	25 l
Laundry	75 l	100 l	50 l
Household/cooking	75 l	75 l	50 l
Drinking	20 l	50 l	50 l

Source: Author's calculations using informants' information

Table 2 demonstrates that individuals' daily water use does vary systematically with age. The middle-aged and the young respondents consume a significant amount of water on personal hygiene compared to old respondents. In terms of household/cooking, the elderly, at 50 litres, are the ones that consume less than the other two groups. One probable explanation might be that people in the age group of 60 to 75 are less involved with household matters. In terms of drinking water, young people, aged 18 to 34, use less, which can be attributed to the youth lifestyle of drinking fizzy drinks rather than water.

Table 3: Daily water usage by gender in percentage (%)

	Personal hygiene	Laundry	Drinking	Household & cooking
Female	70 %	80 %	80 %	80 %
Male	30 %	20 %	20 %	20 %
Total	**100**	**100**	**100**	**100**

Source: Author's calculations using informants' information

The data show that age and gender influence water consumption. The data in Table 3 demonstrate that women use a significant amount more water than men in all categories investigated – personal hygiene, laundry, cooking and drinking. Women used 80% of the household water for washing, cooking and drinking compared to 20% for the men. Equally, women used 70% of water for personal hygiene compared to 30% for men. Culture and gender expectations likely influence women's usage of more water compared to men due to their resilience as pillars of the homes. Cultural concepts of beauty are likely to be a contributing factor in differential water usages observed. Thus, gender is often a critical factor in determining individuals' adaptations and daily water usage.[6]

Table 4 below, shows that individuals' daily water consumption does not differ much according to age and gender. However, use is above the average water usage per municipality.

Table 4: Number of residents interviewed per age group and daily water use per litre as reported

Age	Number of residents	Minimum Water Usage	Maximum Water Usage
18-34	13	75 l	350 l
35-59	16	50 l	200 l
60-75	7	25 l	50 l

Source: Author's calculations using informants' information

In terms of age, Table 4 shows that young residents aged between 18 and 34 years tend to use more water compared to those between 35 to 59 years. The difference is likely due to the daily activities of

the latter, including running households and businesses such as hair salons, car washes and laundries. Elderly residents aged between 60 to 75 use less water than those between the ages 35 to 59 and those between 18 to 34. Nevertheless, individually or combined, the data show that the daily consumption is higher than that prescribed by municipalities during the crisis.

4.1. Awareness of the Water Crisis

Awareness itself is a function of two elements. One is the message passed on to the community by the City authorities while the other is the message among the consumers. The first question in the interview was about awareness of water scarcity in the country. This question is critical to determine whether and how the responses of the residents who are conscious about water scarcity differ from those who are not. Out of 36 informants, five responded that they were aware of water scarcity problems, saying they had heard of water scarcity problems but seldom thought about them because there had been no water cuts and 31 said they were not aware at all. One female in the age group 35 to 59, who sold food on the street near the taxi rank, refused any notion of water scarcity and stated that there is much water. Another response was from a female in the age group 60 to 75, whose son works for a landscape company, who stated that she was aware that water is scarce in this country because 'my son told me'. Another male (18 to 34 age group) explained that his sister, who travelled to Namibia, told him about her experiences. Both responses illustrate how people's occupations and travel experiences influence their perceptions of and knowledge about the development of the water crisis.

Table 5 illustrates that awareness of water scarcity is shallow. Out of 36 participants, 31 were not aware. Only five were mindful of the water crisis in Cape Town. This figure demonstrates that awareness of water scarcity is shallow, probably because of the lack of a strong awareness campaign by the municipality in Khayelitsha. It is challenging to adapt to an environment where there is no awareness. There were several contrasting perspectives presented accompanied by residents' dissatisfaction with the municipality in terms of poor service delivery and lack of communication. Some argued that Cape Town's City had introduced forced measures to curb water waste by

providing a limited amount of water litres per household per day. Municipal authorities installed a device to monitor the supply to formal houses with a designated number of litres of water provided per day. The installation to curb water waste has been highly contentious as it happens mostly in low-income residential areas (Mahlanza 2014). According to the residents, when water from the formal households runs out, these residents reportedly relied on alternative methods to obtain water, the most common practice being to cross into the non-formal housing areas to collect water from communal taps. However, this gives way to a new wave of stress, including wasteful behaviour.

Table 5: Awareness of water scarcity

	Number of residents aware of water scarcity	Number of residents not aware of water scarcity	Number of residents unresponsive
Female	3	21	24
Male	2	10	12
Total	5	31	36

Source: Author's calculations using informants' information

The question about how a limit of 25 litres a day would impact on the people's lifestyle did not apply to the 11 informants who stated their present daily water use is 25 litres or less. There were mixed responses from the remaining informants. However, many people believed that they could limit water usage if they were more conscious about the water crisis and preventing water waste. One male (60 to 75 age group) explained that it is impossible to live on 25 litres a day. He claimed to be a plumber with some experience quantifying water use and estimated his primary daily water use (and need) at 40 litres. From the above responses, one gets a sense of how awareness influences their attitudes.

One young man aged between 18 and 34 years responded that, 'It will be a war.' Another middle-aged man (35 to 59) responded, saying,

'That is not possible. We are not going to pay. Government has money to maintain us. That is what we vote for, for better service. We do not see why we need to pay for water in the area we live in.' These responses are not surprising considering the socio-economic circumstances and the predicament, which caused adverse reaction and anger towards government service delivery.

There was a similarity in responses from four respondents – two residents aged between 35 to 59, and the other two middle-aged couples (35 to 59). One said that, 'It will be impossible to restrict or cut water in the informal settlement because of the marginalisation of our communities. Water cuts will further kill our people.' Others said, 'Why would we care about a government which does not care about us?' and 'Let us use the water.' These responses suggest a claim to the right to water. These extreme reactions indicate the unwillingness to save water because of the broken relationship with the government. A middle-aged female (35 to 59) stated that, 'If the government cannot provide basic services, then this is a give-and-take situation.' Another explained that the bucket system still exists saying, 'When you cannot go to the toilet at night because of crime, is that dignity? The bucket just changes colour from grey, black to white, the one we have now.' The elderly age group seems discouraged, with the middle-aged group still hoping for change. Those aged from 18 to 34 were angry about service delivery.

Sive showed his 25-litre buckets of soaked meat and chopped potatoes in the back, explaining the process of making *shisa nyama*.[7] He demonstrated his adaptation strategy by putting the meat and potatoes in different buckets three-quarters full of water. The buckets are refilled with fresh water when they become too dirty. He does this four to five times every day and argues that he needs four to five buckets of water always at hand for meat and chips. According to him, that was not a new adaptive measure but a practice even before the water crisis. His entrepreneurial skill demonstrates the disparity of one's needs based on his or her daily activities and the amount of water consumed – in this instance, in the process of making chips.

A male entrepreneur aged betwee' 35 to 59, referred to as Toto, did not provide any estimates and seemed confused by the questions. A fascinating interview was with an elderly man aged between 60 to 75, referred to as Wezo-an ANC war veteran who is in his late

seventies. Wezo did not comprehend any of the questions asked. Asake, who was one of the research assistants, asked him how much water he consumes daily. He responded immediately, 'I use it when I want it,' without any further explanation. This response may be an illustration of attitude and lack of response to water restrictions.

4.2. Prioritisation of Water Usage

Prioritisation is a relative concept and it involves many factors. The question about how people prioritise water enabled us to understand how people assign their water personally. Most responses were expected, including drinking, cooking and showering. Tables 2 and 3 display the findings of the essential categories for water consumption, differentiated by gender and age. One woman mentioned '*Umgidi*',[8] Emphasising the importance of cultural traditions, and another woman responded: 'for my son'.

There was no clear evidence on adaptation because some use buckets while some use hosepipes, with no incentive for water saving to the advantage of their business. Men prioritise water for business and often use a significant amount of water in that sense. From the response above, one may assume that if there is an incentive for saving on water consumption, some may have a different attitude toward water and may initiate change.

The data indicates that women prioritise household hygiene more than men (see Table 3). Analysis of gender tends to be superficial in the water sector, as many assume that improved water access would reduce women's burdens and therefore be useful for gender equity. Furthermore, women are also managers of household water and responsible for individual and household health and well-being. As stated earlier, in most developing countries, women play an important role in household management, because they have to bear the workload of water collection. Scholars such as Strang and Linnhoff-Popien (2004) argue that water is associated with feminine power. Adaptation or no adaptation, the primary assumption during conversations with both men and women is that women's concerns are to do with collecting water and domestic use. On the other hand, men are household providers and water consumers through businesses such as car washes. These narratives reproduce themselves because of assumptions about the 'household' and the

false dichotomy between domestic and productive domains – where the woman's productive activities are visible, however, not as important as men's income-generating activities.

Some responses illustrate the efficient usage of water and adaptability by women. Many argue that scarcity for them is not new, while others indicate that they have been living with limited access to water for their entire lives. However, prioritising water is their primary concern together with sanitation. Lindiwe said, 'We prefer to do our washing on Saturdays, clean the house and do other duties that require water usage.' As one informant commented, 'When you cannot go to the toilet at night because of crime, is that dignity? The bucket just changes colour from grey, black to white the one we have now.'

Linda and Monde are women activists interviewed – one working as a cleaner and the other one unemployed. Both stated that in the past, they managed water disasters such as floods, drought and water scarcity. These women argued that they are willing to work hand-in-hand with the government to conserve water during the water crisis. They claimed that they have been asking for the government's support for many years with their water-related issues with no success. As they stated, 'Although we women take part in making decisions regarding water usage in our household, we do understand and see how people misuse water, more particularly men. We close the tap when left running, but we still feel neglected, men should learn how to appreciate it.' According to Linda and Monde, the current crisis allows men to realise the importance of involving women in decision making.

Briefly, the role of women in water usage is crucial because of the use of buckets, rather than hosepipes, as measurements and are the first to close the tap when left running. Their actions may translate into the understanding of what adaptation means. However, with many people using one communal tap, it has become difficult for some of them to monitor water wastage. The significant role of women as providers and users who waste less water has seldom been invisible in institutional arrangements for the development and management of water resources (Cap-Net/WGP 2005: 11). This finding agrees with the observations of Caber (1994) and Ahmed (2007), who stated that women are visible in their caregiving role and

that policies reproduce this role. The same finding relates to Arora-Jonson's (2011, 2013) observation that women's roles can be extended outside of the private family realm to include the community and the environment. Arora-Jonsson (2011, 2013) argues that women should be 'guardians of the environment' because women are better suited for environmental protection and adapt quickly to water crises.

4.3. Residents' Adaptation to the Water Crisis

Adaptation is the attempt of an individual to conform to an environment, reconciling personal tendencies and rules imposed by the environment and the search for a balance between what is possible and what is not. In the context of drought, Jones and Boyd (2011) defined adaptation in times of shocks and stress as *ex-post* and *ex-ante* coping strategies. The general meaning of adaptation is a change in either people's behaviour or the way people approach an event in terms of resolving a challenge. Adaptation to a water crisis depends on many factors. The ability to adapt to a crisis is influenced by what is called 'determinants of adaptation' (Smit et al. 2000). Maddison (2007) points out that perception and adaptation plans are two vital elements of adaptation, which means that communities need to experience a change in drought conditions and then adopt a set of coping strategies to address it.

Although it was challenging to directly ask residents whether they were adapting to the water crisis, adaptation is not just about consumption. It also includes an attitude towards water consumption. From observations looking at how water is left running without closing taps, this signals that there is no adaptation. Besides the feeling of being neglected, there were neither water cuts nor restrictions on communal taps and no visible information provided to the community regarding the water crisis. The water price offers an incentive to adapt, but the sharing of communal taps may not allow for such an incentive. The lack of environmental consciousness has not curbed the attitude of residents; instead, it has created water waste which has become a relatively fixed feature in Khayelitsha. As demonstrated earlier, if one consumes water at a survival rate, there is little that one can do and then it becomes difficult to adapt to the crisis due to lack of awareness (see residents'

responses above). The underlying concern is to find the best means for the city authorities to provide adequate service (Rodina and Harry 2016).

The other aspect of adaptive ability is change: the ability portion of an adaptation to a new way of functioning. However, the terms relate to resilience through the description. There is also a question about what one should be doing to build resilience. It is not always desirable; scarcity of water is a highly resilient state. Those on the peripheric setting with a lack of service delivery may not see the current functioning sustainable. Because of limited resources, one may have to decide, for instance, whether to use water freely or promote the resilience of an environment. Studies done by Lebel et al. (2006), suggest that building the resilience of an environment requires including those who are on the periphery, promoting social justice and accountability at all levels. Resilience suggests consistency when confronted with an event that involves change, but to find a standard definition of the term opens up many questions: What is constant? Which kind of change? Over what period? The response to these questions cannot fall under one rubric; the context under which this place the resilience concept is necessary to understand water in an informal setting. There is a plethora of these contexts available; however, various concepts speak from resilience in individuals or a single object, to the system, to adaptation.

Conclusion

This chapter interpreted the main findings from the research process to make meaning of the patterns and perceptions found in the analysis of the data. These findings were then placed in the context of the broader discourse on adaptation to the water crisis. The chapter also addresses inequality in water distribution in South African townships, drawing from studies conducted in Khayelitsha Site B (Kongo 2019) Phiri in Soweto (Maphela and Cloete 2019) in the City of Johannesburg, and Dunoon (Mahlanza, Ziervogel and Scott 2016). The chapter illustrated that, although the adaptation to the water crisis provided by the study areas are worth isolating from generic discourses on adaptation to the water crisis, the level of inequality is still more pronounced when the comparisons are drawn

between the wealthier suburbs of Cape Town and the informal settlements such us Khayelitsha.

The chapter examined resilience that continues to dictate the attitudes and behaviour of residents, also whether and how the water crisis is affecting the livelihoods and needs of residents in informal settlements. Several factors make this a promising exercise. These include the richness and complexity of the narrative record and, also, the extreme nature of residents in both sections. Moreover, how the access to water and its usage and imaginaries of deep time have served as a space of contestation for several direct social forces and relations. In short, all of the overdetermined, culturally interesting practices and ideas that emerge when residents from different gender and age of a given experience and tradition set out to provide their experiences with water amid a turbulent history. It discussed the different ways of water usage and reflected on conversations carried out at the communal water tap and within residential houses. In terms of gender, there are differences in water consumption with women consciously using a significant amount of water.

The narratives have demonstrated that stories are not merely a vague statement, but are often embedded with meaning, providing points to understand the lived reality. Based on the data collected from the TT section, from a purely qualitative analysis of the informants' estimations, the Free Basic Water Policy relates to the basic needs of water. The same report could not be made of the data from the UT section, because most of the informants did not provide precise daily water consumption estimates. How adaptation takes place, whether residents keep functioning or break down depends on different variables. The narrative and experience with water highlighted in this chapter demonstrate this. In this chapter, resilience refers to the ability of residents to generate different ways of operating during water scarcity.

This chapter has further demonstrated that there is nothing universal or predetermined in people's adaptations to the water crisis, the resident's basic water needs and daily consumption. Without an understanding of how the current context of water allocation and the system works, and how people perceive and adapt to water, as well as the community's consumption of water, it will be problematic to change current consumption patterns and meet the basic water needs

of all South Africans. There are a large number of researches that use some aspect of the resilience concept. Given the limited space provided, the chapter presented residents' narratives and experiences only. The stories and expertise help the reader to understand how the ideas that constitute resilience theory, or possibly better, resilience concept translate into practice.

In brief, residents of the informal settlement, in particular shack dwellers, consume less water than all segments of the society (affluent domestic users, industry and agriculture). Due to lack of awareness of the water crisis by the residents, it is challenging to refer to adaptation. Residents characterised the municipality as unhelpful and negligent, as the message packaged by the City Council has hardly reached them, and emphasising the government's failure and its continued marginalisation as they consume water close to the survival rate of water consumption. A further change in water consumption is detrimental to health. Those with businesses, including men, consume a large amount of water and prioritise water for their companies as do their women counterparts who use water for household chores. Besides the difference in water usage, there is also wastage of water through the means of hosepipes to wash the cars, and members of the community do not often close communal taps or report water leaks to the municipality. The study suggests that the current government must address more than just the political consequences of apartheid and the exclusionary system. It must simultaneously confront its social and economic legacy. This challenge lies precisely in the realm of 'service delivery'. Access to water, in all the various senses of the word, is at the core of the challenge confronting the South African government.

Notes

[1] Like adaptation, unless all points are shared, with a clear vision of the future, what constitutes a positive coping strategy will be contested. Even refuting has its benefits.

[2] South Africa has less than 1,000 m^3 of fresh water available annually per person.

[3] Considering the difficulties surrounding the water crisis in Cape Town, this chapter assists policy makers to assess progress at the municipal level critically.

Therefore, the lack of adaptation to the water crisis can give authorities a sense of how residents are responding to the crisis.

[4] How does one differentiate between locating not just the study of the city's inaction during the unequal distribution of water, which later on resulted in a statement by the World Health Organization and by the IMF, and congratulating the city for doing something miraculous during the water crisis when, in fact, the City of Cape Town was ostensibly saved by the rain? What would be the thoughts on the actual argument that underpins the city's water conservation.

[5] The National Youth Policy 2009–2014 in South Africa classifies young people as those within the age group of 14 to 35 years. (See South African government /National youth policy.) This paper uses the age classification as per the South African Constitution. However, the study classified participants in three categories: A young person as any person who appeared to be under the age of 18 to 34 years old. Middle-aged is any person between 35 and 59 years, and those over 60 as elderly or pensioner.

[6] The study did not include transgender individuals.

[7] *Shisa nyama* is a Zulu expression for 'burnt meat'. It began as a way for township butcheries to dispose of offcuts. It soon became a gathering place for up-and-coming urban professionals wanting to catch up with peers and reconnect with their roots, local township residents and those who now live in the suburbs. They quickly evolved and became entrepreneurial ventures and are now much more than a place to eat braaied meat and listen to good music. The characteristic of these places is coal, smoke and flames, and its juxtapositions attract the public. Currently, *shisa nyama* is open weekdays and nights too.

[8] A South African traditional practice or Xhosa cultural event to welcome a boy returning as a man from the initiation, with no English translation.

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