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A city in a water crisis: the responses of the people of Gaborone

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Abstract

Worldwide, countries are challenged by the increasing pressure on potable water resources. In Botswana these pressures are particularly severe. Gaborone, the capital city of Botswana, is faced with a water crisis. There are no nearby permanent water sources to supply the city and successive years of drought led to extreme water shortages in Gaborone in 2015. This study investigates how the government has responded to the developing water shortage over the last decades and how the water use and management practices of the people changed in response to this water crisis. Social practice theory is applied as an analytical theoretical framework with a focus on the elements of practices and the norms of consumption (three Cs of cleanliness, comfort and convenience) reveal how and why consumption takes place. It is shown that the co-evolution of water supply infrastructure and customer demand creates imperatives and expectations that water is always available and ready to be used. It is also concluded that practices of water use are shaped around the concepts of cleanliness, comfort and convenience and that when water was very scarce, practices evolved so that acceptable social standards could still be maintained. The study shows that although people's practices changed, there were limits to their adaptability in the context of the supply and demand paradigm that dominates water infrastructure across the world. This study illustrates that social practice theory's conventions of comfort, cleanliness and convenience (the 3Cs) needs to be extended to survival to adequately capture how people respond in a resource constrained situation, which is a contribution this thesis makes to the social practice theory literature.

While the importance of technical supply solutions to water situations cannot be overlooked, this study shows that addressing water demand and supply cannot be entirely dependent on them. Understanding people's social practices and the ways in which they adjust to changes in water provision can be valuable to inform policy aimed at building resilience and adaptive strategies to crisis situations such as water paucity.

Keywords: Social practices, water, demand and supply, materials, meanings and competences, resilience and adaptation, Gaborone, Botswana.

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List of abbreviations

DWA.....	Department of Water Affairs
IWRM.....	Integrated Water Resources Management
KAP.....	Knowledge, Attitudes and Perceptions
NWMP.....	National Water Master Plan
NGOs.....	Non-Governmental Organisations
NSC.....	North South Carrier pipeline
PVC.....	Polyvinyl Chloride
WDM.....	Water Demand Management
WUC.....	Water Utilities Corporation

Chapter 1

Introduction

Water scarcity is a global issue which threatens human survival. UN-Water (2006) estimates that by 2025, 1.8 billion people will be living in water scarce regions or countries, while two-thirds of the world population could be leading water stressed lives. Water shortage means that the water demands cannot be fully satisfied and arid and semi-arid regions are more affected by problems of water shortage because of their vulnerability to drought and climate change (UN-Water, 2006). Gaborone, the study area, is a city located in Botswana in a semi-arid region of Southern Africa and being already pretty dry, is severely affected by water shortages.

At the time of independence in 1966, Gaborone was only a small town with a population of 6000 (Andringa, 1990). Since then it has grown tremendously – in 2011 the city's population was 231,592, and the population of the Greater Gaborone area was close to 565,000 (Statistics Botswana, 2014a). The number of households in Gaborone has increased from 58,476 in 2001 to 73,834 in 2011 (Statistics Botswana, 2014b). As the city has grown so has the demand for water. Initially the main source of water was the Gaborone dam, which was later supplemented by a number of dams in the surrounding region. At the beginning of the millennium, Gaborone was hit hard by water paucity due to recurring droughts and failure of the Gaborone dam to meet the growing demand of the rapidly increasing number of residents. The crisis has persisted until the present.

There are no permanent water sources in the city. The sources of water supply for Gaborone include Gaborone dam, dams in the surrounding region including neighbouring South Africa, wellfields and the North South Water Carrier (NSC) pipeline which brings water from dams in the north. Of recent years, none of these sources have been able to consistently provide Gaborone with water – all the dams were well below capacity and the NSC pipeline often experiences malfunctions due to power cuts and pipe damage. Gaborone therefore has a desperate need to develop reliable water resources to ensure water supply particularly in drought periods. A popular conception about the water situation in Gaborone is that some people think climate change has affected the supply and view meeting the growing demand through the build and supply model as more important. Various water use regulations were formulated to control the water demand; one of these was water rationing which was perceived by many residents as a punishment. Some efforts to educate and create awareness to reduce demand have been implemented but the main focus has been on increasing and maintaining the supply.

Fully understanding the ways in which people adjust to changes in water provision can be useful to inform policy at building resilience and adaptive strategies to crises such as water scarcity. To address the water situation in Gaborone, it is essential to understand people’s daily social practices. Understanding people’s social practices will not only assist in improving implementation of conservation strategies which can lead to water use behaviour changes, but also in developing resilience and capability to adapt to climate change consequences. The intention of this study therefore aligns itself to social practice theory in analysing people’s practices of resource provision and consumption. According to Reckwitz (2002b), social practice theory provides a framework of analysis and conceptualisation that constitutes a particular way of viewing and investigating what people do.

1.1 The Global context

Global economic growth coupled with population increase and rapid urbanisation are the underpinning factors exerting excessive pressure on natural resources. Rapid urbanisation in particular places a huge pressure on water resources and other related water infrastructure (Van Rensburg, 2006b). Unrestrained industrialization and growth of cities have changed the consumption levels of natural resources in urban settings. These factors bring sustainability challenges and can have adverse effects if not cautiously controlled.

During the 20th century, the global population tripled and water use continued to escalate. The global population is expected to rise to 9 billion by 2050 with more than 62 % of these people living in urban areas (Table 1.1) (Worldometers, n.d).

Table 1.1: World population changes for 2000-2016.

Year	Population	Yearly % Change	Yearly Change	Median Age	Fertility Rate	Density (P/Km ²)	Urban Pop %	Urban Population
2016	7,432,663,275	1.13 %	83,191,176	29.9	2.5	57	54.3 %	4,034,193,153
2015	7,349,472,099	1.18 %	83,949,411	30	2.51	57	53.8 %	3,957,285,013
2010	6,929,725,043	1.23 %	82,017,839	29	2.56	53	51.5 %	3,571,272,167
2005	6,519,635,850	1.25 %	78,602,746	27	2.62	50	49.1 %	3,199,013,076
2000	6,126,622,121	1.33 %	78,299,807	26	2.74	47	46.6 %	2,856,131,072

Source: (Worldometers, n.d). World Population (2017 and historical) section.

In many developing countries, growth rates are still high and populations are rapidly urbanising. Africa, in particular, experienced a population growth rate of close to 2.5% in the middle of 2014 (The Statistics Portal, 2014). Urban areas have become attractive centres for rural dwellers as they present opportunities for better employment and amenities. When urbanisation outpaces the rate at which services and facilities can be provided in urban areas, the result is inadequate infrastructure and support services to meet the ever increasing demand for resources.

1.2 World water demand and scarcity

Water is essential for human development, as well as to all economic and social activities. Yet approximately 1.2 billion people have limited access to safe potable water, with nearly 3 billion living without basic sanitation services leading to water related challenges (National Intelligence Council, 2008).

Freshwater shortage is the most pressing crisis facing the Earth today, and threatens to get worse. Developing countries particularly Africa, the Middle East, South Asia and northern China are the most affected by water shortages. These regions live with less than 1,700 cubic meters per capita of water (National Intelligence Council, 2008).

UN-Water (2006) estimates that by 2025, 1.8 billion people will be living in water scarce regions, while two-thirds of the world population could be leading water stressed lives. While water shortages have encouraged cooperation and partnerships among nations, the possibility of water conflicts among water stressed countries cannot be disputed. Countries sharing this threatened resource are liable to conflicts because sharing a very limited resource can be very challenging (Mohamed, 2014; UN-Water, 2006).

The escalating pressure on potable water resulting from increasing demand is a serious concern for the world. Climatic conditions and unsustainable consumption patterns (UN-Water, 2006) sabotage its consistent supply, and sound sustainable management approaches need to be put in place (Van Rensburg, 2006a). However, the political response is usually to provide more water (sometimes in ways that are not sustainable) but then the supply gets outstripped by demand in what can be described as a vicious cycle.

1.3 Background information to Botswana

Botswana is a landlocked country situated in Southern Africa (Figure 1.1). In the fifty years since independence, it has changed from one of the poorest countries in the world, to become a middle economy. Its success in economic growth is mainly driven by the mining sector, particularly in the

extraction of diamonds. Diamonds account for one-third of Gross Domestic Product (GDP) (about US\$3.3 billion). The country has a population of close to 2.1 million (Statistics Botswana, 2014a).



Figure1.1: Botswana, a southern Africa landlocked country.

Source: www.theodora.com/maps/new9/botswana_map.gif

1.4 History of Gaborone

Gaborone is the capital city of Botswana and is located at 24°40'S, 25°55'E. It is found in the flat valley between the Kgale and Oodi hills on the banks of Notwane River in the south-eastern part of Botswana. It is 15 km from the South African border post at Tlokweng.

Before independence, Gaborone was known as Gaborones, and was named Gaborone after Botswana gained its independence in 1966 from Britain. The city of Gaborone derived its name from chief Gaborone who led his tribe to this place in the 1880s from Magaliesberg, South Africa. It was used by the former British colonial government as an administrative area (Morton & Ramsay, 1987).

From 1885 until independence, Botswana was known as Bechuanaland Protectorate and administered from Mafikeng, an adjacent urban area in South Africa, 30 km outside the Botswana Ramatlabama border (Morton & Ramsay, 1987). With independence, a capital city within the political borders was clearly required and two attributes made Gaborone eligible. Firstly, Gaborone had no tribe associated with it, hence there would be no tensions between ethnic groups. Secondly, the Notwane River which runs through the eastern edge of the city provided a suitable place for

construction of a dam which would later be used to supply the residents with water (Morton & Ramsay, 1987; Mosha, 1996).

1.5 Planning and development of Gaborone

The original plan of the city of Gaborone was for an administrative area with movement of vehicles separated from pedestrian movement. The town was designed to accommodate 20 000 people or less, mainly government workers, and the dam capacity, service levels and road networks were designed to cater for this number (Mosha, 1996). Although there is currently urban renewal going on to cater for growth, Gaborone was originally set up as a traditional city which did not assume any growth resulting from an influx of job seekers. The challenge brought about by rapid urbanisation is that the original facilities cannot cope with the increased densities.

According to the 2011 census, 99.3% of Gaborone households have access to piped water and 65.2% had their own flush toilets, 3.9% a ventilated improved pit latrine, 32.1% a pit latrine and 0.1% dry compost (Statistics Botswana, 2014b, Table 2.2j). Households reliant on flush toilets for sanitation face hygiene challenges in a city with limited water.

1.6 Climate change and rainfall patterns

Botswana is a semi-arid, land-locked country with a very flat topography (Ministry of Local Government Lands and Rural Development, 2015). It receives low and unreliable rainfall. Climatic conditions determine the availability of water through precipitation and evaporation trends (Toteng, 2008). The average rainfall is 250-650 mm per year (Toteng, 2008), and the mean rainfall is declining (Figure 1.2). In 2004 and 2007 respectively, Botswana experienced drought which impacted heavily on the inflow of water into the Gaborone dam (Toteng, 2008). The years 2012 and 2015 were also declared drought years. The country receives its rainfall in summer between October and March and there has not been enough water collected in the dam during this period to sustain the city for the whole year, requiring other alternatives to augment the supply of water to the city.

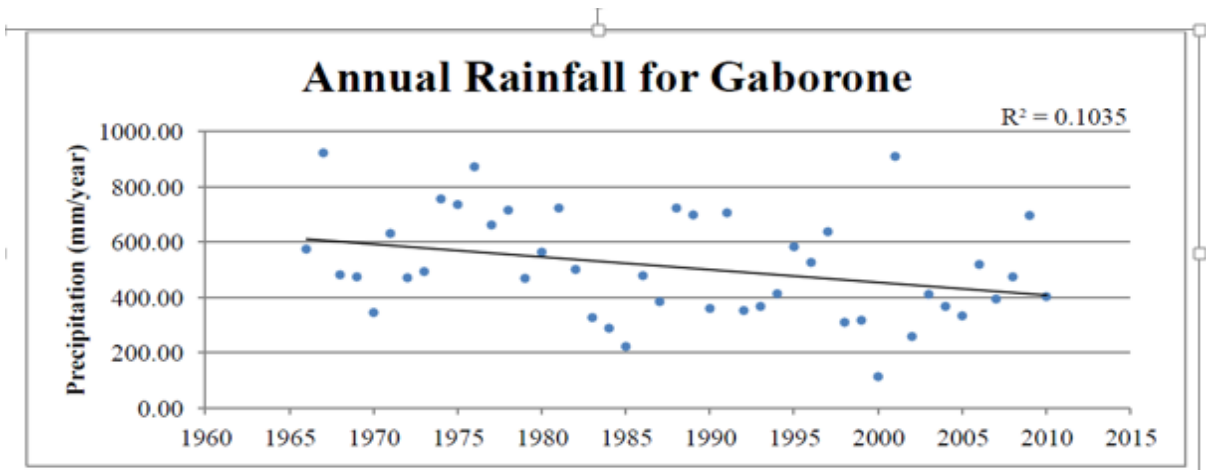


Figure 1.2: Rainfall patterns for Gaborone from 1960 to 2010. Source: Farrington (2015, p. 11).

The average monthly maximum temperatures for Gaborone is 33 degrees Celsius in summer with January being the hottest month, and the coldest month is July with an average minimum temperature of 4 degrees Celsius in winter (Figure 1.3).

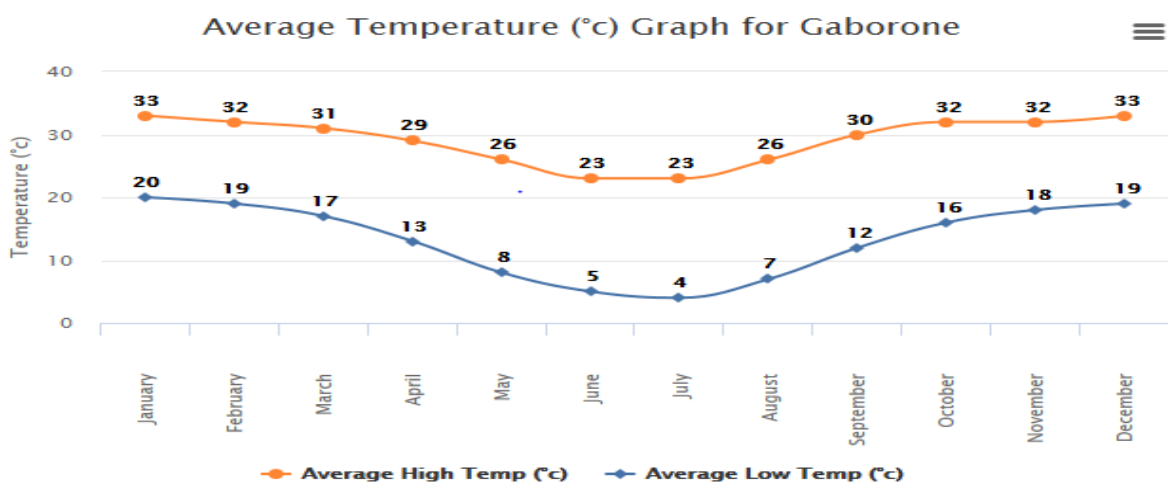


Figure 1.3: High/low temperatures for Gaborone from 2000 to 2012. Source: World Weather Online (n.d).

1.7 History of the water challenges in Gaborone

In 1964, construction of the Gaborone dam was initiated. The dam aimed at capturing water from Notwane River and it became the main source of water for the Gaborone populace and the surrounding areas. Farrington (2015) observed that when the dam was initially constructed it was estimated that it would supply reliable potable water for the Gaborone populace, which was estimated to rise from 6000 residents in 1966 to an approximate of 20 000 residents by 1983. Moshia (1996) however, points out that this was a huge underestimation, as the residents of the city

increased to more than 50 000 during this period. Between 1984 and 1986, the wall of Gaborone dam was elevated by 8 metres to increase the capacity from 38 Mm³ to 141 million Mm³. However, after 1986 the level of water in the dam started to decline (Andringa, 1990).

The drop in water levels in the Gaborone dam led to a bilateral agreement between South Africa and Botswana on the supply of water to the city. The two governments agreed that Molatedi dam which is situated in South Africa and supplies the north west of South Africa would also provide Gaborone city with freshwater. Under the agreement signed in 1988, Botswana could receive 7.9 Mm³ per year, unless the water levels of the Molatedi dam fell below 26%, in which case the amount of water supplied to Gaborone would reduce (Statistics Botswana, 2015). However, the demand for water in the greater Gaborone area and surrounding urban villages continued to increase, and the proportion of Gaborone's water now coming from Molatedi dam is insignificant. It is insignificant because the dam level has fallen below 26% so South Africa is no longer able to supply as much.

Further substantial decline was experienced in the early 2000s. By 2004, the water level in the Gaborone dam had dropped to only 26% of capacity, the lowest level since it was built (Workman, 2010). By early 2005, the dam stood at 23% of capacity. By September the same year, the dam was only 17% full and the experts predicted that there was less than five months of water supply for the residents (Statistics Botswana, 2015). Efforts were made to fix the problem, and in 2006 the National Water Master Plan was revised. The water shortage persisted in subsequent years, and 2015 was the fourth year in a row that the Gaborone dam received little rainfall. By 2014, Gaborone was using 145 million litres per day, but in April 2014, the dam's level stood at 15.1 % providing only 54 million litres per day (Water Utilities Corporation, 2014). Mmegi newspaper online described the situation in October 2014:

“For the first time in its history, Gaborone dam is drying, its once proud 141 million cubic metres of water drying up to barely four metres above silt level. Of the seven water draw-off points in the dam, six are exposed and the last is halfway in the water. Once the water reaches below this last water draw-off point, Gaborone dam will have failed, depriving the 500,000 residents and businesses of Greater Gaborone their primary and traditional source of water” (Mguni, 2014, October 10).

At the beginning of 2015, the corporation predicted that if it did not rain, the dam would dry up and Greater Gaborone would experience an acute shortage of water. By the beginning of October 2015, the dam recorded a low percentage of 1.4% and by January 2016 the levels were at 1.1% (Water Utilities Corporation, 2016), meaning that no water could be pumped and the dam was declared 'failed' and could no longer serve its purpose of supplying water to the residents. Of the other sources of water for Gaborone, the Molatedi and Letsibogo dams were at the verge of drying up, while Bokaa could supply water for a further 8 months only (Table 1.2). In Table 1.2, the column

headed 'Contribution to the Gaborone area's water supply' indicates the expected respective contributions of the different dams to Gaborone's water supply in a non-drought situation.

Table 1.2: Dam and water supply situation, January 2016.

Dam	Capacity (million m ³)	Contribution to the Gaborone area's water supply %	Current level %	Notes
Gaborone	141.4	56	1.1	Failed
Molatedi	201	8-16	4.3	10 months' supply remains, at 8% of demand
Bokaa	18.5	49.2	10	8 months supply remains
Letsibogo	100	36	43.8	10 months' supply remains

Source: Water Utilities Corporation (2016).

1.8 Statement of the problem

Many studies in water management assess the success of demand management based on information dissemination, awareness creation and other communications which encourage efficient use of water (Hambira, Moalafhi, & Mulale, 2011). Such efficiency measures seek to control the increasing demand for water. Secondly, government authorities prioritise big water infrastructure (Guy & Marvin, 2001). In Gaborone, the water authorities are determined to correct the water crisis through emphasising green consumption and embarking on capital intensive projects to increase the supply. A focus on securing the supply (while failing to adequately address the demand) creates the illusion that water management can be achieved solely through technical solutions (Magnusson, 2005) and that water is always available for use. The problematic outcome of this approach is a severing of the relationship between systems of provision and the users. The key point is, while the government is addressing the demand through efficiency, it is addressing it simplistically and in a way that is not sufficient. Because of the resource use expectations created by the infrastructure, there is an emergence of the supply and demand dichotomy which "generates fantasies of supply and security, and reinforces a fanciful notion that infrastructure can be controlled and managed by one set of actors" (Strengers & Maller, 2012, p. 755). Increasing the supply seeks to protect people from the consequences of climate change (Strengers & Maller, 2012) rather than building their adaptation and resilience capacity in preparation for climate change impacts. The main issue for the long term is that relying on changing individual behaviours may not be the best solution without a deeper understanding of the social practices that underpin those behaviours. And that water security cannot

not solely depend on an increase of the bulk water supplies but also on adjusting of social practices according to situations and available resources.

There is, therefore, a need to approach the interaction between the supply and demand from a different angle. In order to understand the implications of the build and supply paradigm and norms for resource consumption, the analytical lens of social practice theory is applied in this study, an area Reckwitz (2002b) describes as having relevance to analyse what people do. The importance of including a social practice perspective in water conservation is explained by Shove (2003a) and Strengers (2011) who emphasize that there is need to understand the motives for resource use and how the resource is treated and handled by people on the ground. The outcome of water conservation measures is thus influenced not only by the economic incentives and disincentives but also by practices e.g. through a combination of the elements.

The water situation in Gaborone is extremely sensitive because of the persistent droughts and climatic conditions. This research was instigated to understand how the government has responded to water shortages and practices behind the water uses and management in a water limited city of Gaborone and to examine the potential of demand management through understanding the everyday social practices that people engage in.

1.9 Research objectives and questions

A number of challenges exist in relation to managing water demand in the rapidly urbanizing city of Gaborone. This study seeks to understand how the government reacted to water shortages and appreciate the responsiveness of water users in Gaborone. Through the use of the literature, interviews and observations, these objectives seek to analyse the water situation in Gaborone. The specific research objectives are:

- To understand government's response to water shortages in Gaborone
- To investigate how people were coping with water shortages in Gaborone and how it has affected water use practices

The research questions are therefore:

- What is the government's response to address the water problem?
- How have the experiences of water shortages influenced people's water use and management practices?

1.10 Structure of this thesis

This thesis consists of seven chapters inclusive of this introduction. Chapter 2 provides a theoretical framework used in this study. This involves a summary of literature regarding the role of social practices, the elements of practices in everyday life and the drivers of consumption. Chapter 3 reiterates the research aims and objectives and outlines the methodological approach that has been used in this research as well as ethical considerations. In chapter 4 and 5, the results are presented. Chapter 4 sets out the government response to the water situation in Gaborone. Chapter 5 explains the experiences and the water use and management practices adopted by the people of Gaborone. These results are then discussed in chapter 6 and linked to the theoretical framework detailed in chapter 2. The last chapter, chapter 7 draws together and summarises conclusions of the study and provides recommendations about alternatives to water demand management and future research areas.

Chapter 2

Theoretical framework

2.1 Introduction

In this chapter, the theoretical framework used to answer the research questions for this study is explained.

As has been described earlier, Gaborone is faced with a serious water shortage. Improving water supply through investing in big water infrastructure and emphasizing efficiency through information dissemination and efficient technology are considered by many governments as the best way to respond to a potential water crisis. However, commentators of social practice theory believe that an exclusive focus on these two measures is unlikely to resolve the existing water crisis. This chapter explains social practice theory which offers insights into addressing the provision and use of resources in a resource disrupted area. It also sets out some key concepts considered significant for developing sustainable resource use and management practices, and practice change. Social practice theory was selected as it was thought it would offer a more complete representation of the behaviour of consumers and useful insights from a different perspective.

In this chapter, the position of social practice theory within cultural theory is described. It also explains the central themes of the theory as: practices made from interdependent elements, how human beings are conceptualised in social practice theory, and the role assigned to materials and how they script practices in our everyday routines. The perspective that the factors driving consumption are the concepts of cleanliness, comfort and convenience is also examined.

2.2 Theory of Social practice

In social practice theory, the word 'practice' refers to practice as a noun. Any action or conduct can be perceived as part of practice, thus, a way of consuming, doing research or learning how to conserve can all be perceived as practices. To understand social practice theory, we have to recognise that theories of social practice are explanations of particular ways of living. According to Reckwitz (2002b) and Shove, Pantzar, and Watson (2012), social practice theory provides a framework of analysis and conceptualisation that constitutes a particular way of viewing and investigating what people do.

Reckwitz (2002b) distinguishes between four types of cultural theory (Figure 2.1) with each tracing the social differently: in the human mind, in text, in communication and in practices. He thus

classifies practice theory as an example of cultural theory and states that “not all cultural theories are practice theories” (Reckwitz, 2002b, p. 245). This study is focused on practices, hence of the four types of cultural theory, practice theory will be deliberated in detail.

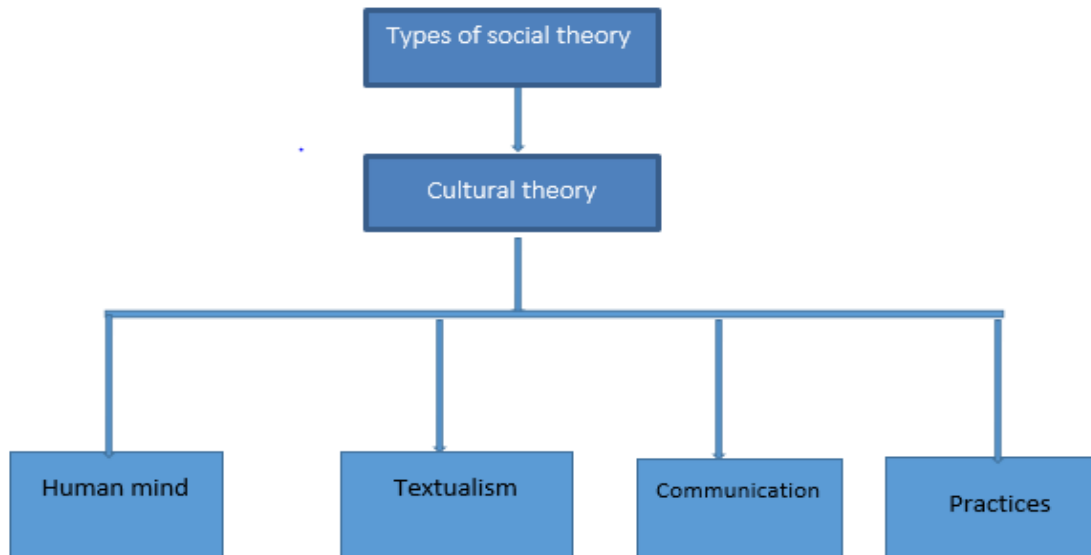


Figure 2.1: Social practice theory as positioned by Reckwitz (2002b).

One particular point of interest is that social practice theorists have a consensus on some details about social practice theory, such as taking practices as the central unit of analysis. The definition of practice conceptualises practices as a product of many single but interrelated elements and the unit of analysis is the practice (Kuijer, 2014).

What is a practice?

“A practice is a routinized type of behaviour which consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, things and their use, a background knowledge in the form of understanding know-how, states of emotion and motivational knowledge” (Reckwitz, 2002b, p. 249).

Practices such as laundering and shopping for laundry-related products are interconnected practices. In line with the definition, “consumption is not itself a practice but is, rather, a moment in every practice” (Warde, 2005, p. 137). Following this understanding, in contrast to popular beliefs that attitudes, values and intentions are the major drivers of human behaviour (Jelsma, 2006), actions and patterns of resource consumption are not viewed as stemming directly from individuals’ behaviour and attitude but as embedded and happening as a component of social practices in the form of habits and routines (Warde, 2005).

Routines are unconscious patterns of actions guided by material objects, the knowledge we have about them and meanings we attach to them. Certain features of the material objects involved support and guide the action of the consumer (Jelsma, 2006). Hence, in drawing insight from social practice theory, it is the practice itself, rather than the individual performing it, that becomes the unit of analysis. The various performances embodied in the multitude of social practices undertaken from moment to moment are seen as part of the routine accomplishment of what people take to be their normal everyday way of life (Shove, 2004). In this light, a practice can be seen as a routine activity when performed everyday but when it is looked at closely with a focus on the practice rather than the individual, much can be revealed. Pantzar and Shove (2010) and Shove and Pantzar (2005), for example, provide an illustration on the nature of the practice of Nordic walking. Nordic walking is the type of speed walking which involves two sticks. They report that a growing number of people have been recruited into Nordic walking for fun or health reasons. Although the practice may have symbolic significance, it also involves the use of material components and the expertise of how to do it. Without the material components and the expertise Nordic walking would not be possible.

Schatzki (1996) describes practice as nexuses of “doings and sayings” that compose them, that are not only acknowledged by the performer but also by those watching the action. Schatzki argues that practices are sometimes labelled as what people do and what they utter about what they do, rather than as how practices are constituted as actions which are performed by individuals. Bathing, laundering or cleaning are often referred to as facts of life. This is in contrast to our understandings of doings as produced from beliefs, attitudes, opinions and values (Ajzen, 1991). According to Strengers (2010), these latter perspectives of understanding people based on their values and beliefs come as obstacles to an understanding of social and material structures because we end up focussing on peoples’ responsibility without taking any account of why people are doing what they are doing. Social practice theory seeks to overcome these limitations by focussing on the elements which constitute and connect doings and sayings.

2.3 Practice elements and their relationships

Reckwitz’s definition of practices specifies that practices should be seen as a “block” or pattern of interrelated elements. This section provides insights on the separate elements of practices. The study adopts a model of three practice elements suggested by Shove et al. (2012) as shown in figure 2.2, and uses this as a framework for data analysis. These elements are materials, competences and meanings. The framework acknowledges the role of material objects in shaping practices and as such has relevance as this study conceptualises water as a material component of social practices.

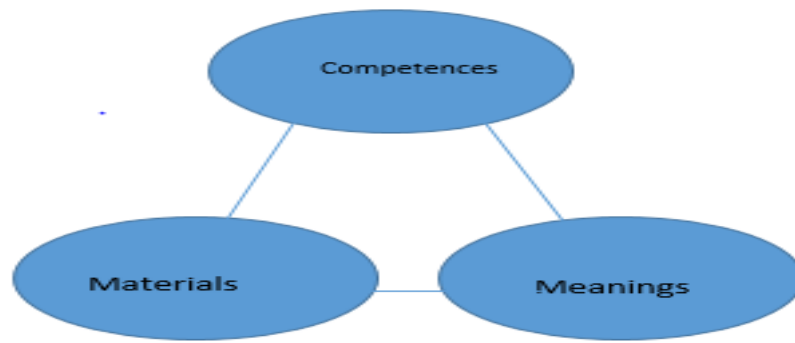


Figure 2.2: A diagram of interrelated elements of a practice. Source: Shove et al. (2012, p. 26).

It is worth noting that the elements of the material-competence-meaning framework connect, influence and shape one another. While it is important to note that practices can be understood through the formation of links between elements, elements remain essential in helping to analyse how practices change and their implications.

2.3.1 Materials

Materials are the physical and visible material objects deployed in the practice. Shove et al. (2012) describe materials as things, objects, infrastructures, tools, technology, hardware and the body itself. Materiality is the material properties of particular objects describing more of the specificity of the object (Strengers & Maller, 2012). Applying this concept to water, the materiality of water refers to the process of what it does, how it is used, how it moves, its properties and the relationship it has with people. For example, water is a material element in the social practice of bathing.

In accordance with the developers of Actor Network Theory (Callon, 1986; Latour, 1987) and social practice theorists like Reckwitz (2002a) and Shove et al. (2012), to make a social change it is important to treat both human and non-human actants equally in examining and analysing what is happening. These authors are of the view that material non-human objects, just like the human, are active actors that have a role to play in a network that constitutes a practice and have the capability to contribute to a change. The use of material objects such as storage tanks, cars, bicycles and trailers makes water use and provision to households possible. These objects create and reinforce relationships between the users and the systems of supply through the properties of water. Thus materials like water can be shared because of their availability via infrastructure although they might not be equally easily reached by all people (Kuijer, 2014). This means that practices are the consequent result of a collective but contingent achievement.

The role of material objects does not feature in most resource consumption discussions (Shove et al., 2012; Strengers & Maller, 2012). Indeed Reckwitz (2002a) has criticised social practice theorists for

failing to ascribe roles to material objects in practices. He argues that non-human actors, quasi-objects and hybrids are becoming central constituents of daily practices. Consistent with this view, water reticulation networks within households form part of material objects that extend to water reservoirs such as dams, boreholes and pipes, and other technological objects used in households such as taps, water storing tanks, trailers and cars. As such, all practices conducted in households need many of these artefacts and technologies (Strengers, 2010). Instead of perceiving them as inactive actors, Latour argues these material objects shape and organise practices (Latour, 1987). In this view, artefacts are seen as active actors which command daily life practices and social order just like humans do. They are constitutive elements that have facilitating, constraining and entrenching implications.

Material elements of practice are explicitly recognised by Reckwitz (2002a); Shove et al. (2012); Strengers and Maller (2012), therefore they are needed since they have clear relevance as we are learning about the effectiveness of material objects found in our localities, how they thrive in strengthening preferred social practices and the opposite.

These authors argue that the role of material objects is derived not just from how these objects are interpreted or valued by people but also how they are used. For example Reckwitz (2002b) explains that in order to play football, a ball and goal are needed. According to him, players are not just using the ball in kicking it during the course of playing; they are also reproducing the practice of playing football which requires interconnections between elements. From this perspective, material objects are not just objects; they have a particular purpose in a practice. As such, material objects are rendered irreplaceable elements of social practices (Reckwitz, 2002a). As he explains “not only bodies but also artefacts are sites of understanding practices”. Therefore, both humans and materials mutually constitute practices.

2.3.2 Meanings

Meanings are ideas that are shared by groups of people. Why a practice is performed can be explained by examining the shared ideas. Reckwitz (2002b, p. 249) describes meanings as mental activities, states of emotion and motivational knowledge, while Shove et al. (2012, p. 23) refer to them as “the social and symbolic significance of participation at any one moment”. Shove and Pantzar (2005) view meanings as positioning society in relation to their norms and values. While meanings are as significant as materials and the competences in influence, they are also important in interpreting practices that people are involved in. That said, meanings should not be seen as a single driving or motivating force. Rather, meanings should be treated as elements of practice (Shove et al., 2012).

As a further illustration, Shove et al. (2012) provide an example of a practice of driving a car and the connection between the elements constituted in the practice. They explain that a practice of driving a car depends on a mixture of particular materials, meanings and competences. The act of driving is the integration of different elements that can change over time. Figure 2.3 characterizes the growth of driving through capturing elements involved at a particular period in time. It illustrates how elements interconnect in a practice, using the example of driving in the USA 1900s-1910s.

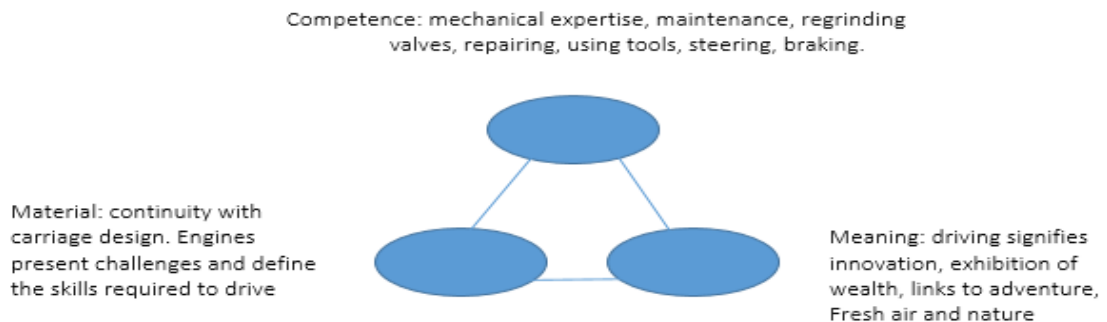


Figure 2.3: A diagram of elements of driving in the USA in the 1900s-1910s. Source: Shove et al. (2012, p. 29).

2.3.3 Competences

Competences are forms of understanding and practical skills that link elements of practices. Through the application of skills and know-how, people are able to perform practices. Skills are not inherent but learned bodily routines. As such, they involve emotions. Skills are informed by past and everyday practice experiences (Schatzki, 2002).

The relations between actors (human and non-human) in a network of a practice is a relationship of practical understanding (Crouch, 2003), know-how, feelings and doings. According to Latour (1991), skills can be circulated between people and material objects. Through practical understanding of actions, actors are able to acknowledge and understand their world better as well as learning situational practices through undertaking them. Since practice involves doing things in a certain way, by knowing their world, people are able to make informed choices on what to do. For example, the wish to do particular practices and not doing others. This is to say “ways of feeling about and appreciating things and situations” is viewed as part of the practice (Kuijer, 2014, p. 27). Therefore, it can be concluded that practical knowledge can be seen as an embedded skill which informs acts (Strengers, 2010).

Further, while practices depend on the skill needed to perform the action, it is not always normal that performers are aware of this understanding, and because practical knowledge is reproduced, the way of understanding becomes a collective, shared knowledge by people conducting socially related practices (Reckwitz, 2002b; Strengers, 2010).

2.4 Human beings as carriers of practices

In social practice theory, the role of human beings is explored. Human beings are enrolled as carriers of social practices (Reckwitz, 2002b), an idea fundamental in understanding change in practices. To understand why human beings are assigned the role of a carrier, it is important to state the explicit position of social practice theory. Social practice theorists consider it a step too far for social theories to conceptualise human beings as rational thinkers and decision makers. However, human bodies play a role in social practice theory. Reckwitz (2002b, p. 251) states that practices are 'routinized bodily activities'. He is of the view that bodily actions need to be organised by the mind with which the knowledge is conveyed through the body. Routinized bodily activities come with forms of understanding and knowing but this understanding can only exist if it has manifested in bodily behaviour. A practice can thus be seen as a routine, skilful performance of human bodies. These routines are regularly performed and learnt overtime and the body becomes the domain of knowledge. Through repeated performances, the body is trained in a particular way and the knowledge about the practice becomes embedded in the performer. The practice of taking a shower for instance is comprised of a regular set of bodily performances associated with particular know-how, particular ways of interpreting and feeling about the practice of showering.

Since people are given the role of carriers in a practice, they make contact, get recruited and start performing a range of practices (Hargreaves, 2011). It is through these commitments with practices that people appreciate the world they are living in and develop consistency in their practices (Warde, 2005).

Although people and practices are interrelated, and because practices exist through human bodies, they are maintained and transformed when performed by people. While it is difficult for individuals to transform elements of practices (Kuijer, 2014) in unison at once, this does not imply that they are passive actors. Rather they are regarded as skilful agents who interrogate the environment around them, carry out various practices in the normal course of daily life (Hargreaves, 2011) and within the constraints they encounter. If practices are constituted of materials, meanings and competences, practices have to be performed in these three elements concurrently. Taking the practice of driving as an illustration, driving is dependent on all the three elements and it evolves as these elements change and these changes are a consequence of integrative work. Over time, one of the elements

(e.g. meaning or materials) may change while the others stay the same, but the practice will evolve as a result of the new combination. These observations lead us to conclude that the car, the practical knowledge needed to move it, and the meaning and significance of driving, are closely related (Shove et al., 2012) such that they constitute what Reckwitz (2002b) describes as a block of interlocking bits. Hence these elements are “linked together and transformed through the process of doing” (Shove et al., 2012, p. 41).

Therefore seeking to change behaviour requires more than just regulations and education, and it is crucial to understand practices that people carry out. For resource use practices to be more sustainable, people may need motivation and change of practices. Encouraging diversification of diverse resources for different purposes, incentivising innovation and sharing practical experiences (Strengers & Maller, 2012) are forms of motivation which allow and encourage people to manage their everyday practices. Motivation also allows and encourages people's involvement in organizing what makes sense for them to do. This is different from empowering people through education about resources and their impact (Strengers & Maller, 2012), and understanding people based on their values and beliefs (Hargreaves, 2011). Understanding people based on their values and beliefs results in concentrating on people's individual accountability without considering why people perform practices they are performing.

On a similar note, Horton (2003) concludes that proposing sustainable behaviour can be best encouraged by providing ‘green new architecture’ of materialities encouraging green practices. Investing in green new architecture provides a room for practice improvement which may yield desired practices. Healy (2003) on the other hand, claims public knowledge is a very important component of changed behaviour only if the outcomes engage the material context. While these two authors concur that material objects are key to shaping practices, their definition of practice is in divergence and falls short of what Shove et al. (2012) regard as involving the three interlocking elements constituting a practice. In other words social practice theory says that in order to analyse practices, there is need to focus on other things such as the competences and meanings which also have influence in shaping the social world. This is particularly noted by Warde (2005, p. 140) who wrote that “the principal implication of a theory of practice is that the sources of changed behaviour lie in the development of practices themselves”. Experimenting makes people regard an action as part of everyday practice. If the action is rewarding, people may want to always perform the action even if there are no external forms of rewards.

2.5 Scripting practices in material objects

The use of material objects requires practical knowledge on how to carry out the practice and common understanding between people about why the practice has to be conducted in that particular manner. This notion suggests that what is deemed to be the social is a product of intertwined material practices resulting from practical understanding (Schatzki, 2002). This statement validates why Strengers and Maller (2012) argue that artefacts are essential practice elements through which practices are shaped. Following this understanding, Strengers and Maller (2012) and Reckwitz (2002a) call for social practice theorists to assign the material objects an active role for their contribution and transformation of societies. Their role is found in the composition and carrying out of daily practices.

Some socio-technical studies ascribe a role to structures of resource provision and their material status in practices is described as scripting (Hanseth & Monteiro, 1997).

“A script is a material structure that by its specific layout, exerts force on the actions of its users. That is the script of an artefact invites certain user behaviour while counteracting other behaviour” (Jelsma, 2006, p. 223).

Scripting thus becomes the process by which material objects propose particular routines and outcomes (Akrich, 1992). These material objects script principles of morality or immorality into them which asks people to consume more or less resources (Jelsma, 2006) and so impact the trend of human behaviour. Sofoulis (2005) demonstrates that at a household level, washing machines and showers are the biggest consumers of water mainly because of the amount of water needed to conduct cycles of washing for clothes or bodies to be clean. The use of these resource-consuming objects hampers attempts by the government to reduce the amount of water resources people consume.

Latour (1991) also gives an example of how practices can be scripted in people. Hotel customers were asked to leave their keys by the reception desk when leaving the room. This was done to inscribe the preferred pattern of behaviour. A series of trials were made to check the strength of various inscriptions. According to Latour, the first inscription was to write on an object by a way of signalling all clients to return the keys by the reception desk when vacating the room. This inscription was weak. Another trial was made, a manual door-keeper and the same outcome was produced. The management then increased the weight to the keys by putting a metal knob of some weight and the preferred behaviour was attained. In this story, through the use of an artefact, the managers' desires were finally inscribed to a practice strongly enough to oppose the initial practices of clients.

Material infrastructures like water supply networks (dams or pipelines) which channel resources to households are described as 'connective tissue' (Strengers & Maller, 2012) and are hard to transform (Strengers, 2010). Most of them are fixed and durable, and path dependent, locking in certain practices that may last longer than the common understanding and material setting they were planned for (Arthur, 1989; Shove et al., 2012).

Guy and Marvin (2001); Sofoulis (2005) and Strengers and Maller (2012) have shown that large scale systems such as pipes, mega dams and water treatment plants encourage people to be involved in wasteful water practices because they are centrally managed and the supply structures are intended to insulate residents from natural fluctuations in water supply. These authors discuss the role played by these material infrastructures as signalling a policy response that gives security assurance and continuous water supply, regardless of water shortages. In Namibia, for example, the government adopted the Kavango River/Karst Aquifer pipeline schemes and mega dam building to address the issue of water supply in the city of Windhoek. The schemes involve transferring water over 350 km and 600 km respectively (Biggs & Williams, 2001). Namibia typifies a water shortage country that continues to think about adding pipes without thinking about the water itself. These material objects have influence on the behaviour of householders and their patterns of consumption. And yet the materiality of water (its provision through the hydrological cycle and its need to flow) does not.

"These accounts provide insight into the links between production and consumption that should raise concern for any policy maker pursuing large-scale infrastructural investments in the interest of securing supply, as well as clues on what alternative types of infrastructural arrangements might enhance householders' adaptive capacity" (Strengers & Maller, 2012, p. 756).

In view of this, demand management is characterised by a division between production where resources are 'produced, captured and managed' to people's homesteads and consumption where resources are used up (Strengers, 2011). The use of these material objects lowers residents' ability and need to carefully use water resources (Strengers & Maller, 2012). Nelson (2007) describes them as embracing 'one best way' and their application is at the largest scale, while Sofoulis (2005) views them as encouraging inscription of certain practices. Such inscriptions according to Hanseth and Monteiro (1997) attempt to define the pattern of use of resources. Such inscriptions entail a series of actions for the consumers and delegates roles and experiences to the user as well as constituents of the system (Latour, 1991). This is certainly not surprising given that technological systems are "today largely hidden, opaque, invisible, disappearing underground and locked into pipes..." (Kaika, 2005, p. 29). Their hidden nature contributes to reducing the process of social change, with people perceiving water resource as a commodity that is simply provided through pipes into the household (Kaika, 2005; Strengers, 2010). In other words, the unseen flows as well as the associated material objects,

block the social relations that are scripted and performed through these flows. Despite this, the communities continue to look for water to satisfy their needs.

The role of scripting is not always obvious, but by learning about the system of materiality in water, we learn more precisely how material objects are inscribed and which inscriptions are needed to achieve a desired practice. Assessing the strengths and limits of material objects give understandings of the role of materiality in shaping practices. By understanding the influence materials have on practices, we are also appreciating how they influence our everyday routines.

2.6 Reproduction and transformation of practices

Practices occur on a regular basis as opposed to a one-off activity. Thus they become a way of living for some people as they are continually performed. Hence, if practices are to be sustained there is need for recruitment of actors. People entice each other into the practice, which leads to its transformation. Pantzar and Shove (2010) and Shove and Pantzar (2005) give an example that the practice of Nordic walking can only exist if there is regular recurrent performance, with each element involved in practice reproducing the interdependent elements which constitute the practice. Practices become an interdependent entity.

Apart from being essential, irreplaceable components of a practice, material objects play an enabling social reproduction role (Strengers, 2010; Warde, 2005) and because they are used differently in various situations, they therefore facilitate networks beyond personal contact (Crouch, 2003). The enabling feature of material objects is supported by Shove et al. (2012) as they argue material elements can change, transfer and preserve forms of competence. According to Shove et al. (2012), orders from material objects are beneficial in keeping the circulation of an understanding and so the element of meaning can move between practices. The reproduction of practices creates an understanding and improvement of practices (Warde, 2005). This then prepares people to survive situations by inventing and applying certain skills of living resulting in them experiencing new relationships and meanings.

Additionally, new material objects may be introduced to form part of the reproduction and performance of a practice (Strengers, 2010), qualifying practices to be coordinated entities (Warde, 2005). Material objects have also the capability to change practices through integration in practice (Kuijer, 2014) and to 'materialize' or 'incorporate' knowledge related to that particular practice (Reckwitz, 2002a, p. 212). Material objects therefore can shape or be shaped by the context within which they are used.

In their work 'Consumers, producers and practices: Understanding the invention and reinvention of Nordic Walking', Shove and Pantzar (2005) conclude that certain practice elements can be passive which can lead to change of the practice but they are still available for future use (Shove et al., 2012). In the course of reproduction, new links are made, some broken resulting in the formation, persistence and fading of other practices. This interpretation is in line with the thinking of Reckwitz (2002b, p. 255) that 'breaks and shifts' in the reproductions of practices can occur in:

"Everyday crises of routines, in constellations of interpretative indeterminacy and with the inadequacy of knowledge with which the agent, carrying out the practice, is confronted in the face of the situation".

By way of illustration, Strengers (2010) observes that in cases of households' comfort and cleanliness practices, existing practices can be destabilised. A shift in the composition of a practice might occur. Shortage of water may result in modified cleanliness practices as a result of common understanding about hygiene, knowledge of how to sustain this understanding and available material objects such as storage tanks to take care of one self.

As such, practices cannot just be shaped by bringing new material objects. Relations between actors is conditional. Transformation of practices can be viewed as dynamic processes which involve shifts and breaks in their daily reproduction informed by their designers and by performers who perform the integrated practice (Jelsma, 2006; Kuijer, 2014; Strengers, 2010; Warde, 2005). In spite of this, our understanding of the process of change can be enhanced by expanding the way we look at the influence of material objects on practices and how the existing practices may be re-settled, re-created and re-defined and/or reinforced.

Similarly, what informs new practices and how past experiences influence practice change is something to investigate. Unfolding the importance of understanding practices assists in investigating how they are established and spread. As Shove et al. (2012) explain, it is important to interpret and understand how practices are reproduced and transformed. And possibly investigating how and why they become as they are, a section I am turning to next.

2.7 Shove's concepts of cleanliness, comfort and convenience (the 3Cs)

In her book, Shove (2003a) explores resource consumption and service provision in respect to the 3Cs in the domestic domain. She analyses consumption from a socio-technical systems angle. Shove (2003b) in her paper on converging conventions of comfort, cleanliness and convenience, argues that everyday domestic consumption is linked to normal, routinized and taken for granted practices within households. In other words, people do not just use resources, they use the services provided by water resources to fulfil the desires for cleanliness, comfort and convenience which people have

become accustomed to. For this reason, households' practices need to be studied to understand how and why householders do what they do.

She highlights that the desire to meet the socially tolerable standards of cleanliness and comfort in the manner which they are practiced lead to the proliferation of the consumption of water. She however, argues that it is difficult to determine if convenience increases water use, rather, she and Sofoulis (2005) believe it is not convenience itself but the material objects used to acquire the desired service that can either increase or decrease the use. Nonetheless, convenience has the potential to shape routines relating to cleanliness and comfort.

2.7.1 Cleanliness

Cleanliness is defined by Shove (2003a) as a concept which involves morality, social and cultural significance. The concept of cleanliness is traced back to the Eighteenth century where it was related to issues of hygiene, reducing diseases and poverty (Kuijer, 2014), where upon Shove describes it as a product of socially acceptable standards in the society. Cleanliness involves regular showering or bathing, washing clothes, dishwashing, toilet flushing, and cleaning the house and the surroundings, and the manner in which these activities are carried out. Ever since the eighteenth century, it has become evident that practices linked to cleanliness such as bathing, showering, laundry have significantly increased over the years creating the need for more water use.

"In the space of generations the population as a whole has become radically cleaner, striving to achieve increasingly sanitised bodies ... and clothing, soaping away every single use and scrubbing household surfaces with toxic cleansing substances. This vastly increases levels of water usage" (Strang, 2004, p. 22).

This illustration is an indication that people have increased the frequency of showering, washing clothes and cleaning the environment with the use of sanitising chemicals which in turn require more use of water. Cleanliness is not only linked to heightened expectations of hygiene, but also makes a distinction between rural and urban dwellers (Shove, 2003a).

"Distinctions between the rural and urban, the civilised and barbaric, the familiar and foreign consequently condensed into a newly discriminating language of cleanliness ... regular bathing was reconceptualised as an entry to society itself" (Shove, 2003a, p. 100).

Despite the necessity of hygiene, Shove (2003a) observes that social values have shifted the practices of hygiene beyond necessity to social acceptance. The standards involved in cleanliness are normal day-to-day expectations that come from society rather than being imposed regulations on society (Shove, 2003b). The use of deodorants to kill smells, bathing and washing typifies a society that has transformed its level of cleanliness to fit into the larger society to meet apparently agreed

expectations for hygiene. According to Shove (2003c), laundering, bathing or showering and the variety of improved cleaning materials provide processes of increasing personal cleanliness standards and expectations. Given that these practices are socially mediated, framed and constrained, there are opportunities for variations of practices, social conventions, creation of personalities and investment in social wellbeing. Cleanliness, specifically bathing, is seen as a basic social duty and the habits of keeping clean can involve extreme levels of water use something which is made possible by the use of plumbing technology (Kuijjer, 2014). Shove (2003b) maintains that bathing is at the centre of the shift to cleanliness and how physical personal purity with respect to cleanliness is defined. As such, cleanliness can be seen as part of a socio-technical system that includes the use of systems such as bathtubs, showers and washing machines and in-house plumbing, and lead to regular engagement of cleanliness practices such as bathing/showering, flushing the toilet and washing clothes because there is a continuous supply of water within the house.

2.7.2 Comfort

Comfort, just like cleanliness, has evolved overtime. During the Eighteenth century it occupied “a middle ground between necessity and luxury” (Shove, 2003a, p. 25) and is now increasingly becoming an essential pursuit. Shove relates comfort to everyday activities such as bathing or flushing the toilet and makes a connection between water supplies and wealth. In other words, water represents luxury. Filling bathtubs with water and flushing toilets with ease illustrate the manner in which water is viewed as taken for granted. Shove (2003b) is of the view that when the built environment provides defined conditions of comfort, people become accustomed to them. When the resource becomes intermittent, a different way of living is experienced and is described as uncomfortable. The luxurious use of water can be linked to olden days when its accessibility was associated with status, riches and water rights (Knamiller, 2012) and now many more people have access to it. However, limiting the amount of water for use is thus viewed as depriving one’s true pleasures of life that come along with excessive use. What was deemed luxury in the past is taken for granted today.

2.7.3 Convenience

As societies have developed, the meaning of convenience has also shifted overtime.

“Initially referring to ease of use, then to saving time, convenience is now associated with the capacity to shift, juggle and reorder episodes and events (Shove, 2003a, p. 170).

Women formerly known to be housewives and child carers and now increasingly becoming career women, the desire for cleanliness in all respects (house cleaning, washing clothes, bathing, etc.) still

needs to be achieved. The need to look presentable with clean clothes calls for effective structuring of activities. This scheduling of activities is assisted by technological objects which are perceived as expedient and time saving. To Shove, laundry and bathing are practices that can be negotiated and organised to fit around the non-negotiable activities of work or school. Hence scheduling activities around these technological objects has implications on the use of the resource.

The need for comfort and convenience calls for water reticulation within the house which provides ease of use and creates an illusion that the supply is reliable. These technical objects in turn hinder social change in resource use (Kaika, 2005) since the impression that water is always available and flowing is understood to be emanating from the hidden underground properties of the water system. Washing clothes using machines is one illustration of a practice that can be carried out even when one is not at home. Showering is also perceived as a quick way of cleaning oneself. As long as these technological objects are in place and the desire exists to conduct household practices at a certain speed and flexibility (Knamiller, 2012), routines on how water is used are created and contribute to what is perceived to be a normal water use culture (Sofoulis, 2005). Accordingly, convenience can generate a path dependency of demand which appears hard to deviate from (Shove, 2003a, 2003c). The socially constructed nature of practices and routines suggests they could be changed.

2.8 Conclusion

Exploring the implications of practices through the lens of the social practice theory provides insights into the theoretical and practical basis of sustainable practice change. Human action is guided by everyday routines. Most basically, these routines can be re-settled, re-defined and re-enforced, if emphasis is channelled to peoples' daily practices. Hence this study provides an explanation of adaptation strategies that are adopted during difficult situations by recognising that attempts to change practices rest on understanding why people consume resources as they do and recognising the interrelated elements constituting the practice.

Chapter 3

Methodological approach

3.1 Introduction

A qualitative approach was chosen to realise the objectives of the study. The fundamental point underpinning a qualitative approach is the “assumption of multiple, socially constructed realities” and that social behaviour can be understood through interpreting meanings which participants display (Tolich & Davidson, 2011, p. 33). Unlike the quantitative approach which imposes categories and simplifies what is profoundly complex, qualitative research because of its iterative nature allowed me to gain in-depth insights. In qualitative research, semi-structured and open-ended questions were used to give the participants the opportunity to share their thoughts about certain occurrences.

This approach was preferred as I was particularly concerned with investigating the deeper meanings and experiences of the people living in a city with water crisis. Rich data is a term used by (Marx, 2008, p. 795) to describe the idea that:

“Qualitative data and their subsequent representation in text should reveal the complexities and richness of what is being studied. Although it is never possible to comprehend all dimensions of a phenomenon, the qualitative researcher seeks to understand what is being investigated as deeply as possible and to situate it within the context of time and space rather than isolation”.

These comments from Marx about situating a study “within the context of time and space” was relevant to my study as it was conducted when people were still emotional about the impacts of the water shortage. The idea of situating the study within its context is also said in contrast to quantitative methods that seek to extract findings from their context. Qualitative methods allow for exploration of the context and make it part of the study which is not the case with quantitative methods.

3.2 Data collection

Both primary and secondary sources of data were employed to conduct the study. Secondary sources included reports and other relevant documents from relevant institutions. Secondary sources were used essentially for triangulation purposes and supplementing the documented information relevant to the case, in particular for examining the context.

Primary research methods included face-to-face interviews with concerned people and institutions, and observations. Data collection took place from the end of April to the end of June 2016.

The observation method was to access information that could have not been accessed through interviews and also to immerse myself in the daily life of the people I was studying. Prior to the commencement of data collection, I intended to collect data by conducting observations in both public places and homes. The purpose of the planned observations in public places was to carefully understand the interactions, actions and practices deployed by the participants from the general public when water pipes are down and when people are told there will be no water and the general atmosphere when water is not available. Natural behaviour is best understood by employing observation techniques.

However, by the time of data collection the situation had slightly improved which meant the water practices I had planned to observe in public places were no longer occurring. Hence, all the observations were conducted in residents' homes.

3.2.1 Interviews

Interviews were conducted with individuals in their homes and professionals in their respective institutions. With their permission, residents' water practices in their homes were also observed. Open-ended, semi-structured questions were developed. They were designed as prompting questions to guide a line of inquiry. Depending on how the participants responded to interview questions, I followed their lead and developed more questions that seemed appropriate for the interview. This ensured some degree of flexibility during the process of the interview essentially for tackling emerging issues as they arose.

Before data collection, the planned initial question was to ask the household participants: "how are you coping with the water situation?" but given that by the time data collection began at the end of April 2016 water was once again reasonably available, this question was changed to "how did you cope and what did you do during the water shortage period?"

Interview questions were developed on the basis of what kind of information is required to address research questions and objectives. For example, the prompting questions for the householders included questions like how did you cope with water shortages, what did you do and how did you do it. Questions directed to the water experts were along the lines of, what are the causes of water shortage and the strategies used to augment water supply in the city. Thus I had the opportunity to build an understanding from a variety of perspectives among the participants. I found interviews to be very effective as participants had more time to contemplate their answers. I also had the

opportunity to phrase and rephrase interview questions and follow up with participants for clarifications. This was undertaken essentially for triangulation of information gathered through home observations and from documents.

Four sets of questions for four groups of participants were developed (Appendix A). Interviews were undertaken with the selected members of the public and other relevant stakeholders such as relevant government departments, Non-Governmental Organisations and the academics. Thirty-two interviews were conducted, including 24 householders— 8 from Gaborone North (N), 8 from Gaborone West (W), and 8 from Gaborone South (S). All the interviewees were Botswana nationals. Table 3.1 details the classifications of the interview participants and the codes used to identify them in the text.

Table 3.1: Classification of interviewees

Respondents	Number	Identifying code used in text
Householders in G-West phase 1, Phase 4, New Naledi/Canada, Bontleng, Phakalane, Block 8 and G-North	24	See table 3.2 below
Non-governmental Organisations (NGOs) <i>(Kalahari Conservation Society and Somarelang Tikologo)</i>	3	6NGO, G 7NGO, G 8NGO, G
Government departments <i>(Department of Water Affairs and Water Utilities Corporation (government company))</i>	3	1GD, D 2GD, D 3GD, D
Academics <i>(University of Botswana, Department of Environmental Science)</i>	2	4AL, UB 5AL, UB
Total	32	
GD=Government Department, AL=Academic Lecturer, NGO=Non-Governmental Organisation, G=Gaborone, UB=University of Botswana		

All interviews (except one where notes were taken) were digitally recorded and the recorded data was transcribed into the computer. However, the recording was only done after participants' consent as per the Lincoln Human Ethics Committee requirements. Interviews were conducted in both English and Setswana (the local language). Interviewees were encouraged to give true answers and not the 'right' answers. I explained to the interviewees that I did not want them to tell me what they thought, I wanted to hear their experiences during the disruption period.

3.2.2 Criteria for selecting interview participants

Systematic sampling was employed as a technique to select participants from the general public. The general public in this context refers to people or householders in their homes. The selection, recruitment and data collection of participants took place between April and June 2016. The study

was conducted in Gaborone, the capital city of Botswana. Participants were selected from three areas of the city namely: Gaborone West, Gaborone South and Gaborone North (See Figure 3.1).

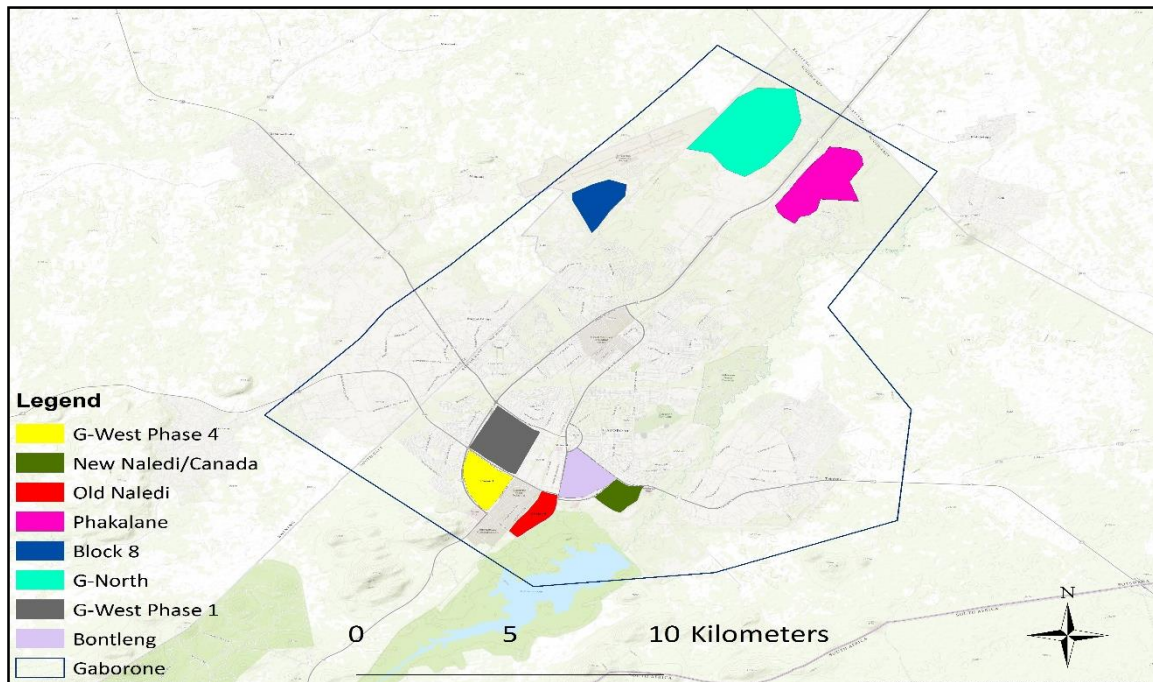


Figure 3.1: Locations of the different study areas within Gaborone city.

Gaborone west comprises of G-West phase 1 and Phase 4. The people living in Phase 4 are middle and high income and some reside in the Botswana Housing Corporation houses. G-west phase 1 is a low and middle income location. Gaborone South consists of Old Naledi, New Naledi/Canada and Bontleng. New Naledi/Canada residents are mostly middle income people, while residents of Old Naledi and Bontleng are low income. Gaborone North consists of high income people from Phakalane, Block 8 and G-north. Table 3.2 gives details of locations and socio-economic status of the householder interviewees, the water services (water supply and sewage disposal) available to them, and the identifying codes used in the text. Note that one household (25GR, W) had both a flush toilet and a pit latrine – only the flush toilet is shown in this table.

Table 3.2: Classification of household interviewees according to their respective locations and socio-economic status and water services

Socio-economic status	Location	Identifying codes used in the text	Water supply	Toilet	Identifying codes used in the text	Water supply	Toilet
High income	Phakalane	9GR, N; 16 GR,N	Internal plumbing	Flush			
	Block 8	12 GR, N; 14GR, N; 21GR, N; 26GR, N	Internal plumbing	Flush			
	G-North	17GR,N; 29GR,N	Internal plumbing	Flush			
Middle and high income	Phase 4	10GR, W; 18GR,W; 23GR,W; 31GR,W	Internal plumbing	Flush			
Middle income	New Naledi/ Canada	15GR,S; 19GR, S; 22GR,S	Internal plumbing	Flush			
Middle and low income	Gaborone West Phase 1	11GR,W; 20GR,W; 25GR,W 32GR, W	Internal plumbing	Flush	11GR,W	Standpipe in yard	Pit latrine
Low income	Bontleng	13GR,S; 24GR,S	Internal plumbing	Flush	28GR,S	Standpipe in yard	Pit latrine
	Old Naledi	27GR,S; 30GR,S	Internal plumbing	Flush			
G=Gaborone, R=Resident, N=North, S=South, W=West							

Participants from 18 years and above across all genders and age cohorts were interviewed. The constitution of Botswana recognises that young adults from 18 years are responsible citizens who are capable of making informed decisions hence this research only interviewed people from this age. This was done to enable me to get a range of opinions since an open-ended approach was used. I stopped at every eighth household to conduct interviews.

Purposive sampling was undertaken for experts' participation. The interviews were held with key people involved in the water sector. It was necessary to understand how the government is grappling with the water situation in the city, the government's role and how the academics have advised the government on the water issue, the anticipated challenges and the role of NGOs in the water sector.

The purpose of the study is to understand how the government has responded to the water situation and households' social practices to the water shortages in Gaborone. In this section, I provide detailed information on the research objectives and questions and the type of information used to answer each objective and question. Two research objectives and questions were developed to assist in the organisation of data. Table 3.3, provides some insights on the research objectives and

questions, and type of information that was used to address each question. Literature review, interviews and home observations were the sources of information to achieve these objectives.

Table 3.3: Information for addressing each objective and question

Research objectives	Research questions	Sources of information
To understand government's response to water shortages in Gaborone.	What is the government's response to address the water problem?	Interviews Literature review Mass media information
-To investigate how people are coping with water shortages in Gaborone and how it has affected water use practices.	How have the experiences of water shortages influenced people's water use and management practices?	Interviews Home observations

By the end of the data collection phase, an enormous amount of data was gathered. I became immersed in the data as I transcribed it to address the research questions and objectives. I had many questions about how the data might link to the theoretical framework, prompting me to read interview notes many times and take notes throughout the study. Reviewing the literature was a regular exercise during the course of my study. Constant reading of the literature was found to be a very important process and assisted with the interpretation of the raw data. Whenever themes emerged, I consulted the literature to seek triangulation and to see what would aid me with comprehending what was really going on. This iterative process aided me in conducting my study.

3.3 Analysis of the data

The study adopts a logical approach to analyse qualitative data. This approach entails recognising themes, patterns and meanings in the data. Qualitative data analysis is a "process of inductive reasoning, thinking and theorizing and a dynamic and creative process" (Taylor & Bogdan, 1998, pp. 140-141). It is an ongoing process of discovery in which themes are identified and concepts developed (Lofland & Lofland, 2006). By way of identifying patterns, establishing how I can label actions and describe emerging themes, deductive reasoning with the use of a theoretical framework was applied to derive conclusions. This inductive and deductive process involved looking for patterns and meanings in the data and deducing general conclusions about my study. I therefore looked at my data and created categories to identify practices that people were engaged in and concepts of the 3Cs which Shove describes as the drivers of consumption and an additional S (Survival) was derived from the data. These practices, concepts and themes were later analysed according to how the material objects and competences influence practices. This means that the discovery process is ongoing and critical reflection needs to take place throughout the process of data collection not only after the transcription of the recorded information is complete. For this study, my interest was to

understand how the government has responded to the water shortages and households' social practices in response to the water shortages in Gaborone.

A combination of NVivo and manual sorting were used to code the collected data. NVivo is a computer software package used to organise qualitative data for analysis. The purpose of NVivo was to organise the data to identify the main themes and elements of practice theory. Manual sorting was used to look for relations. These modes of organising the data allowed me to identify, sort and arrange the data and examine the connections between the elements identified in the data. Coding allows for summarising of information, not by losing the importance and meaning of the information, but through capturing key concepts (Becker, 1998).

3.4 Human ethics considerations

Data collection for this study involved participation of human beings and it was essential to treat them with respect. Approval from the Lincoln Human Ethics Committee was sought and obtained prior to commencement of field work. The following steps were taken to ensure participants' rights were respected throughout the process of research allowing the participants to:

- Participate voluntarily
- Withdraw information at any stage up until 31st July 2016
- Remain unknown, by the use of pseudonyms rather than the real names in the analysis of findings and interview records
- Contact the research team for any queries

Information acquired from the participants was treated as private and confidential and was only accessed by the research team. As such the necessary steps were fulfilled and consistent with the protocol approved in the human ethics application by the Lincoln committee.

3.5 Conclusion

This chapter has discussed the research approach developed for this study which involved the collection and analysis of qualitative data. The reasons for using interviews and observations, criteria for selecting participants, description of the study area, how analysis was carried out, followed by human ethics considerations have been discussed. The results from data collection and gained insights will be presented in the subsequent chapters (chapter 4 and 5).

Chapter 4

Management of water supply in Gaborone

4.1 Introduction

The intention of this chapter is to address the question: what is the government's response to address the water problem in Gaborone? The chapter provides an overview of the interdependencies in the systems of supply that support water consumption. In Gaborone, inadequacy of the legislation and lack of integration between sectors, lack of resources, dilapidated infrastructure, and rising demand have combined to create Gaborone's water crisis. It also presents the nature and timelines of the water shortage. The chapter concludes by describing the strategies that the government has put in place to resolve the issue of water in Gaborone. Through the lens of social practice theory, water provision and consumption will be analysed. The information presented in this chapter is based on interviews with government officials, academics and the NGOs and the study of relevant documents.

4.2 Legislative factors

4.2.1 The water sector policy and legal framework

The legislation governing the sector is fragmented and out of date and therefore requires urgent review to render it more relevant. The water sector is governed by 65 pieces of legislation (Respondent 2GD, G) and the Water Act has not been updated since 1968. Other relevant laws are the Borehole Act (1956), Water Works Act (1962) and Water Utilities Corporation Act (1970). The existing laws are not compatible with the current lives of the people or present world water management best practice and provide little support for the implementation of Integrated Water Resources Management (IWRM). They have never been revised in the five to six decades since they were enacted, and they therefore miss important aspects of today's modern approaches to water management. Currently, the country relies on the 2006 revised National Water Master Plan (NWMP) for guiding the country's water resources management framework (Department of Water Affairs, 2013). Two issues are embraced by the plan: water resources stewardship and water demand management.

The goal of the water sector reforms arising from the 2006 revised National Master Water Plan and carried out in 2009 was to correct the institutional and legal framework of the water sector (Respondent 2GD, G). As part of the reforms, the role of the Water Utilities Corporation (WUC), a

parastatal which had been established in 1970 to manage a water supply and distribution project in the Shashe Development Area, was expanded to cover water provision and sanitation services for the whole country. Giving WUC the responsibility for water supply means the public commodity of water has been commercialised. Access to water is often deemed a basic human right, so this commercialisation was received with mixed feelings across the country. The reforms also instigated the draft National Water Policy which was developed in 2012 (Respondents 1GD, G; 2GD, G); (Department of Water Affairs, 2013). The draft policy supports the adoption of IWRM which includes the implementation of demand management strategies and advocates for water efficiency measures.

The policy has remained a draft since 2012; it is yet to be finalised and approved to provide guidance to the water sector. At the time of data collection, it was billed for debate in the July 2016 parliamentary session (Respondent 2 GD, G). According to this respondent, once the policy is complete other legislations will fall into place. This is to say, until its approval, revision of other legislation cannot take place. Any delay in the endorsement of the national policy will delay revision of the related pieces of legislation.

4.2.2 Lack of integration between sectors

Integrated planning is the key in planning for management of resources. Most of the problems emanate because things are approached in silos (Respondent 2GD, G). Water was cited as a land based resource, and as such it cannot be separated from the other environmental issues. By separating it, the focus will be just looking at water but water is affected by issues of land ownership and use (Respondent 5AL, UB). For example, there is some water that is in the hands of private sector individuals or companies e.g. boreholes and rivers traversing people's homesteads (Respondents 5AL, UB; 7NGO, G). These respondents explained that catchment areas of Gaborone dam are also sitting with different land uses and dealing with these complexities requires looking at them in an integrated, holistic manner guided by IWRM principles.

4.3 Economic factors

Water infrastructure has been underfunded for decades and when WUC became responsible for water and wastewater management in 2009, it did not have the funding needed to repair, maintain and upgrade the system (Respondents 1GD, G; 2GD, G; 3GD, G). The droughts caused the costs of supplying water to skyrocket (Respondent 1GD, G), and the large number of leaks (Ministry of Local Government Lands and Rural Development, 2015) and the need to provide some water free to address public complaints during period of extreme water shortage (Respondent 1GD, G) have reduced income, aggravating the funding shortfall.

Alongside funding issues are challenges of adequacy of human resources (skills, competences and numbers) to operate the water sector. The water industry authorities are particularly challenged by the need to compete for skilled manpower to fully implement projects (Respondents 2GD, G; 3GD, G; 6NGO, G). Respondent 2GD, G explains that, at the time of restructuring:

“The skills of people who were supposed to operate the infrastructure were also lacking”.

The above statement leads to a conclusion that:

“There are some other sections of the reforms that were good but were hurried, they could have been implemented in phases on a trial and error basis so that if there is any mistake they can correct in the particular area” (Respondent 5AL, UB).

Respondent 5AL, UB commented that taking over water supply and distribution, and wastewater from Department of Water Affairs (DWA) and Department of Waste Management and Pollution Control (DWMPC) was too much for WUC, which is struggling financially. These mandates are perceived as too big for WUC because it is not well resourced.

On a related issue, respondent 4AL, UB has argued that the government does not fully engage the academics [or other local experts] for advice on issues of national interest and hence local ideas do not penetrate the government. Instead the government depend heavily on international consultants because of their reputation. He further argued that this creates a problem in that the project becomes fashionable because of the consultant but then when consultants have done their part and left, the local people (who were not involved in the design and planning) are supposed to carry on with the implementation and may not follow through long enough for the project to start yielding results.

4.4 Technological factors

The water infrastructure of dams, boreholes and pipes which supplies Gaborone is old and dilapidated and in urgent need of upgrading. The North South Carrier (NSC) pipeline sometimes breaks down because of power outages and there are high water losses throughout the system due to frequent pipeline ruptures and leakages. According to Department of Water Affairs (2013), 46% of water is lost through the NSC pipeline. Further water losses in Gaborone area alone stand at 14 939 m³/day (18.0%) (Table 4.1). Water losses are also attributed to vandalism (Ministry of Local Government Lands and Rural Development, 2015).

Table 4.1: Daily water losses, demand and supply, 2015/2016.

Daily supply m ³ /day(2015)	Daily demand m ³ /day(2015)	Daily losses m ³ /day	Daily losses %
67 775	52 836	14 939	18.0

Source: Ministry of Local Government Lands and Rural Development (2015).

The initial mandate of WUC, prior to implementation of the recommendations of the revised NWMP of 2006, was to supply towns and cities with water. The water infrastructure system they inherited was a fairly simple one of dams (e.g. Gaborone, Shashe and Letsibogo dams) and pipes running along beside the railway line. This made the water supply and its treatment by the corporation easy.

As the water shortage became more severe, this system was supplemented by boreholes and wellfields, requiring new skills and more funding. Respondent 2GD, G observed that WUC has never operated boreholes/wellfields, and lacks expertise in operating wellfields and measuring and monitoring systems for groundwater. When it started operating boreholes, it often over-pumped the boreholes and the yield of boreholes declined (Respondent 2GD, G), and sometimes the boreholes pumped air. The lack of water monitoring in most of the wellfields and the stand-alone boreholes has led to over abstraction and depletion of the resource.

4.5 The water shortage situation – intermittent supply

During 2015, the water shortage in Gaborone became very acute. This forced WUC to introduce water restrictions and rationing not only in the city of Gaborone but also in Greater Gaborone. From early 2015 to August 2015, water supply became irregular and a rationing schedule was drawn up and followed. From September to December 2015, water restrictions and awareness efficiency measures became intense and were sternly enforced by WUC as the water crisis intensified. This included rules restricting the use of freshwater for purposes like filling swimming pools, construction, car washing and gardening. The use of hoses has been banned since 2007. Educational campaigns to change peoples' attitudes towards the use of water also intensified. Gaborone became a city characterised by 'water shedding', where water supply in each location of Gaborone and greater Gaborone was rationed according to a schedule, and the flow and use of water were monitored in Gaborone and Greater Gaborone. On some days water was shut down as a way of controlling and monitoring its use. Some locations experienced even longer periods of water rationing, with more than one respondent reporting no water supply for up to five days a week (Respondents 15GR, S; 19GR, S; 22GR, S).

Given these circumstances, water could not be used for any other activity apart from essential human needs like bathing, drinking, cooking etc. and this was only if water had been collected and

stored. Before the water shortage crisis, people were using freshwater for bathing, drinking, cooking, etc. as well as every household activities including gardening, car washing and sprinkling water on the compound surface (to reduce dust) to prepare for the cleaning of the yard.

Everyone was affected by water shortage in Gaborone but the shortage varied according to location. However, during the early months of the intermittent supply period (table 4.2), residents complained about lack of communication on what was happening with water in the city; they could wake up to find that there is no water flow from taps before they could prepare themselves. Residents complained through radio stations and the water authorities responded by publicizing water rationing schedules. By mid-2015 (between April and August), everyone in the inner city knew the days they were not going to get water most of the time. In late 2015, during the extreme water shortage period, however, the concerns continued that there were still some instances where water authorities would cut the flow of water without prior knowledge of the public and sometimes the rationing was inconsistent. Table 4.2 summarises the timing and nature of the water crisis.

Table 4.2: Water shortage, periods and characteristics

Periods and timelines	Characteristics/description of the period
Pre-crisis	-Period before 2015. -Normal water availability (ostensibly abundant).
Intermittent supply period	-Early 2015 to August 2015. -Irregular water supply with rationing and restrictions. -Water rationing schedule drawn up and followed (normally 2 days a week for each location). -No proper water rationing communication during the early months of this period.
Extreme water shortage period	-September to December 2015 - Worst period with water rationing, restrictions and cuts -Inconsistent water rationing (up to 5 or more days a week) -Frequent water cuts without prior knowledge of the residents. -Inconsistent information on water rationing and cuts (sometimes people would be told that water will be cut on certain dates and locations but it would be cut on different dates and locations, not the ones notified). -All areas of the city were dry most of the time (water not available most of the time). -People seen roaming around the streets with water containers in search of water and some trying to get water from streams found along the road and in the city. -Purchasing of both bottled water from supermarkets and 'borehole' water from private water sellers (trucks seen everywhere selling water). The researcher was in Gaborone during December 2015 and observed much of what was occurring above.
Post-crisis	-Period when data collection was conducted (April end to June end 2016). -Water was reasonably available (abundant) and no rationing (water flow was back to normal).

Block 3 industrial, the government enclave and some other government organisations (Central Investigation Department (CID) in Bontleng) were cited by respondents as rarely rationed. When contacted for clarity on why water rationing was not even across the city, the government water official interviewed (Respondent 1GD, G) explained the scenario in two ways:

- WUC had made a plan that because people would be out at their respective work places during the day, residential areas would be rationed during working hours and focus of the supply would be where people will be. These are places like the business area, the government enclave and industries where people are, but back home in the residential areas, the pressure would be low.
- Water was rationed to improve the supply. The practical implication of rationing water by closing off the water coming from the reservoir is that water flows to the lowest point in the system, so people at the lower points benefit since there will always be water in the pipeline in the lowest areas. According to respondent 1GD, G, this is the reason why some people were always having water while others did not, not because the organisation chose to allow some people to have water and others not, it happened because of gravity. His statement is in accordance with some respondents' that water rationing is not a good solution because there is no equity-people at locations furthest from reservoir were more likely to have continuous access to water.

The other reason could be that there was lack of pressure to force pump water to go through which could also double the problem, hence there was need for water flushing through the system.

In summary, the government deliberately sent water to workplaces in order to direct what was available to the most useful locations during the day. Further, people at higher elevations experienced more water problems than those at lower ones, and they experienced shortages earlier than those at lower elevations. When the system was refilled the residents at lower elevations benefited faster. There was a difference in proximity, not all neighbourhoods had the same level of unreliable supply.

4.6 Augmentation of water supply in Gaborone

Various capital intensive interventions and specific programs to augment the supply of water countrywide were formulated by the government, among them the transfer schemes and groundwater abstraction.

The revised NMWP of 2006 projected that by 2021 there would be serious water shortage in Gaborone, and recommended the construction of the NSC Pipeline Project (Department of Water

Affairs, 2013) to lessen strain on the Gaborone dam by transferring water from dams located in northern Botswana to the South. The Government of Botswana then decided as a priority to invest in this major water infrastructure project to improve the capacity of water resources (Respondent 1GD, G). The project is divided into two phases. Phase I, the main pipeline (NSC I), was accomplished in 1999 (Mohamed, 2014). Phase II is under construction, and is adding supplementary pipelines which feed into and out of the main pipeline.

4.6.1 North South Carrier pipeline I

The NSC I pipeline was first constructed in 1992. Since 1999, fifty five percent of the water supplied to Gaborone comes through the 365 km NSC pipeline (Farrington, 2015) (shown in Figure 4.1). Phase I aims to draw water from dams from north-eastern Botswana to the south where the city is. The project is promising but it is capital-intensive and breakdowns within the main pipeline are often experienced due to pipe ruptures (Respondent 1GD, G) and power disruptions. In the first 10 months of 2015 alone, the main pipeline failed several times. It has also earlier been reported that 46% of the water transferred through the NSC channel is being lost through leaks (Department of Water Affairs, 2013). As a result of the combination of the dry Gaborone dam and the pipelines failures, in 2015 the city has experienced water shortage for as long as 1-2 or more weeks without any water at all available in some areas.



Figure 4.1: The NSC I pipeline near Palapye. Source: the researcher.

As the pipeline has aged, it has become dilapidated and needs increased maintenance. At the time of data collection, the NSC I pipeline was being upgraded and 75% of the pipeline had been replaced with a steel material (Respondents 1GD, G; 2GD, G). It is anticipated that the steel material will reduce the frequency of bursting of the pipeline, and reduce or eliminate the 46% leakage rate. Since the start of the maintenance phase, the pipeline is functioning effectively with no leaks detected on

the replaced part (Respondent 1GD, G). According to this respondent, a crew working specifically on pipeline maintenance has been deployed to monitor its performance.

4.6.2 North South Carrier pipeline II

The construction of NSC II along the A1 road is planned to supplement the problematic NSC I. Phase I of the NSC pipeline ends in Palapye and the second phase, which will go from Palapye to Mmamashia, is still under commissioning (Respondent 1GD, G). The pipelines currently constructed are interconnected with NSC I such that water can be injected from NSC I to NSC II and vice versa. The main objective of this interconnection is to allow them to work together and that when there are problems in one of the pipelines, water can be supplied from another pipeline (Respondent 2GD, G). With the replica pipelines interconnected (Figure 4.2), the water authorities are optimistic that an increased reliability of supply is likely to be achieved.

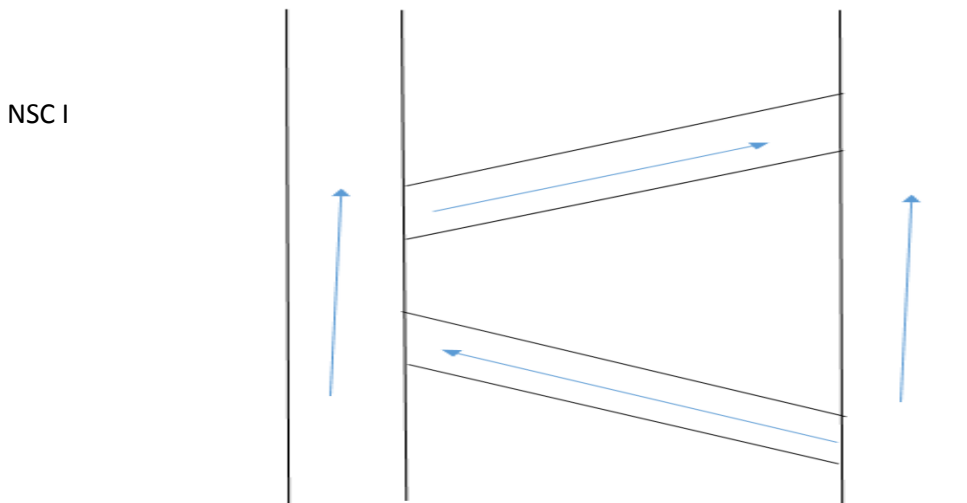


Figure 4.2: The interconnected replica pipelines

4.6.3 More exploration and development of wellfields

During the drought of 2015, it became apparent that Gaborone dam and other surrounding dams like Bokaa, Nnywane and Molatedi dam from neighbouring South Africa could not be depended upon to provide sufficient water for the city. The water authorities responded by developing the Masama wellfields along the Mahalapye A1 road to north of the city and resuscitating the Ramotswa wellfields (Respondents 1GD, G; 2GD, G) to south of the city. Ramotswa and Masama wellfields have a design capacity of 5 and 30 million litres of water per day respectively (Respondent 1GD, G). In addition to these two, some wellfields such as Malotwane and Gaothobogwe were also developed (Respondent 2GD, G).

These new wellfields are intended to increase the security of the city's supply system by making it less dependent on rainfall, and represent an essential enhancement in the quality of life of the population of the city. Considering the huge levels of evaporation in a semi-arid area, wellfields are an effective strategy of water storage and abstraction. The abstraction of wellfields is by far the most viable alternative to augment the supply of water to the city while exploring other possibilities, and it appears the government is committed to using these wellfields to augment supply. However, they are very capital intensive and, given the rate of replenishment is unknown, how long they can supply water at the current rate is also unknown.

According to respondent 1GD, G, there are no health risks related to the potable use of water produced from these boreholes. Masama is located 100 km away from the city, in the bush along the Mahalapye A1 road where there are no human activities (Respondent 1GD, G). However, there is a concern among the public that Ramotswa wellfield waters may be vulnerable to pollution because of human activities. Ramotswa was initially a village without sanitation services, with everyone using pit latrines, leading to potential contamination of the ground water. The village has grown as a result of the growth of the nearby city of Gaborone, and more recently the government introduced a piped sewage system with offsite treatment which has reduced the use of pit latrines. While care needs to be exercised to fully preserve this water, respondent 1GD, G claims WUC is committed to ensuring precautionary measures to protect and ensure good quality water and no groundwater contamination. This dedication is highlighted by WUC closely monitoring Ramotswa wellfields through the corporation's internationally accredited laboratory. For respondent 1GD, G:

"Any deviations that we see, we completely stop the operation, and WUC is an internationally quality assured laboratory".

Alongside the government managed boreholes, there has been a proliferation of unmonitored private boreholes all around the Greater Gaborone region. Because they are unmonitored, these boreholes represent a water quality risk. In addition, if unmonitored the government has no data to track rate of depletion of the aquifers.

As has been explained in the previous text, the government has adopted the build and supply approach where big dams, aquifer abstraction and water transfer schemes have been made a priority (Respondent 4AL, UB). This respondent views this approach as exemplifying a country which focuses on trying to meet the demand all the time, hence views this as only a temporary solution. Good as these currently implemented projects are, Magnusson (2005) is also of the view that concentrating on supply management results in overexploitation of the available water. The author further states that a focus on the supply management side cultivates a strong belief that management of water is linked to development of water projects and depends entirely on technical solutions. Little attention

is given to transforming human behaviour with regard to water use, control or demand. Further, dependence on infrastructure poses major challenges to the government in terms of revenue and how these infrastructures are deployed in a country that has a serious water problem.

4.6.4 Exploring and utilising other alternative sources of water

There are some projects on stream to try and solve the water problem. These include wastewater recycling, the use of effluent as an alternative source, storm water reclamation, tariff droughts and further development of primary infrastructure.

Wastewater will be harvested and used for Agricultural purposes and where possible, treated to a level that it can be supplied for potable use (Respondents 1GD, G; 3GD, G). However, there is need to improve on the state of the wastewater treatment plants to render them environmentally friendly and to comply with the Botswana Bureau Standards (Respondent 3GD, G). For his part, respondent 3GD, G states that the plants are currently in a deplorable state and are likely to pose a pollution threat to the environment. According to this respondent, areas which need urgent attention include: equipment maintenance, metering of inflows and outflows, desludging of ponds and construction of drying beds among other things. People's perception regarding use of wastewater also need to be considered. People might not be ready to use it, especially for potable consumption.

To ensure adequate and efficient water supply, surface water has to be used as the main source of supply. Ground water in turn will come as a back-up.

There are a number of inter-basin transfer schemes. Botswana is engaging with neighbouring countries to access shared water resources (Respondents 1GD, G; 2GD, G; 3GD, G). Two transfer schemes have been identified so far. There are plans to increase the bulky water provision from the Chobe-Zambesi transfer scheme from the north of the country to the south (Respondents 1GD, G; 2GD, G; 3GD, G). The Chobe-Zambesi transfer scheme is at the planning stage and the bulk of its water will be for agricultural purposes. Only 150 million cubic metres will be available for potable use by 2022 (Respondent 1GD, G). Water authorities are also negotiating the option to transmit water from the Lesotho Highland waters (Respondent 2GD, G). These projects have the potential to increase the supply in Gaborone, however, it takes time to discuss and negotiate shared waters, particularly international diplomacy negotiations. The protocol procedures may delay progress.

The subsequent table 4.3 summarises the key developments in water management in Botswana from 1956-present.

Table 4.3: Chronology of events

1956	Enactment of Borehole Act, formation of Department of Water Affairs
1962	Enactment of Water Works Act
1964	Construction of Gaborone dam
1968	Water Act passed
1970	Water Utilities Corporation Act enacted, formation of Water Utilities Corporation
1984-1986	Wall of Gaborone dam raised by 8m to increase capacity
1986	Levels of water in Gaborone dam begin to decline
1988	Bilateral agreement with South Africa to access to water from Molatedi dam
1992	Construction of the North South Carrier pipeline I and accomplished in 1999
2004	Water levels in the Gaborone dam dropped to 26% of the capacity, declared a drought year.
Early 2005	Water levels in Gaborone dam dropped to 23%
Late 2005	Water levels in Gaborone dam dropped to 17%
2006	Revision of National Water Master Plan-currently used to guide the water sector
2007	Declared a drought year
2009-2013	Implementation of the water sector reforms-WUC emerged as the sole provider of potable water countrywide
2012	Formulation of the draft National water policy, billed for July parliamentary debate, declared a drought year
2013	Formulation of Integrated Water Resources Management Plan
April 2014	Water levels in Gaborone dam at 15.1%, initiation of Somarela Thothi project
2015	Beginning of serious water shortage and 2015 declared a drought year
Oct 2015	Water levels in Gaborone dam at 1.4% and the dam declared failed
2015	Development of Masama wellfields, resuscitation of Ramotswa wellfields, additional development of Malotwane and Gaothobogwe wellfields and upgrading of the NSC I pipeline
Jan 2016	Water levels in Gaborone dam stood at 1.1% and the dam was declared failed
2015/16	Phase I of NSC II pipeline under construction to interconnect NSC I and NSC II pipelines
2016	Phase II of NSC II pipeline under commissioning (the extension of the pipeline from Palapye to Mmamashia, near Gaborone).
2015/16	Implementation of Somarela Thothi project
Future plans	Wastewater recycling and storm water reclamation, recommendations for drought water tariffs, further development of Primary infrastructure, negotiations with neighbouring countries e.g. Lesotho and Zambia to access shared waters.

4.7 Implementation of demand management strategies

Water is a scarce commodity in the city of Gaborone and demand for it is ever increasing. In 2015, the focus began to shift from solely on the supply side. Water Demand Management (WDM) programs were put in place and WDM became a core element of water crisis alleviation strategies involving water conservation publicity campaigns. Although the approach was responsive rather than proactive, there was evidence that the government (through WUC and DWA) and other stakeholders closely worked together to engage the users in a coordinated water conservation mission.

Key initiatives conducted in the year 2015 in response to the drought related to implementation of water conservation and demand management measures and practices, and were intended to improve water use efficiency and reduce consumption. The main project undertaken was the

Somarela Thothi (Save A Drop) project, a collaborative project involving First National Bank Botswana Foundation, WUC, Limpopo Watercourse Commission and the GTZ Trans-boundary water management programme (Respondent 1GD, G). This is the most important and most recently implemented project by WUC. The project started in 2014 to pilot its effectiveness in reducing the demand (Respondent 1GD, G). The main intervention of the project started in April 2015 and ended in March 2016. The project had two aspects involving technical and social interventions which were implemented simultaneously to which I now turn.

4.7.1 Water pressure management

Through the Save the Drop programme, WUC focused programmes on addressing leakages. The technical aspect of the project emphasized water pressure management as opposed to water rationing (Respondent 1GD, G). The respondent observed that pressure management prolongs the design life of the distribution network and has been identified as one of the most cost effective measures to reduce water losses, rupture frequencies, and inefficient water use.

The WUC started by monitoring leakages in Gaborone. When the water is under high pressure, the amount of leakage is very high; if the pressure is low, leakages are not detected on the network. Hence, the polyvinyl chloride (PVC) pipes (to replace the non-durable material previously used) have been installed where there is more pressure so as to hold the pressures and reduce leakages (Respondent 1GD, G). The respondent stated that, PVC pipes assist in reducing water pressure. This technical aspect of the project was to explore engineering possibilities with the available resources without doing capital intensive investments. The installation of PVC pipes is a project implemented on the western side of the city and railway line, in airport meter block 8 stretching to G-West Phase 2 of the city (Figure 4.3). The eastern side of the railway line is not covered under the PVC project. The WUC has taken a decision that because of the drought, the installation of PVC pipes on the eastern side of the city will be delayed to give priority to the highest water consumer areas in the west (Respondent 1GD, G).

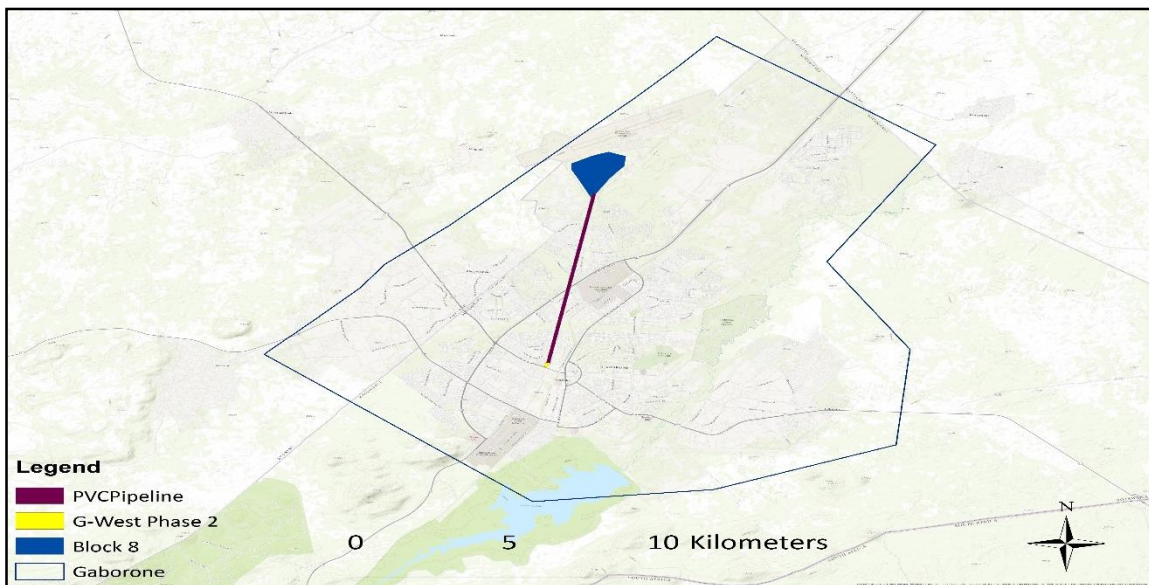


Figure 4.3: A map showing the installation of the PVC pipes on the western side of the city.

4.7.2 Public education and awareness

The second part of the Somarela Thothi project was a public education and awareness campaign. Appeals were made to the residents to execute water saving practices. Greater emphasis was placed on community outreach, educating and engaging with the public on the water situation (Respondents 1GD, G; 2GD, G; 3GD, G). The reason for sensitizing the Gaborone community was to convince them to acknowledge and collectively own the problem. Education was also done to make people aware of the drought and its consequences, and encourage them to efficiently use water by dissemination of water related information (Respondents 1GD, G; 2GD, G; 3GD, G; 6NGO, G; 7NGO, G), door to door talks, workshops, road shows/open space exhibitions and Water Pitso (Respondents 1GD, G; 2GD, G). Water Pitso is a consultative forum by which all relevant stakeholders converge to discuss issues affecting the water sector in the country.

The water authorities reached out to the people, and showed them available water statistics and statistics on the losses (Respondent 2GD, G). Residents were taught about water savings tips at home, with the message that every drop counts (Respondent 1GD, G). A total of 21 035 consumers were reached through door-to-door outreach and workshops (Respondent 3GD, G). However, no baseline to check the actual water consumption per family was carried out; hence it is difficult to draw a conclusion about how people responded.

Water Utilities Corporation also developed water conservation brochures such as “How to read your water meter”, “Saving water in the home”, “Water restrictions” and “Fixing of leaks in the home” (Respondent 1GD, G; 3GD, G). The publications were developed in both English and Setswana (the local language) as part of the social intervention. According to respondent 1GD, G, these brochures

were distributed in schools, in homes and in public areas for easy access by the community. The corporation anticipates that continuing with this project will yield good results in terms of a drop in consumption pattern in the city.

Before and after implementation of the Somarela Thothi project, a pre-and post-implementation survey of Knowledge, Attitudes and Perceptions (KAP) was conducted among 416 and 128 consumers respectively (Respondents 1GD, G; 3GD, G). According to respondent 1GD, G the aim of the surveys was to identify whether the project had any effect on knowledge, attitudes and perceptions concerning water demand and supply conservation. Results from both the before and after KAP surveys indicate that consumers do not know how to read their water meter, find the water rationing schedule unclear and inconsistent, and were not aware that Botswana is experiencing its worst drought in 30 years (Respondents 1GD, G; 3GD, G). This might be an indication that the education and awareness campaign might not be as effective as anticipated since people are not socially engaged but are expected to make a choice on how they can contribute to water management based on advice from the water authorities.

4.7.3 Water Rationing

In addition to the above explained interventions, water rationing was also implemented, beginning 2015. Every location in Gaborone including Greater Gaborone had a designated day/s of water rationing (Respondent 1GD, G). Water rationing was designed to share the resource. It was however, received with mixed feelings by the residents, with many thinking water was not equally distributed and that the rationing was an inconvenience to their daily activities.

4.7.4 Water pricing

Charging for water is one of the key methods governments use to curb excessive water consumption, increase efficiency and fund the cost of supply. In Botswana, block tariff charging is used where consumers pay water bills depending on the amount they have used (Respondent 1GD, G). The tariff includes a charge for the wastewater each consumer produces. WUC earns money from selling water and the charges are based on monthly usage and aim to recover production and transport costs. And so, the corporation has no incentive to conserve the resource as charges are set to recover costs, removing the motivation to contain costs and reduce leaks. This approach, however, has been found to be failing to include values and practices of individuals which determine the quantity of water used (Magnusson, 2005), instead reconfiguring temporary gestures to water management which do not translate into actual changed behaviour.

Although the government is trying to use both water supply and water demand approaches, WDM does not guarantee change of consumption behaviour (McGranahan, 2002). The government encourages people to be more efficient but fails to talk about demand in a realistic way. Efficiency is usually conceived in a simplistic way and complex issues such as the extent of efficiency and how to be self-sufficient are not considered, as we will see in chapter 6. Demand management does not give enough recognition to how people do what they are doing, the meanings they attach to their practices and the competences required carrying them out (Shove et al., 2012). Particular assumptions are made about people and none of them address peoples' questions about what they need to do, hence linking social practice theory to find exactly what is going on, on the ground, is key. Chapter 6 elaborates on these ideas in detail.

4.8 Conclusion

This chapter demonstrates the significance of interaction between various aspects which enable water uses. Water shortage in Gaborone arose as a consequence of relations between different components. Water authorities have responded to the crisis by focusing on infrastructure improvements to augment the supply and executing WDM programs to increase water use efficiency. More alternative options continue to be explored with the aim of improving water provision and reducing water consumption through closer examination and understanding of demand.

Chapter 5

Householders water use and management practices

5.1 Introduction

"I think I am at that point where I don't misuse water, really my lifestyle does not allow me to misuse water. For someone who is not like me, the situation has taught them that there really is no water, if a person has not learnt through that then that person is a bad student. Life really is the best teacher, just the situations that we go through, not wanting to go into the loo but you need it, it's dirty and you think you can use it like this [even though it is very dirty]. This situation shouldn't occur again, it's a bad experience but we have been taught and we passed the test [as presented by God]" (Respondent 9GR, N).

This chapter answers the question: how have the experiences of water shortages in Gaborone influenced people's water use and management practices? It presents how the residents of Gaborone have responded to water shortages during a period of water crisis in 2015 and in the periods of 'normal' water supply conditions before and after. In this chapter, the actions employed by the residents of Gaborone during the two phases of water shortage (intermittent supply and extreme shortage as described from the previous chapter) and under normal water supply conditions are explored through the lens of social practice theory. Social practice theory identifies how and why people perform their resource use actions and seeks to provide insights into how these actions can be strengthened or constrained. It is through social practice theory that an explanation of relationships and connections of what people are doing can be understood.

It is shown that water consumption habits can change in response to circumstances. The data gathered from the participants show how water uses and management changed during the crisis period. At the time of data collection the supply situation had improved for the better.

5.2 Water supply and use activities

What follows is the description of what transpired and actions adopted during the water shortage period. A number of the water use actions performed by the respondents were more or less the same in all the households but there was some variation in the way and frequency they were performed. These activities included keeping clean, bathing, doing laundry, and gardening, cooking, drinking, washing kitchen pots, crockery and utensils and flushing toilets. In the context of this thesis, bathing refers to all activities involving washing the body like taking a bath or shower and brushing teeth. Outdoor activities were very limited with gardening being the only outdoor activity.

5.2.1 Bathing

People interviewed indicated they had either a shower or bathtub in their household. In high income people's houses and hotels, the bathtub would be big enough to lie in, but in many households, although they have the western bathtub, to bathe they instead used a bucket placed either inside the bathtub or in a large bowl in the shower cubicle (See Figure 5.1). Taking a bath means squatting inside the bathtub or bowl with a bucket containing water for washing and rinsing the body. Showering means a 5 minutes quick washing of the body while standing under the shower head.

When water is abundant people either shower or bathe using either the western style bathtub or the bowl bathtub. Even before the crisis, what I refer to as 'bowl-bucket bathing' was standard practice for taking a bath for some people, particularly for the low income householders who are not connected to the reticulation system.



Figure 5.1: A picture showing a bowl-bucket bathing in a shower cubicle. Source: the researcher.

As shown in figure 5.1, bowl-bucket bathing is a form of reducing water use as buckets normally used hold 5 to 10 litres of water, compared to the bathtub bowl which holds approximately 180-200 litres of water. This practice is not particularly new as the working class people and people living in the countryside without water reticulation systems practice it. This is a particularly interesting practice to study as we will see.

5.2.1.1 Explaining how the practice of bathing changed

There were three scenarios that happened as shown in figure 5.2. Pre-crisis, very affluent households either had a bath or a shower (shown in A). During the same period medium water users were showering or squatting in the bathtub with a bucket or in the bowl with a bucket placed inside the shower cubicle (shown in B). During the intermittent period then everyone was either doing the

bathing in a bathtub with a bucket or bowl-bucket bathing (shown in C) and during the worst times people just did cloth bathing (shown in D). During the extreme water shortage period, ‘bathing’ was reduced to the use of a wet cloth to wash the body, particularly the face and hands.

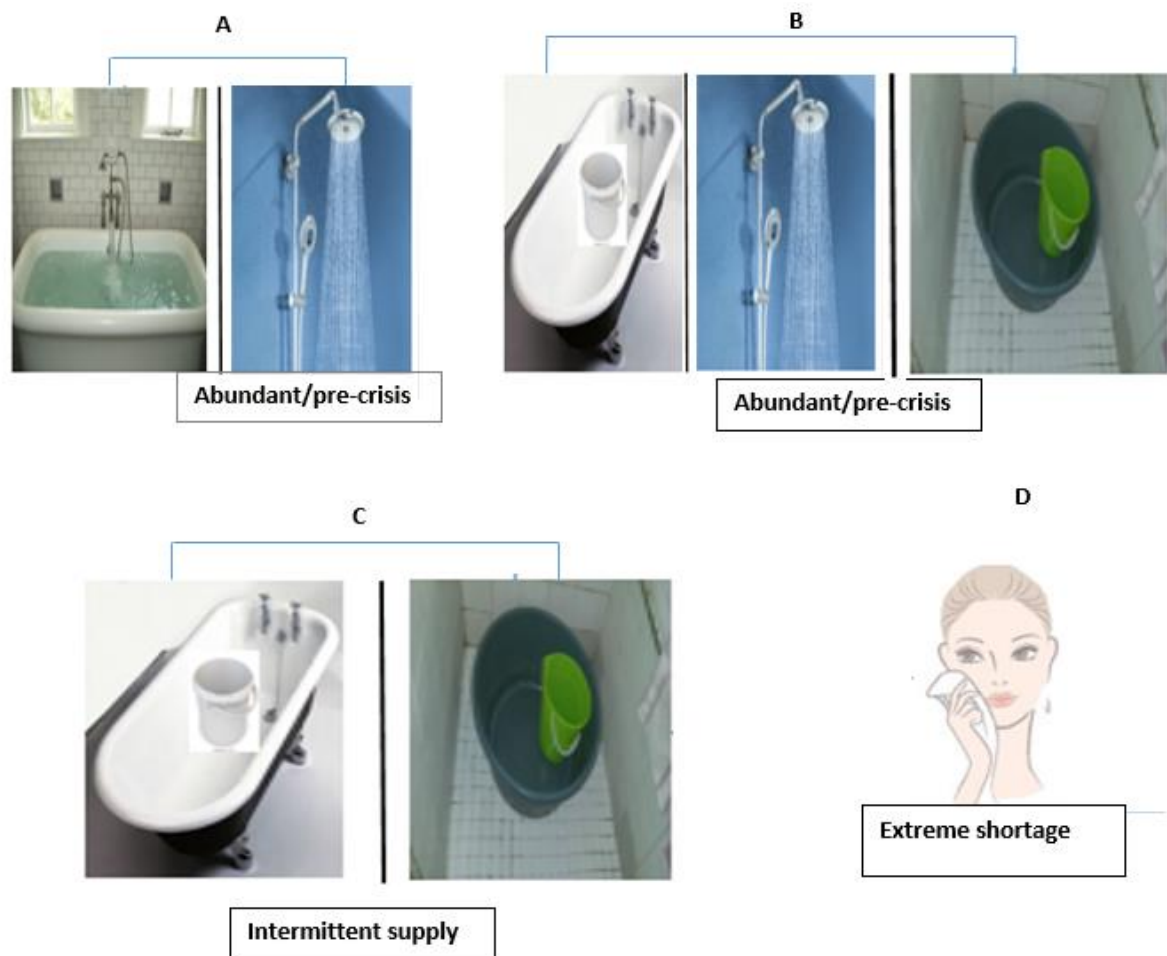


Figure 5.2: Illustrating the sequence of change in bathing practices during the water disruption period. A – pre-crisis practice in very affluent households; B – pre-crisis practice in medium user households; C – practice in all households during intermittent supply; D – practice in majority of the households during extreme shortage.

Pre-crisis, when water was more abundant, water use activities varied from the intermittent supply and extreme shortage periods. For example, one respondent explained how her brother was excited by filling up the bathtub during the pre-crisis period when times were good. This practice according to this respondent has changed ever since the water shortage situation started.

“Ever since the situation started everyone here knows what to do right because we started using a 5 litre bucket to bath” (Respondent 10GR, W).

According to the respondents, the bowl-bucket bathing system is a proper method to adopt during drought times.

Pre-crisis when water was abundant, most people bathed or showered twice a day - in the morning when going for work and in the evening when knocking off. The bathing twice a day habit is something that is done throughout the year particularly in response to the very hot summer temperatures. Bathing is also a method of cooling off since most households do not have air conditioners. During the intermittent supply period, buckets were used to bath either once or twice a day in the morning and evening. Bathing twice was dependent on the availability and the pressure of water. Showers were rarely used due to the low water pressure. Bathing twice a day was evident in households with smaller families and is attributed partly to less water demand from these households compared to those with larger families. It is also due to differing levels and perceptions of hygiene.

“I use water moderately, mostly in bathing in the morning and evening because as a lady I should be always looking clean and up-to-date with hygiene” (Respondent 11GR, W).

During the extreme shortage period, ‘bowl-bucket bathing’ was by far the most dominant and convenient form of body cleansing in the city of Gaborone. It was a preferred form of cleaning the body, something that has been directed towards the effort of reducing water consumption. The time for bathing (i.e. morning or evening) during the extreme shortage period varied between households but the frequency reduced to once a day.

“Instead of bathing twice a day, we bathed only once in the morning and avoid bathing in the evening ... it reduces the usage of water: we don’t enjoy the usage of water the way we want like if you are used to bath 3 times a day, you cannot do that. It limits things like gym because you may be afraid that you may not have water to bath” (Respondent 12GR, N).

Hence, bathing was restricted to once a day, either in the morning or evening, something which the respondents described as an inconvenience as their bathing frequency was severely regulated and depended on the water rationing schedule. This was a situation where people have been removed from the gratification of bathing. This includes those working, school children and those remaining at home most of the time. Bathing in the morning was aimed at improving hygiene for those going out to work, while bathing in the evening was meant for general cleanliness. Despite the indication by some respondents that the main purpose of bathing is to keep clean, for some people taking a bath served an additional purpose: it freshens up and relaxes the body for a better sleep.

“Bathing was a problem, most of the time I would take a big container and fill it with water. The water was for bathing in the evening because it relaxes you for a better sleep after a long day of working” (Respondent 11GR, W).

There appeared to be a clear pattern that most women preferred taking baths in the evening during both the intermittent and the extreme shortage period (if water was available through scheduling or from water stored). The majority of men preferred taking a bath in the morning to start the day while

fresh. Parents preferred to bathe their children in the evening, and then allow them to have cloth-bathing in the morning before going to school. Similarly, women preferred to bathe in the evening and have a cloth-bath before going to work. The younger generation, particularly teenagers, because of their developmental stage would want to adequately wash their bodies. Adolescents normally want to wash a lot to get rid of all the new smells they didn't have before. This was not the case, body washing once a day was maintained by most respondents regardless of the age and gender. This is because the situation dictated activities to be performed and when.

At the time of the most extreme shortage, the whole city was described as very dry making it very difficult for any water-based activity to take place. During this period, respondents explained that daily 'bathing' was reduced to sharing a small amount of water with children, wiping the face with a wet cloth or using a cup to wash the face. Sometimes no bathing was taking place at all.

"It was tough, we were not bathing nor doing laundry. We could use a cup to wash the face" (Respondent 13GR, S).

The use of a wet cloth was mainly practical during this period. This kind of bathing was done just to move on with the daily activities. It was viewed by people as a way of preparing for the day although it was not a pleasant thing to do given the weather conditions. The respondents viewed the consequences of water shortage as a punishment which comes along with some form of discomfort.

"Life is not as good as when there is water, water is everything but if there is no water there is no way you can live. You feel as if people make you suffer and you always feel stressed and uncomfortable because there is no water" (Respondent 14GR, N).

Compared to previous years, respondents acknowledged that in the year 2015, the frequency of bathing had reduced drastically with some wanting to return to previous bathing habits.

"My wish is to have enough water so that I can happily bath: using buckets to bathe is stressful because even now we still observe the Water Utilities Corporation instructions of using limited water" (Respondent 15GR, S).

It was also widely agreed that the frequency and nature of bathing in 2015 was undesirable in particular during the extreme shortage period. Some people did not take pride in using the bowl-bucket system to bathe and bathing less frequently, since they equate inadequate bathing with lack of proper hygiene. Cleanliness of the body therefore became associated with luxury.

"I have since realized that living without water is a big challenge, hygiene was a problem. The little drop that we had was for drinking and cooking. Bathing was a luxury; we would just wipe our face and spend the whole day without bathing". (Respondent 22GR, S).

Adapting to the new circumstances of water shortage does not occur suddenly, and some respondents particularly youths who had spent most of their youth in an urban environment and from well off families found it difficult to adapt to the new bathing system in a city. The frequency of bathing and level of personal cleanliness was reduced compared to pre-crisis period when water in the city was more abundant and the respondents felt the level of social interaction was also being decreased due to some offensive odours from people.

“There was no water at all and I would just wipe off my face with a wet cloth and go to school and it was difficult to socialize with others because we always had awkward smell, when you knock off from school you shoot straight home to avoid disappointments” (Respondent 15GR, S).

It can be seen that cloth-bathing was viewed as inadequate.

Teenagers tend to be most sensitive and easily embarrassed by their smells. Hence bathing is perceived as a basic social act. Failure to satisfactorily meet the perceived standard of cleanliness and smell was a cause for discomfort and was having an effect on peoples’ social interaction.

While the reduction in the frequency of bathing was forced on people because of water shortage, it was accepted by some respondents as in a good cause.

“For me it was a well done job by the government so that people can learn ... obviously to me it was making perfect sense to ration water so that we can have something and bathing once a day was done to preserve water” (Respondent 12GR, N).

On a similar form of cleaning the body, teeth brushing was done with taps off to avoid running water. Some scooped water with a cup to brush teeth instead of using the tap. This was found to be reducing the duration of the water flow.

Although the frequency of bathing was reduced, the little wastewater produced was not discarded but was used for other purposes as we will see.

In summary, for all respondents bathing was done to maintain some level of hygiene and health and improve social interaction, but for some it also meant cooling off, refreshment and relaxation of the body.

5.2.2 Doing laundry

Most households in Gaborone city are connected to the water reticulation system. As such, they have provision for the use of washing machines and four of the households interviewed indicated that they use washing machines to wash clothes. Before the start of the water shortage, three out of

the four washing machines were used occasionally when parents were busy, while the other machine was used for every clothes wash. Most households do their laundry during weekends but some do it any time during the week.

Cultural reasons play a part in the low number of washing machines found in households. Not owning washing machines (either washing machine or dishwasher) is attributed to a popular belief that these gadgets are for western countries. It is also a common belief in Botswana society that households' chores should be done manually to keep active and avoid laziness. The use of washing machines is regarded as encouraging laziness among young people. Hence, cultural reasons play a role in the much decreased use of washing machines. The other reason for low use of machines is the cost to purchase them.

The residents saw the beginning of the water rationing in early 2015 as normal, as they understood the water situation in Gaborone. However, with time when the situation intensified, washing clothes – in particular for students and those who go to work in particular situations such as offices and food outlets – became a big challenge. The intermittent supply of water saw the residents coming up with other ways of conserving water. For example, washing clothes was now restricted and the use of washing machines was viewed as desirable but not possible. During the period of most extreme shortage, the use of washing machines was discontinued completely.

“...I have tried to do away with things that waste water e.g. washing machines ... at first we didn't care, now I have realised that machines use a lot of water” [from the reticulated system] (Respondent 16GR, N).

While one reason for stopping the use of washing machines was that there was limited water that can be used in the machine, the other motive was that the owners felt guilty about possessing them for they use a lot of water hence the respondent started doing laundry manually. Besides reducing the amount of water that washing machines consume, another reason was to save money.

“We have been using a washing machine and a dishwasher but we have decided to stop using them because they require a lot of water. Even our bill was very high. We used to pay up to P2000.00 (an equivalence of NZ\$266.67) a month but we have reduced it to P350.00 (NZ\$46.67) a month, we have cut a lot on bills” (Respondent 16GR, N).

However, with water more available at the time of data collection in June 2016, one household indicated that they had resorted to using the washing machine. The respondent indicated that the machine is now used occasionally by them as parents while their children wash their own clothes using hands. While a number of respondents mentioned that they know washing machines to be one of the heavy consumers of water at a household level, they also commented that their use signals laziness.

"We do not use the washing machine regularly. Most of the time my wife encourages children to use their hands so that tomorrow they become good housewives" (Respondent 12GR, N).

The frequency of manual washing of clothes varied among the respondents. While it is commonly believed, given the weather conditions, clothes should be washed every weekend after every single wear rather than when they are dirty, the tradition had changed during the extreme water shortage period. Respondents made sure that they did not get their clothes dirty so they were able to wear them over and over.

"Laundry was controlled. We needed some clothes that when you are putting on a shirt you can wear it once, twice or even thrice instead of once" (Respondent 17GR, N).

Individual households restricted their laundry when supply became intermittent. No one had a designated laundry day. Doing laundry depended on the load, need or the availability of water. Given the frequency of water rationing and cuts for each location, perhaps it was practical for residents not to designate and adopt particular days for clothes washing. During the intermittent and extreme shortage periods, on average laundry was done 1 to 2 times a month. As may be expected, not all the clothes were washed but the very few clothes deemed essential were selected for washing.

"To do laundry we were just washing a few clothes that we feel are important like school uniforms because there was not enough water" (Respondent 11GR, W).

Those who used to wear clean clothes every day because of the nature of their jobs [food industry] had to also cut the washing frequency and only selected items were washed. Because their employers wanted them to look clean and it was difficult to wash clothes at home, the bosses often gave staff access to facilities so they could wash at work.

Respondents found the intermittent water supply situation disturbing. They indicated that sometimes the water authorities would cut the water supply unexpectedly and school children were forced to just wash the collar of their shirts to render them clean when in actual fact the whole shirt was dirty. In addition, workers were forced to wear the same clothes over and over. At times school uniforms like jerseys would be washed in the evening when water had just begun flowing. In such instances, school jerseys sometimes did not get completely dry and students were forced to wear them wet. In cases where water was back flowing again during the crisis, households would ensure their laundry was clean. Other than that, it caused a lot of inconvenience so much that the respondents felt the water system was determining which activities they could do and when, not themselves. Furthermore, respondents found it embarrassing to continuously wear dirty and partly dried clothes.

5.2.3 Washing kitchen utensils, crockery, pots and dishes

Of the 24 households interviewed, only one had a dishwasher. It was a challenge to do even manual dishwashing after every meal during the extreme water shortage period. On average cooking was done once a day, although there were some who cooked twice a day, breakfast and evening meal, which translated into dishwashing expected to be performed once or twice a day. The ones who prepared their meals twice a day are the ones who remained at home for the better half of the day. Light breakfast such as oats or bread was cited as some of the food that did not require much water for dishwashing.

Water stored in storage containers was used to wash the utensils. Washing was carried out after every meal particularly those with smaller families. The rinsing water was then saved for another round of dishwashing either the same day or any other day. The respondents ensured that they do not leave food particles in water so that they can store it for the next use. One technique used was to scrape and wipe utensils with the utensils' swab before washing them. One respondent indicated that their household had a swab designated to wiping the plates after meals and pots were soaked with the dirty water used for washing the plates to make the washing easier. This cloth/swab was then soaked and washed with the same water used to wash plates, and this water was then used to soak the pots. Almost all the respondents took pride in filling small bowls with only a little water to wash the dishes. This practice was explained with enthusiasm— a sign of adjusting to the situation.

“We would wash utensils with little water, we would use small bowls to wash the utensils. Because we were now used to using small amounts of water, even if it was available we would wash dishes with little water. This we did by avoiding the use of running water so we could use a stopper to close the sink and wash the dishes with little water, the same with laundry” (Respondent 15GR, S).

Washing all the dishes with a small amount of water takes skill to render them clean. Although the respondents reported that it was a challenge to wash oil-covered utensils to the expected standard, a strategy was devised to assist with proper washing.

“The problem was when you cooked oily food because that needed more water but we would put little water in the pot with sunlight liquid and boil that water so that water and oil are separated. Then you could easily wash because the oil will be floating on the top of the water and we could easily scoop it off” (Respondent 18GR, W).

This kind of treatment was widely applied to allow for less water use because to just wash without treating the oil would require more water and detergent than normal.

Respondents described how the situation towards the end of 2015 (during the extreme water shortage) forced them to abandon everything that requires the use of water. For example dirty dishes were left to accumulate for some days, either to allow for one load of dishwashing to be done or as a result of lack of water to wash them.

“The effect was very high because hygiene was lacking, so it created some dirty dishes everywhere because we couldn’t clean properly, dishes were always left dirty for some days and there were flies everywhere and smells. But when water is available again that is when we wash them” (Respondent 13GR, S).

As much as they knew that accumulating dirty dishes is unhygienic as the action was attracting flies and some smells compared to immediate cleaning, the other reason stated was to have one large load so as to cut down the use of more water for small frequent loads. In addition, it was practically and emotionally impossible for the residents to use their last drop on dish cleaning which forced them to leave dishes for a while before the supply of water was restored again.

5.2.4 Toilet flushing

Almost all the households interviewed indicated that they use toilets with water flushing disposal. Only two households indicated that they did not have a flush toilet but a pit latrine. One household had both the flush toilet and the pit latrine. For all other households, residents depended entirely on the flush toilets. Unlike those using pit latrines, those using water disposal flushing toilets were severely impacted given that they had no any other alternative. Before deliberating more on this issue, it is worth noting that, for all the participants reliant on the flush disposal toilets, this topic was a sensitive one. Emotions ran very high, not because the topic itself was sensitive but because they considered being denied water for flushing the water disposal toilets as a form of punishment.

“In our area we suffered a lot because we don’t have pit latrines ... we suffered a lot ... we would stay for up to 3 weeks without water. Imagine there is no water for that long and you use a flushing toilet. It was really painful” (Respondent 19GR, S).

Respondents with flush toilets asserted that using the toilet was a big challenge. Majority of the respondents talked about how disturbing the situation was, particularly in households with large families and small children.

“Because we use the flush toilet, it affected our hygiene especially if you live with small children. If there is no water, it is always dirty and unhygienic: it is difficult to be clean unlike when there is water, especially since our toilet is used by seven people” (Respondent 20GR, W).

According to the residents, their cleanliness and hygiene changed for the worst due to shortage of water, a situation they had no control over. Because of this situation they believed their health status was at stake due to unhygienic practices performed by the children and offensive odours.

It was common that toilets were not regularly flushed.

“Sometimes I would go to the toilet and not flush. I was avoiding frequent flushing” (Respondent 15GR, S).

It was everybody’s understanding that “if it’s yellow let it mellow, if it’s brown flush it down”. This is the slogan the Gaborone residents have learnt to embrace during the trying time in their lives.

Flushing for “Number One” activity was not common. Toilets were only flushed after the colour had changed. These developments occurred during both the intermittent supply and extreme shortage periods.

While this practice of not flushing the toilet after every use had served some good purpose for the residents of Gaborone, it is expected that children need to be taught personal hygienic practices.

There appeared to be some degree of greater acceptance of avoiding flushing the toilet unnecessarily or after every single use. The reason for not flushing was to save the little water that was there unless it’s brown. However some households did not accept this. Some respondents found it impossible to leave the loo un-flushed as they consider the urine to have a smell which needs to be got rid of by flushing it down the drain. These were typically households which had the means to buy treated wastewater specifically for flushing - those households that didn’t have the money to buy treated wastewater for flushing the toilet were more likely to find it possible to leave the toilet unflushed.

During the time when the water shortage was most acute, regardless of whether you were from high or low income household, the use of a bucket to flush the toilet became a daily routine. The bucket was used as it uses small amount of water. Some filled the cistern half way with water and used half tanks to flush their waste. However, participants exhibited some form of embarrassment to carry around the bucket for flushing.

“Even though the toilet is inside the house, we would put some buckets with water in the toilet for flushing and it was not nice for people to see you with a bucket going to the toilet, it was terrible, an inconvenience” (Respondent 16GR, N).

Apart from not flushing and the use of a bucket to flush, residents found solace from other sources of water like wastewater. Wastewater from either laundry or bathing was stored and saved for flushing.

“After we had bathed, washed clothes, we would collect that water and store it in containers so that we use it for flushing the toilet” (Respondent 21GR, N).

On rare occasions when it had rained, the rainwater was harvested and stored for flushing. Either way, both recycled water and rainwater were used to flush when it's brown, not when it's yellow. In contrast, some households neither used bathing nor washing water for flushing since they considered it as unclean and makes the toilet even dirtier. Methods used included water from swimming pools (for those which were not completely dry), buying purified water and treated wastewater for flushing. This was done by those who could afford to buy this water and had the money to be more discerning about what they did.

Some respondents challenged the effectiveness of using a bucket of water to flush waste down the drain.

“If I can tell you there was a time when the drains were blocked and when we requested the services of drains attendants, they told us that there was no problem and that the only problem was that there isn't enough water for flushing and moving things down. Things could not move down because there was no water, there was no proper flushing hence water was not flowing appropriately so that the waste could move down-flushing was a problem” (Respondent 22GR, S).

One household also had dual flush toilet but were critical of the weaker flush. As such insufficient toilet flushing might cause drains blockage.

For many, interaction with the loo was worth avoiding but then how do you answer the call of nature, a question posed by one of the participants. The following comment relates to the period between September and December 2015, a period that was considered worse than other months:

“I still remember when we would stay for long periods of time without relieving ourselves to avoid flushing because there was no water” (Respondent 14GR, N).

By implication, this sad situation might mean that the wastewater (from bathing and laundry) which was relied upon by the residents for toilet flushing was not available. This led to avoiding interaction with the loo. Delaying using the loo can have health implications. During this period, instead of the loo, some used buckets for urine. The toilets in the nearest malls were also utilised, only if they had water.

Some had stopped cleaning their toilets while those who were cleaning would flush once on average in the process of cleaning. Flushing for cleaning by some respondents was done by scooping water from the bucket.

5.2.5 Gardening

During both the intermittent supply and extreme shortage periods, Gaborone residents could not use hoses to carry out outdoor activities such as watering plants or car washing, even though one household indicated that they used a hose to sprinkle water on the ground to reduce dust when they were cleaning. According to this household this has since stopped because there was no water coming out from the tap. It made sense for all other people to ignore hoses for outdoor activities because the water pressure was low. Besides, the government had already imposed a ban in the years 2007 and 2012 on the use of hoses for watering plants, car washing or cleaning pavements.

Most participants have left their plants to die because of the unfavourable weather conditions and inadequate watering; one household had to stop using their drip irrigation sprinkler since they felt it uses a lot of water while some have gone to the extent of no longer growing vegetables and removing their lawns.

“We had to remove the sprinkler ... we had to buy water all the time to fill the jojo tank [see Figure 5.3]. Most of the water from the jojo tank was used for flushing and gardening but it was too expensive and we ended up removing all our lawns” (Respondent 16GR, N).



Figure 5.3: Showing a jojo tank (green tank) used to store water. Jojo is the trade name for a common brand of polythene storage tanks manufactured in South Africa. Source: the researcher.

All these changes were explained as heart breaking by those who valued their gardens. This was evidenced by the respondents frowning their faces and constantly swearing to signal an unpleasant scenario. Despite the situation, most of the people who demonstrated some degree of interest in gardening mounted the jojo tanks (Figure 5.3) in their yards and filled them with either treated wastewater or borehole water bought from individuals to water their plants.

“As for me, it increased my expenses because I like my garden and always I was buying wastewater to water my plants” (Respondent 23GR, W).

The interviews revealed that well off people survived on buying wastewater to treat their plants while those who did not have the means to do so used wastewater from bathing and laundry. Those persevering with their gardens were active and passion driven, and commented that looking at greenery relaxes the mind. Using a bucket to water plants became a common activity. The bucket concept is linked to water saving as there was a popular belief that reduction of water use in one area can benefit another activity.

Although it is not clear when watering was done, some level of awareness of the strategies to conserve water in the garden was displayed during that time, such as growing drought tolerant plants.

5.2.6 Cooking

There were mixed responses by the participants to the challenges of cooking. For some it was not a problem since they used stored water from tanks to cook, while some indicated that they would sometimes fail to cook, not because there was no food but because there was no water instead they starved. Even school children, who are usually fed a cooked meal at school, were sometimes sent home because of no cooking at school.

5.2.7 Drinking

In late 2015, a heat wave (temperatures ranging between 37 and 43 degrees Celsius) occurred during the time of extreme water shortage, and so people were more likely to become dehydrated. Because of the weather conditions, people needed more water to quench their thirst but there was no water. Stored water was usually used for drinking but during very dry times, some people rationed the amount they could drink per day.

“If you had 5L of water you must make sure that you use that water for more than 2 days, we even had a limit for drinking water even though it was very hot. We made sure that at least if we can drink 2 to 3 cups of water as opposed to now we can drink litres of water” (Respondent 18GR, W).

Residents of Gaborone were caught between the immediate use of water and saving for tomorrow's use. It is evident that drinking water was just to quench the thirst during the extreme shortage period. A human body needs sufficient water for it to function well. Their wellbeing was affected.

Knowing they had to drink, some people were forced to buy purified bottled water from supermarkets, so life became expensive for the people in the city.

“There was a time when there was no water at all and it was tough that time, there was not even a drop. I ended up going to the supermarket to buy two 5 litres of water and the prices had gone up. It was also rare to find water in supermarkets at that time” (Respondent 24GR, S).

People in Gaborone were faced with a crisis and it was not everyone who could afford to buy water. But they had to part with their cash to find some water for drinking. Others asserted that they would ask for a cup of water from neighbours just to quench their thirst at least. These changes in people’s lives were a cause of discomfort. By implication it means people have been removed from their comfort zones to adopt new ways of dealing with the situation at hand.

In addition to the above actions, the following are other procedures used as part of managing the water shortage situation in Gaborone.

5.2.8 Storing water

As stated earlier, a schedule was drawn up as to when water will be available in different parts of the city, hence it was almost predictable as to when and where water will be available in different areas of the city unlike in other areas in the periphery of the city. However, the rationing was sometimes inconsistent in terms of communication dissemination to the public by the responsible authorities. Although it was sometimes unpredictable, it was known that water would be available at some point, albeit for a short period. And because the supply was irregular, storing of water helped people to cope with intermittent and unpredictable supply. The scheduling aided the residents to have routines which they were embarking on prior to the set days when water would be rationed. People had water tanks for storage to use in the next few days when there would be no flow of water. These storage tanks were filled with water once it was back flowing.

“We bought containers, and we would fetch water in advance and store in containers” (Respondent 25GR, W).

These routines were also performed whenever the pipeline went down or when they were told there was going to be no water.

There were complaints that after a few days, the stored water starts to accumulate some stuff at the bottom of the container and develop some smell. Residents have described it as water getting rotten.

“But the fun part is that water was getting rotten, if you kept it for some days it developed some smell and you would see some green stuff underneath or even some mud like clay soil. It was not supposed to be kept for a long time. Ask people they will tell you, it was smelling and the taste was bad once it has gone bad. If you look through a see-through container you would see white things in the water. You had to always change the

water to avoid the smell. In short the water was not clean” (Respondent 26GR, N).

Residents viewed storing water as the solution to intermittent and often unpredictable availability, but all of a sudden the water they had stored was going bad. Those storing water were not expecting the quality of the water to deteriorate. Respondent 1GD, G, a water expert indicated that it is best for people to get water straight from the taps since it is quality assured by the WUC and good for human consumption. However, some participants knew that stored water can become stagnant and associated it with uncleanliness, but indicated that when water was short, there was no other option but to respond to what the situation at hand dictates. Hence their continued storage of water in a variety of containers, such as those shown in figure 5.4.



Figure 5.4: Some of the storage tanks which were used to store water. Source: the researcher.

On a similar note, there were also concerns that since the beginning of the water situation, the water quality in the piped system had deteriorated. Respondents described the water coming from taps as not clean and having changed colour, taste and sometimes displayed some mud like clay. This situation was compared to previous situations when water was abundant when it tasted good, had good colour and didn't have mud. Respondent 1GD, G commented that this scenario was bound to happen on grounds that when a pipeline bursts, some dust and turbidity accumulate and causes some changes in the water. Another reason cited is that when water is rationed, the flow of water finds the pipes empty and the turbulence flow increases the turbidity which is why the respondents claimed they were/are supplied with untreated water. This motivated some residents choosing to boil the water prior to consumption.

*“The best way was to boil the water especially if you use it for drinking”
(Respondent 27GR, S).*

Some respondents mentioned that they expected their water bills to be lower than usual as they equated their water use with supply. They explained how difficult it was to access and use water during the extreme shortage period.

At the time of data collection in April to June 2016, when water was flowing reasonably, the residents were still storing water. The reason for storing water when water is back flowing is that the residents no longer trust the government. Residents are sceptical whether the interventions in place provide a permanent solution. They were cited as saying:

“We no longer trust if this is a permanent solution, as we are speaking my buckets are full, I do not want to be caught off guard” (Respondent 27GR, S).

These sayings were necessitated by observations that at times during the extreme shortage period, water rationing was inconsistent, frequent pipeline bursts which saw residents going for weeks without water and that most of the programmes according to the respondents were reactive as opposed to proactive. Hence, they still believe whatever is in place is responsive and provisional. Another issue that caused a loss of trust in the government by the residents were concerns about storage. Water quality deteriorating because of longer storage did not sit well with the residents, prompting them to be sceptical about most programmes the government is undertaking to calm down the situation.

5.2.9 Collaboration with others

The water shortage crisis has seen people coming together to deal with the situation collaboratively. Neighbours, relatives and friends assisted each other either through information sharing, giving each other water or waking up one another in the wee hours of the morning to fetch some water.

“We used to assist each other with some water and information and wake each other up early in the morning so that we could go together to fetch some water” (Respondent 28GR, S).

Following the introduction of the water rationing schedule, information was being shared on which location of Gaborone to find some water. Residents would also circulate information among themselves when there were some announcements that on such a day (outside the water schedule) there will be no water for this period of time. During the intermittent supply period, residents liaised with relatives and friends and would go out to source water from alternate locations since each area of the city had its own day of water rationing.

At the time when water was in extremely short supply, some residents went to the extent of sharing water with their neighbours particularly for cooking and drinking purposes. During the same period, residents had also discovered that if there has been no water for a long time, water usually becomes available in the early hours of the morning and it has been reported that water flow would last for close to an hour and then be cut. Residents would wake up one another from as early as 12 o'clock midnight stretching to three o'clock in the morning.

"We got news from friends that water sometimes becomes available at midnight, sometimes around 3 am especially when it has been unavailable for a long period of time. Sometimes there would be noise outside the yard of people waking up to check if there is water and because of the noise you end up being forced to wake up to check if there is something coming out in your household. Sometimes we would collect up to 20 litres of water"
(Respondent 22GR, S).

This cooperation between the residents strengthened their relationships as friends, relatives and neighbours and probably made an impact on how best to survive the situation. However, people were frequently moody on the grounds that they had nothing else to think about but were always thinking about where and how to get water, hence their wellbeing was impacted.

During the extreme shortage period, some residents would join together and approach their area leaders on the matter. Residents from one of the locations in the city mentioned that after experiencing frequent long water cuts, they mobilised each other to approach their area councillor to ask him to explain to them why their area was heavily affected by water shortage. The water was back flowing again before they could convene with the councillor and they could not meet again.

In contrast to the association between the residents in most areas of the city, there was limited to no collaboration reported by residents residing in the high income households. It appears people are very independent in these areas and considered that they have no business with what is happening in another neighbour's house. These people had the money to pay for recycled or bottled water. There are high levels of inequality in Gaborone with five out of every 10 residents residing in slum areas (Keoreng, 2008).

5.3 Other sources of water

5.3.1 Buying water

During the extreme shortage period, life became very expensive and difficult for the residents of Gaborone. Those that had money, could purchase purified bottled water from supermarkets for drinking purposes even though this became scarce as the crisis intensified. Others bought water which was claimed to be from the boreholes from private water sellers. Taking advantage of the

situation, people in Gaborone and its suburban areas started seeing water as a commercial commodity. Trucks could be seen distributing water around the city as shown in figure 5.5.



Figure 5.5: A truck distributing water in Gaborone. Source: <http://www.businessweekly.co.bw/wp-content/uploads/2015/12/>.

Clearly the source of water sold by these individuals using trucks was not known. Even the water pricing was not regulated as the water laws do not have the provisions to stop private water sellers from selling water whether clean or unclear; the price of water ranged from P250.00 (equivalent to NZ\$1,750) to P350.00 (N\$2,450) a thousand litres.

Residents needed to survive and that called for the continuing maintenance of their livelihood hence the reason why the water of an unknown origin could be used to prepare food for public consumption.

“But there was a time when there was no water everywhere in the city. People started selling water in trucks. I ended up buying it for my business. I am in catering business and staying the whole day without selling anything was a problem ... we would see others transporting it using cars and wheelbarrows and ask them where they got it from, so I bought that water once. The day I bought it I saw others with buckets full of water and I asked them where they got it from because there was no water in our location that is when they told me they bought it from a JOJO tank. One 20 litre bucket was P5.00. When we asked the owner where he got the water from he said he got it from outside Gaborone in Kopong. People made business out of water” (Respondent 21GR, N).

To access this water, respondents reported that they had to use public transport, cars, wheelbarrows and bicycles to carry their water. Those without any of these modes of transport, especially women, had to carry the water on their heads.

Households where there were children, and who could not find alternative ways to access water, had to buy water of an unknown origin to cater for the family.

“We used to buy water from people but I don’t know where they were getting it from ... and you cannot worry about the quality of water because you need it, but we had constant diarrhoea especially in children. Children are very sensitive more so that the situation was bad and children experienced diarrhoea time and again” (Respondent 20GR, W).

Because of the situation some people found themselves using purchased water from an unknown source for all the household activities: cooking, drinking, bathing, and laundering, watering etc. while some preferred bottled water for drinking over water which was difficult to trace its source. Several respondents, the media and water experts concurred that diarrhoea happened more frequently in Gaborone during the water shortage period, and people were advised through mass media to keep away from buying water they have no idea about its source and quality. The source and quality of water were overarching issues for the water industry as the issue of mixed suppliers was not easy to track. Water sellers claimed that the water they sold was from boreholes but could not account for its quality: for them as long as it was clean and tastes ok, it’s okay for consumption. According to the water experts, water quality is more than just the colour and taste.

“Yes, diarrhoea happened in this country. We had Water Pitso (consultation with all relevant stakeholders-from the water industry and the consumers) in March 2016, the issue of the source of water is not easy to track in terms of quality because those selling the water will tell you it’s borehole water but they don’t even know the quality of water, as long as it is clean and tastes okay but water analysis does not say that” (Respondent 6NGO, G).

Even though it was almost impossible to know and trace the source of this water that did not deter the residents from buying it as people were desperately in need of water. The issue of water quality was temporarily disregarded to survive the circumstances.

Furthermore, stocks of water from supermarkets and private water sellers was reported to be getting exhausted as everyone was in need of water.

“We were buying bottled water but it was also getting exhausted” (Respondent 23GR, W).

Where water was getting exhausted, residents started flooding government offices and other areas where they thought they might be able to get water. For example, Central Investigation Department (CID) and the government enclave were some of the offices residents cited as becoming handy during the time. This is the period, according to the respondents, when the whole city was dry with no water and residents had to find alternative ways of sourcing water.

5.3.2 Water from the mosque and community leaders

There was one location in Gaborone, the mosque, where the residents reported that during the driest time, they were obtaining water just like other residents from water sellers but mostly got it from the mosque. It was not clear as to whether there is a borehole in the mosque, but reports are that whenever there was acute water shortage residents would fetch water from the mosque. Residents would make long queues and spend the whole day at the mosque waiting for water. Even if they had to spend the whole day there, they knew at the end of the day they would leave the place with some water.

Similarly, during the same period of extreme shortage, the same people from this same location were assisted with water by their local area leader. The leader was moving around with a trailer providing water to his people. Residents were keen to fetch water from his JOJO tank despite not being able to trace the actual source of water. It appears that people trusted their community leaders to supply water not knowing where it was coming from.

5.3.3 The workplace

Some residents who are working asserted that they relied heavily on their employers for water. Respondents explained how they began regularly collecting water from their work places during times when water was extremely in short supply.

“Because I realised that water was always available at work I became regular in fetching water at work. I would take three barrels and divide them according to how we were going to use them, drinking, cooking, bathing and laundry” (Respondent 10GR, W).

In another case, it has been reported that there was a time when residents from one area of the city vandalised one company’s water pipe. The people dug a hole and placed buckets underneath to fetch water. People had no water and they were hustling. Not having adequate water for the people is a threat to the country and can fuel bad thoughts and breed deviant behaviours among people which can be sometimes difficult to control.

5.4 Connections and variances in water using activities

From the analysis above, it is clear that people attach different meanings to a variety of water uses. The frequency and motivation of water using activities that were performed varied between households. Despite the variations, the similarities were much more pronounced and reproduced than the discrepancies.

Although there were many methods to save water, the similarities occurred due to concern to conserve water. While there were differences in the personal reasons for performing out the activity to suit the needs and desires of individuals, reasons for bathing, for example, were to keep clean, personal hygiene, cool down, refresh and relax, and bucket bathing reduced water use to continue to derive these meanings. Doing laundry, washing kitchen utensils, pots, crockery and gardening also offered a variety of routines to keep clean and maintain hygiene.

5.5 Effects of household size

A mixture of water saving methods, frequency and reasons for performing an action were found in every household. Some households had children living in them. Some experienced regular visitors such as grandchildren and other relatives. Where there was an increased number of people staying in a household, there was more demand for water for laundry, washing dishes, toilet flushing and bathing. Numerically, it makes sense to assume that these households needed and used more water. This assumption is based on the notion that the more people, the more the resource is used at a faster pace.

Variations in the water use and the period when the house is occupied have been noted. Working families with no dependants occupying the house during the day used less water than households with young children, school children and family members who remain at home during the day. School children added an extra need for water as when the school had no water, the children were dismissed from school before the usual time.

5.6 The elements of water saving activities

Table 5.1 summarises the water saving activities identified by respondents and the elements associated with them.

Table 5.1: Elements of water saving methods

Practice	Water saving methods	Outcome of water saving methods	Meaning	Materials			Competency
				Accessing water	Storing water	To perform the practice	
Bathing	<ul style="list-style-type: none"> -The use of a bucket -Avoiding running water 	<ul style="list-style-type: none"> -Uses less water -Limits the amount of water that can be used compared to shower and bath tub 	<ul style="list-style-type: none"> -Cleanliness -Hygiene -Social interaction -Relaxation -Freshens up -Cooling off the body -Happiness -Lack of water as stressful -Luxury -Avoiding smells 	Cars, trailers, trucks, wheel barrows, public transport, shoes, and bicycles.	Storage tanks	Bowls, buckets, wet cloth, cups.	<ul style="list-style-type: none"> -The ability to squat on the bowl -The ability to use wash up water again -The ability to use little amount to clean the body adequately -The ability to ensure all the water for bathing collects in the bowl for another use
Teeth brushing	<ul style="list-style-type: none"> -Avoid running water -Use of a cup uses less water 	<ul style="list-style-type: none"> -Reduces water flow and use 	Cleanliness		Storage tanks	Cup	<ul style="list-style-type: none"> -The ability to measure enough water for teeth brushing
Toilet flushing	<ul style="list-style-type: none"> -Avoiding flushing unnecessarily -Flush with bath and laundry water -Flush with wastewater -Flush using a bucket 	<ul style="list-style-type: none"> -Reduces water use -Reduces freshwater use -Reduces freshwater use -Reduces the amount of waste used compared to from cistern 	Cleanliness	Cars, trailers, trucks, wheel barrows, public transport.	Storage tanks	Buckets	<ul style="list-style-type: none"> -The ability to use wash up water again -The ability to scoop water from a container -The ability to put up with smell and lack of hygiene -The competency holding the bladder
Laundry	<ul style="list-style-type: none"> -Control washing clothes 	<ul style="list-style-type: none"> -Reduces water use 	-Cleanliness	Cars, trailers, trucks,	Storage tanks	Bowls, buckets	<ul style="list-style-type: none"> -The ability to inspect if the clothing is dirty or not

	<ul style="list-style-type: none"> -Inspect clothes before washing -Use of rainwater -Avoid use of washing machines -Wash clothes by hands 	<ul style="list-style-type: none"> -Reduces unnecessary water use -Replaces and reduces freshwater use -Reduces the amount of water that can be used -Regulate and uses less water 	-Avoiding laziness	wheel-barrows, public transport.			<ul style="list-style-type: none"> -The ability to ensure clothes worn do not get dirty -The ability to continuously wear dirty and partly dried clothes -The ability to identify/choose own clothes that which showed the dirt less
Washing kitchen utensils, pots and crockery	<ul style="list-style-type: none"> -Use of a small bowl -Treat oiled utensils (mix water and detergent and boil for the separation of oil and water) -Avoiding running water use -Avoiding dishwasher by washing by hand -Avoiding leaving food particles in water 	<ul style="list-style-type: none"> -Reduces water use -Reduces water use -Reduces water use -Regulate and uses less water -Reduces more use of water and allows for the 	<ul style="list-style-type: none"> -Cleanliness -Avoiding smells -Avoiding laziness 	Cars, trailers, trucks, wheel barrows, public transport.	Storage tanks	Bowls, sink, stopper and swabs	<ul style="list-style-type: none"> -The ability to use wash up water again -The ability to measure enough water for washing utensils -The ability to scrap and wipe dishes -The ability to separate oil from water through boiling water -The ability to use alternatives to water volume to remove oils - The ability to tolerate dirty dishes, bad smells and lack of hygiene

		same water over and over					
Gardening	<ul style="list-style-type: none"> -No/stopped use of hoses -Use bath and laundry water -Growing drought resistant plants -Stop sprinkle irrigation -Use of treated wastewater -Use of a bucket to water plants 	<ul style="list-style-type: none"> -Reduces water use -Reduces freshwater use 	<ul style="list-style-type: none"> -Relaxation of the mind -Passion -keep active -Beauty -Self-sufficiency/provisioning (e.g. some were growing their own food (vegetables and fruits)) 	<ul style="list-style-type: none"> Cars, shoes, trailers, trucks, wheel barrows, public transport. 	Storage tanks	Buckets	<ul style="list-style-type: none"> -The ability to use wash up water again
Cooking/preparation of and drinking	<ul style="list-style-type: none"> -Self-imposed rationing - use of cups to measure the amount of water to be drank per day -Avoiding cooking 	<ul style="list-style-type: none"> -Reduces and controls the amount of water that can be drank -Reduces the amount of water that can be used to prepare food 	<ul style="list-style-type: none"> -Quench thirst -To have energy 			Cups	<ul style="list-style-type: none"> -The ability to measure and ration water so there was enough water for drinking -The ability to skip meals/survive hunger

There were a number of water saving methods mentioned and performed by people as indicated in table 5.1. The most remarkable one is the use of a bucket particularly for bathing, flushing the toilet and watering plants. All the activities mentioned above were being performed by the respondents. The table illustrates what happens when new materials are introduced to a practice- different competences are required and the meanings are likely to change. Table 6.1 illustrates how the water crisis shifted the elements (meanings, materials and competency), the implications of which will be discussed in the next chapter.

5.7 Conclusion

There was a wide range of water using arrangements in the households. Within these arrangements, there are a series of similar patterns in the manner in which the practices were performed within and between households. Explanations for how and why certain activities were performed was provided by the respondents. How their water use activities changed and were performed (e.g. squatting in a bowl and using a bucket for bathing) and the reasons why they were performed were similar across the households. These actions were settled on by the respondents in response to the situation they were faced with. As such the respondents had to adapt their water use actions to fit into the situation at hand and their desires.

Some activities, in particular the use of treated wastewater predominately for flushing the toilet and watering gardens were performed by a well-off section of the society. However, no differences in activities like bathing were noted because the bowl-bucket bathing concept was a normal activity by everyone during this time. It was easy to make some comparisons between a society with abundant water resources and the opposite.

To abate the situation there were so many routines that residents performed, including storing water in advance for drinking, cooking, bathing, flushing and doing laundry every time the flow of water is available. However, water use was drastically reduced during the extreme water shortage with many people failing to bathe, do laundry, flush toilets and drink water as expected. It is clear that these dire circumstances made people realise how valuable water was to the happiness of their everyday life.

Chapter 6

Discussion

6.1 Introduction

The purpose of this study has been to understand how the government has responded to the water situation and how the experiences of water shortages in Gaborone influenced people's water use and management practices. The findings set out in chapter 4 illustrate the strategies adopted by the government to address the issue of water in Gaborone. Chapter 5 outlines the various household practices adopted by residents of Gaborone, factors contributing to water utilisation and methods of conservation during times of varying degrees of water crisis in Gaborone. In this chapter, the results set out in chapter 4 and 5 are linked to the theoretical framework set out in chapter 2. The results are explored through the lens of social practice theory with illustrations from the interconnected elements of practices (Shove et al., 2012). Shove (2003a) identifies and attributes resource consumption to a desire for cleanliness, comfort and convenience. These themes by Shove, as to how and why people use water, were also identified in this research. From a social practice theoretical perspective, I examine the underlying factors driving water consumption at times of severe resource disruption, and how the elements of social practice – material objects, meanings and competences as identified in Table 6.1 – are woven into the performance of practices.

Through the lens of social practice theory, a co-evolving relationship between the supply of water and the demand for water is discernible. Specifically, the current systems of water supply-where the tap is turned on and water almost instantly comes out-create and entrench practices which are heavily dependent on resource provision and consumption. The institutional, economic and political arrangements put in place by governments and water utilities create a division between consumption and production that creates a supplier-consumer relationship, whereby managers see their responsibility as to ensure provision of the resource and the consumer's role as to receive and consume it (Strengers, 2011). This conventional relationship shapes consumption practices meanwhile neglecting reasons why people use resources and how these wants are framed constrained and encouraged by water infrastructure. It was normal for the residents of Gaborone, when water was abundant, to frequently, and without a second thought, flush, wash and bathe, and to water their gardens with ease. As long as water was always available on tap, what happened to the hydrological processes of water or what was required for the delivery of water was rendered little regard.

A social practice approach differs from conventional approaches that focus on the behaviour of individuals (Hargreaves, 2011; Røpke, 2009; Shove, 2003b, 2010; Shove et al., 2012; Strengers, 2011). It is conventional wisdom in environmental management that educating the general public will change their attitudes and beliefs and help them to make the 'right' choices that are expected to reduce or change resource consumption (Røpke, 2009; Shove, 2010; Strengers, 2011). In contrast, social practice theory distances itself from analysing the behaviour of an individual and their uptake (or not) of efficiency procedures, and instead focuses attention on the social and collective organisation of practices that involves meanings, competences and material objects (Hargreaves, 2011). This conceptualisation of resource provision and use demonstrates that rather than taking and treating societal needs for granted, social practice theory advocates for long term changes which relate to everyday life and changes requiring a more holistic and organised approach. According to Shove et al. (2012), understanding and promoting sustainable ways of living should begin with understanding the elements which constitute practices and how these elements are interconnected. People's ability to change what they do is explained by meanings attached to the undertaking of the practice, the introduction of material objects and the competences needed to perform the practice.

6.2 Challenging the conventional wisdom

The water sector globally is still dependent on the traditional approach to seeking change in resource consumption patterns (Shove, 2003b). That is, published international reports put more emphasis on water quantity and the quality of the available water and accountability. A report on Water for a Sustainable World by UN-Water (2015) focuses on water supply. Reports on how to improve water efficiency by World Business Council for Sustainable Development (2002) and World Plumbing Council (2015) have been published and give advice on water efficiency measures as the solution to reduce excessive consumption. While these reports provide important insights into water use behaviours, water scarcity and accounts, and supply and personal water use, their focus is on the individual and their accountability or fostering individual responsibility for the overall problem. Suggestions in these reports are on achieving water reduction through educational awareness and efficiency. According to Shove (2003a), this is a conservative and inadequate approach to responding to today's water issues.

While this traditional approach relies on changing the behaviour of individuals, Shove (2003c), Shove (2010) and Strengers and Maller (2012) are of the view that a more effective approach to addressing demand requires understanding the co-evolutionary processes that constitute supply and demand and emphasise the importance of focussing on practices rather than individuals. In order to modify behaviour, there should be an understanding of meanings attached to practices, and of the materials and competences needed to perform the practice. Thus there is a need to focus on and change the

socio-technical systems and the water use cultures (Sofoulis, 2005). This is a sentiment shared by Shove (2010) when she states that the status quo should be challenged and more sustainable forms of innovation that unravel these routines and understandings should be promoted in our everyday life. Therefore, dealing with behavioural change requires a holistic investigation, since casual and external drivers of behaviour change should also be considered (Shove, 2010).

The following section discusses the role of material infrastructure in every day practices. This is important to consider from a social practice theory perspective as it inscribes meanings to people and hence these are the meanings people adopt because technology constitutes people and the ways they do things.

6.3 The influence of infrastructure on practices

Systems of resource provision inscribe particular forms of use and expectations in people (Shove, 2003b). The government has focused on large water infrastructure construction to augment supply. The result of this build and supply-oriented paradigm is that the populace of Gaborone is supplied by a network of pipes, such as the North South Carrier pipeline, drawing water from dams in the north of the country, and by a number of wellfields and boreholes close to the city. This approach is oriented to maintaining supply as opposed to managing the demand. These big pieces of infrastructure have created an expectation that water is always available-constantly flowing to meet the demand. As Akrich (1992, p. 173) states, once the infrastructure is in place and firmly entrenched and in place in people's homes, consumers have "no choice but to take up the position assigned to them". Users habitually respond in alignment with the material infrastructure of water. The extent to which this has occurred in Gaborone was set out in Chapter 5 whereby it demonstrates people wanting frequent showers and being very unhappy without their comforts and conveniences. Users are constituted as comfort and convenience seeking recipients of the continuous flow of water. As long as we continue to put trust in capital intensive projects, we will continue having this expectation. This expectation has facilitated the creation of the current water demand and existing practices in Gaborone which has led to the current water crisis.

Given that material infrastructure organises and scripts practices (Hanseth & Monteiro, 1997), they also inscribe meanings to the users (Latour, 1991; Shove et al., 2012). As such, water consumption becomes highly determined by highly mechanical and expensive infrastructure which establishes the potential of everyday flow of water (Shove, 2003c). For example, before the water crisis, having a thriving garden was entrenched in the material object of a sprinkler that allows plants to be frequently watered over a large area. Convenience, comfort and cleanliness derived through toilet flushing or turning on the tap for washing and showering is scripted in plumbing and reticulation

infrastructure which provides possibilities of everyday flow of water. While it might be difficult to accept the idea that flushing the toilet is a form of comfort, it is also about convenience and cleanliness, and this is what tallies to comfort. However, when one considers what occurred under conditions of water crisis in Gaborone, one can much more readily recognise toilet flushing as comfort. When faced with a bucket and no flowing water-a usable flushing toilet is a luxury. Washing clothes using a machine requires a range of socio-technological networks with routines and practices of what can be referred to as clean clothing which represent the social order and undertaking of household chores (Sofoulis, 2005).

People have made themselves comfortable through these material objects of plumbing, which are designed to deliver comfort, cleanliness and convenience. The maintenance of comfort therefore turns out to be a massively resource intensive exercise. With all these socio-technologies in place, the expectations created on consumers slowly become community norms (Shove, 2003c). As such, it is shown in this research that people do things unconsciously through the use of technology which embeds particular assumptions about how people operate and by doing that, consumption exists around the idea of abundance. For example, opening the tap and water coming out. This assumption of abundance revolves around technology which creates the expectation that resources are abundant and can be used.

When water was perceived to be abundant there was increased frequency of showering or bathing and washing clothes. With water in short supply, people still expected to continue maintaining the same lifestyle of bathing or showering and washing clothes frequently as a way of keeping clean and eliminating unpleasant smells for social interaction with others. Practices of flushing the toilet, bathing and washing clothes are clearly intertwined with expectations concerning smells and hygiene and a complex network of water infrastructure that includes dams, pipes, boreholes, taps and plumbing materials. Bathing or showering was viewed as cooling the body and providing refreshment and relaxation. Washing machines were seen as time savers. These are the expectations and norms inscribed and embedded in the technology. These co-evolved increasingly intertwined relations between supply and demand create and entrench heavy resource consumption practices. In other words, people are enticed and constituted as resource users with expectations of more supply. These findings illustrate the claim of Reckwitz (2002a) that material objects are an integral part of the practice.

As meanings are inscribed in technology and people are constituted as subjects of the technology, people adopt these meanings. As a result, setting up a system that requires less resources becomes harder for someone who has become dependent on a high level of resource use because it leads to perceptions of deprivation as demonstrated in section 6.5. This co-evolved process entices people to

be heavily dependent on supply which translates into dependency on heavy resource use. It was shown that when people could no longer flush their toilets, frequently soak their bodies in water, cool off, refresh and relax their bodies through bathing as they used to do before water disruption, the situation was described as uncomfortable.

6.4 Efficiency measures

6.4.1 Awareness education and information dissemination

Many studies indicate that analysis of the behaviour of individuals and uptake of efficiency procedures can be used to change consumption behaviours. The 'wrongful' behaviours of individuals are expected to be addressed by strategies or interventions (e.g. pricing, efficiency technologies and advice), information dissemination and other appropriate incentives designed to address individual behaviour. However, Shove (2010) argues that this approach is a response to the 'value-action gap'. A value-action gap is the problem that individuals who espouse green values do not always act in accordance with them (Blake, 1999) ... "after all the gap is only mystifying if we suppose that values do (or should) translate into action" (Shove, 2010, p. 1276). Information dissemination and public education have always been, and remain, two of the popular strategies used to change consumption behaviours in Botswana.

However, the individual behaviour change model does not contain concepts that can initiate debate on the transformation of a society as a whole (Shove, 2010). This study found that there are significant limitations to this information dissemination and education approach. The social practice theory lens brought into view the realities, complexities and imperatives of everyday life in Gaborone. Despite information on avoiding freshwater use for non-potable uses, there were cases reported by the interviewees of the use of a hosepipe to reduce the dust by sprinkling water on the surface in preparation for sweeping the compound and sprinkle irrigation even though they were later stopped because of the low water pressure and moral obligation. While people understood the need to save water, a range of other issues intervened. Specifically, these examples demonstrate that a value-action gap existed in Gaborone as people did not act according to what education awareness measures prescribed.

Research by Strengers (2009) concludes that householders misinterpret, misunderstand, lose interest in and ignore information aimed at them on how to manage resources which is of limited relevance to how they perform their everyday practices. This is an indication that awareness raising has restricted influence since behaviour change is premised on a limited set of goals which encourage personal choices on the action of the behaviour (Hargreaves, 2011; Røpke, 2009; Shove, 2003b,

2010). Personal behaviour is influenced by a range of factors and imperatives including dependencies created by apparently plentiful resource availability through extensive and expensive infrastructure.

In her study, Knamiller (2012) concluded that enhancing public knowledge does not always result in shared values in the society and that new knowledge does not instigate action even when one holds values that accord with new prescriptions. Educational awareness can be effective only if all the people in the society involved adhere to what it recommends. This is to say a change of one person is like saving water with a teaspoon, and if the other millions of people do not change the usage of water then it becomes pointless. Despite the limitation of awareness-raising, it is always worthy to have people with information at their disposal as it is better to have an informed rather than an ill-informed population. While the expectation is that the water sector should provide information to the people, this should not be misinterpreted to be an efficiency measure itself or an effective demand management strategy.

Social practice theorists maintain that a shift to sustainability needs to look beyond policy and decision makers seeking to persuade individuals to increase their use efficiency and making sacrifices (Shove, 2010). There are other factors in our everyday life such as materials, societal expectations, routines, meanings and competences whose role in our resource consumption should be considered (Shove, 2010; Strengers, 2010). In Gaborone, an urgent recognition by the water sector that there is a need to make changes in the way residents meet their needs and desires was made through enforcing water rationing and restrictions, and intensifying educational campaigns. But failure to consider how the desires and needs for cleanliness, comfort and convenience come to be as they are, might fail to address problems concerning different ways in which water resources are used. The consequences of water rationing and restrictions by the water managers were prohibiting outdoor water activities. However, it can also be understood that by banning outdoor water activities, the water managers were legitimising indoor cleanliness practices as essential activities that can be carried out in everyday life.

From this understanding, Shove (2010) argues that consumption practices are shaped by factors such as social institutions, history or infrastructure and these should be considered when changes are to be made. To produce more sustainable practices requires far more than focusing on the apparently 'bad' behaviours of individuals and using education in efforts to fill assumed knowledge gaps. Rather, networks between elements of practices and ingrained practices which are more reliant on resource consumption need to be examined, confronted and broken before remaking and replacing them with new apparently sustainable habits reliant of the same infrastructure with the same embedded scripts of comfort, convenience and cleanliness (detailed discussion on section 6.5).

6.4.2 Water efficiency technologies

Social practice theory does not consider the promotion of efficiency measures to be an effective approach to managing demand (Shove, 2003c; Strengers, 2011). Botswana's draft National Water policy of 2012 explicitly declares the implementation of water efficiency measures. The building codes are yet to be revised, which means incorporating efficient technologies in newly built houses as a way of reducing water consumption in households has not yet begun. However, residents who had dual flush toilets were critical of the weaker flush. While participants were excited and itching for the introduction by the government of better ways of saving water, the question is, will they accept and implement efficiency measures such as the use of dual flush toilets, low pressure water taps or low water shower heads in new buildings as per the requirements of new building codes. The water crisis has provided people with an unexpected experiment on how these measures might work and hence could mitigate against their adoption. While it makes sense to employ technological devices that are designed specifically to script practices that use less water (Jelsma, 2006), Shove (2003b) is of the view that these technological solutions depict some kind of locking in of a practice and can make people think the resource use problem has been resolved while in actual fact it is not, e.g. using more efficient cisterns does not change anything. People's behaviour may not change how often they flush but more efficient toilets do mean less water is used for each flush. Dual toilets will result in reduced water use, but only if users chose the low flush option for urine. Reconfigured characters behind the scenes do not necessarily translate into real life changed behaviour since individuals are not involved in the 'cooperative design process' of a behaviour. Conversely, it is likely that people might not understand or ignore their water saving potential (Strengers, 2011) thus permitting negligent behaviour. Additionally, the call for efficiency does not go far enough. Efficiency measures do not illustrate what is needed and the extent of the efficiency, hence these measures suggest nothing new but reinforcing the status quo and maintain the existing standards.

Efficiency measures have gained momentum over the years as it is believed they have the potential to reduce consumption. They might reduce an individual's consumption under some circumstances but making people the problem without reflecting on the bigger picture and how people are responding to how they are constituted in the infrastructure, this approach has limited effectiveness. Efficiency does not address issues people face, if people are really to be changed. As shown below, it is critical to understand how and why water resources are used.

6.5 The dynamics of water consumption

In this section, the 3Cs and how they influence consumption are examined individually. However, they are recognised as interconnected.

6.5.1 Desire for cleanliness

According to Shove (2003b), the primary driver of water consumption in households is the desire to keep clean. Bathing and general washing within the house are about reproducing cleanliness. Gaborone residents were concerned with bathing, brushing teeth, washing dishes, pots and clothes and the general cleanliness of their surroundings. How people perceive cleanliness differed between and within households. Some residents could not tolerate leaving the toilet un-flushed; some could not leave dishes unwashed while some could not spend the whole day without bathing. These examples show the promotion of cleanliness and its reproduction through regular flushing of the toilet, washing dishes and bathing even if water was not enough to adequately carry out these activities. The reproduction of cleanliness has defined how the residents understand the acceptable and desirable cleanliness practices they regard as normal. The use of a bowl and a bucket to bath was also viewed as stressful as it significantly reduced the amount of water that can be used for bathing.

Shove (2003a) observes that people try to maintain societal acceptable standards of cleanliness even when the resource is interrupted. With water resource disruption in Gaborone, perceptions of cleanliness transformed over time. Cleanliness changed to attempting to maintain hygiene through use of cups to brush teeth, use of bowl and buckets to bath or even to use a wet cloth to wipe the face. Hence, although residents were forced to change the material objects of keeping clean comfortably and conveniently, which was assisted through developing different competences, some meanings (through norms and social expectations) stayed the same while some changed. For example, bathing habits and patterns had to be reconfigured as the water situation intensified. Residents went from bathing two times a day in a bathtub or shower to bowl and bucket bathing once a day and finally, when the water shortage was most acute, to simply wiping the face using a wet cloth. The frequency of washing clothes as well as flushing the toilet also reduced during the extreme shortage.

When exploring cleanliness and reasons why people shower, bathe and wash clothes as they do, Shove (2003b) found that the dominant reason is in terms of fitting in the society for better social interaction with the society. In Gaborone, keeping clean not only allowed people to adhere to acceptable societal standards, it also delivered what they described as the joy that comes with feeling clean and enhanced social interaction. Failing to meet the perceived social standards was viewed as embarrassing and limiting social interaction, particularly in the younger generation. Respondents were avoiding mingling with others after school because of concern about offensive odours. Rather than be seen to be dirty, they were washing their collars, and wearing partly dried clothes. School uniforms were washed as a priority to allow children to look clean and feel satisfied with clean clothes (even if only partially clean and dry). Ensuring cleanliness is equated to good

parental care, societal morals and a meaningful sign related to social order (Shove, 2003a). Notwithstanding the water crisis, the people of Gaborone felt they needed to uphold these expectations.

Cleanliness habits not only entail theories of social order and reproduction (Shove, 2003a), they also involve some routines performed for health and hygiene reasons. People talked of diarrhoea outbreaks on a regular basis, mostly in children, which is why some ensured kitchen utensils were never left dirty. Dirty kitchen utensils attracted flies and other insects which may have spread disease-causing organisms and unpleasant smells. Drinking water was boiled prior to drinking to kill the smell and 'germs'. Similarly, some people could not leave the toilet un-flushed after use because of the smell urine has. Instead treated wastewater was often acquired for flushing. Cleanliness was perceived as a measure for meeting hygiene standards which implies that households would find it difficult to lower their water uses as they had already exhausted other alternatives.

In summary, cleanliness entails a series of concerns involving meeting societal standards with regard to physical bodily looks, expectations in the society, personal health and hygiene standards. This means that even though water was intermittent, people could not further reduce the manner they used water as they had to keep up with the societal standards, expectations and meet basic hygiene requirements.

6.5.2 Desire for comfort

Shove (2003b) maintains that the establishment and sustaining of comfort stimulates immensely resource intensive practices. For many in Gaborone, there is a strong association between water use and comfort. Water is used as a means to meet needs such as physical health. Respondents talked of bathing to cool their bodies, release stress and relaxation of the body after a long day of working. Bathing was also attributed to freshening up as it prepares them for bed in the evening and helps make their day time lively and active. Relaxation creates a fresh mind knowing that the body is clean. Water was also used as a form of pleasure and joy, for example, the little boy filling up the bathtub just to soak his whole body in the bathtub when water was abundant and the young girl who despised the use of a small bucket for bathing as very stressful. These young children had experienced no constraint on their use of water in their life before, in contrast to older residents who had lived through previous droughts and residents who had previously lived in the countryside. Following these illustrations, it can be concluded that people who report being comfortable as a result of the systems that deliver a resource have a particular history (Shove, 2003b) and hence when they experience discomfort as a result of a challenging situation, they feel punished. The same

sentiments might be expressed if efficiency measures are to be introduced because of their nature of operation (reduced water coming out from the plumbing infrastructure).

What appears to be comfort regulates the details of outdoor creativity (Shove, 2003b). The findings show that water has become a means to acquire contentment not only through bathing. Water was also used for gardening to preserve the beauty that comes along with green scenery and mind relaxation. The findings signal water as giving happiness to people. High income householders walked me around their allotments as a gesture to prove passion for gardening which also signalled manual work which encourages keeping active and fit. Without water, one is left wondering what these people would do in life in general or to acquire contentment and fitness if they had to live without a garden.

While gardening falls under comfort because of the creativity and the desire to visually witness the good scenery, it is also associated with some social and economic aspects. It has become a norm in Botswana for people to engage in backyard gardening to grow their own food.

6.5.3 Desire for convenience

Convenience is described in terms of time, simplicity, space and liberty (Shove, 2003b). When water was abundant everyone fetched water direct from the tap for household activities e.g. bathing, cooking etc., flushed the toilet from the automatically filled cistern without having to use the stored water, and wash dishes and pots without having to soak them. Although, people complained that it was difficult and did not satisfy their desire for comfort when water was intermittent, bowl and bucket bathing was highly rated for its functionality in relation to less water use in particular.

People coordinate their daily activities to try to manage mounting time pressure and one way to cope with time was the use of machines. Machines save time as well as providing flexibility, but they end up contributing to excessive water use (Shove, 2003b; Sofoulis, 2005). Although the use of washing machines was not very common in Gaborone, some preferred their use as they save time and doing tedious washing, and other activities could be done almost at the same time when laundry is done. In other words, using a washing machine encourages multi-tasking at the same time effecting further demand for convenience by dividing tasks. Shove (2003b, p. 412) concludes that “the obsession with convenience is a hallmark of the society of the schedule”. Hence this would explain why some residents in Gaborone reverted to their machine washing habits when the water situation seemed to improve. However, the use of washing machines is not collectively accepted in Botswana as it is equated with laziness. How washing machines are perceived (including dishwashers) is culturally motivated.

During the times of extreme water stress, routines were developed and performed to simplify household work (Shove, 2003a). The soaking and treating of oiled pots and dishes rendered them easy to wash up later. Once the water was back flowing, clothes washing was done by hand, normally on weekends. With regard to water storage, keen residents mounted jojo tanks with taps to store borehole and wastewater as a way of easing gardening activities rather than storing bath water and moving it outside to the garden for watering which can also be time consuming. Similarly buckets were put in toilets to store water for flushing to avoid the embarrassment of being seen carrying the bucket to the toilet by other family members in the house. Water was also stored in bowls/containers to ensure flushing of the toilet when necessary. This was a situation where people have been removed from true pleasures of the system to which they have become accustomed to.

However, these new routines have allowed retention of some standard of living as people get used to a new way of living during the time when water was in short supply. The involvement of users in saving water through storage was common during the water scarcity period but practising it in a proper way so that the water did not go 'bad' was a new thing to them. They lacked competence in this respect. A new material object (storage tanks) was being used by people trying to retain the same meanings from water use (i.e. cleanliness, comfort or convenience) but they did not always have enough know-how to store water safely, a skill which is not ordinarily needed by city residents. The needed skills were not entwined in the infrastructure that is built to deliver an apparently abundant resource and constitutes its users as cleanliness, comfort and convenience seekers who are embedded in a society of schedule.

Meanings of new practices and consumption patterns are sustained by consistency in the reproduction of a practice (Shove et al., 2012; Shove & Walker, 2010). Almost all the respondents ensured that whenever water was available all their clothes were washed and clean, storage tanks filled with water (either for potable or non-potable uses) to avoid inconvenience and dictation of when to do the household activities. Water storing for potable uses was still practiced even during the time of data collection when the situation seemed to have improved, an indication of the people's lack of trust in the water providers. People knew what it is like not to have water hence storing was viewed as an insurance against the problem of inconvenience. Not trusting water providers might have triggered sustainable practices of water use, even if temporarily. As much as convenience was of significance, issues of costs sometimes superseded the desire for convenience. The use of washing machines was stopped by some as they found it cheaper to wash clothes by hand than to waste more water on the cycles needed to complete washing which translated into huge water bills. Bills acted as a reminder to how they should use water. This was a situation of extreme water crisis and water challenges necessitated utility of savings by the householders. Collectively people shared ideas to manage expenses as well as resources.

One household had a sprinkler irrigation system and another one used a hose to sprinkle on the yard in preparation for sweeping the yard. The sprinkler system was used to lessen the time needed to water the garden and reduces labour by users but increases water consumption. As a result of the water crisis, the sprinkler irrigation use was discontinued and watering was carried out by the use of a bucket either from a jojo tank or bath water as this gave the householders the opportunity to measure and cautiously control the amount of water they used for watering. Hose use was also discontinued. Discontinuing sprinkler irrigation and the use of the hose were viewed as a moral obligation to lessen water consumption during times of scarcity. Continuing with these practice were going to be offensive to other neighbours seeing outdoor activities being carried out and hence social norms including concern for neighbours approval can facilitate undertaking of these kind of practices. These findings illustrate that householders valued convenience but these convenient solutions worsen the problems people are expected to resolve (Shove, 2003b). While sprinkle watering was used to acquire convenience, at the same time it demanded more water which during water shortage period it was even more important to preserve. The convenience of using certain appliances provides an opportunity for a directed behaviour and hence impacting on consumption.

Shove et al. (2012) stress the need to grasp the interconnections between materials, meanings and competences for practices (the section I am turning to). The 3Cs concepts involve the expectations, cultural significance and the social meanings. They illustrate linkages between elements of a practice and how they constitute social order (Shove, 2003b). The findings show these interconnections. Household practices in relation to the three Cs were drastically transformed in Gaborone over the period of water crisis.

6.6 Materials, meanings and competences

The previous chapter sets out how water shortage influenced water use and instigated what could be described as conservation practices in Gaborone. The case of Gaborone demonstrates “how social order exists and is supported by practices” (Reckwitz, 2002b, p. 251). In other words, social order was maintained by people’s capability to shift and adjust elements of their practices, for example, new material objects became necessary and people had to adjust their meanings and develop new competences. Table 6.1 summarizes how elements of practices shifted. With a new situation taking hold in the city, it was shown that people redefined the meanings they attached to practices they performed. As meanings unfold, people change practices as they begin not only to contest the existing practices but also reconstruct meanings, materials and skills in innovative ways in new circumstances (Hargreaves, 2011; Warde, 2005).

Shove and Walker (2010) argue that elements needed to perform a practice differ by context. Materials needed to participate in certain circumstances and the level of skills required will also differ (Røpke, 2009; Shove et al., 2012; Shove & Walker, 2010). In Gaborone, several ways of changing practices began to unfold, ranging from gradual to drastic reconstruction of practices involving alternative changes from previous practices. Gaborone residents needed to keep clean and that called for bathing. The progression of bathing from the use of a bathtub or a shower to the use of a bucket, or bowl and then to a wet cloth to bathe meant that residents needed new skills to bathe. People had to learn new skills to bathe in such a way that all the water collects in the bowl which would later be used for other purposes like gardening or toilet flushing. Buckets and bowls displaced showers and bathtubs during the time of water shortage. From this point of view, understanding the changing materiality of performing practices is vital for understanding the circulation of material objects within and between households (Shove et al., 2012). Hence relevant material objects and skills emerged and or were rediscovered to ensure the performance of this practice as its meaning was transformed.

Meanings are largely influenced by competing practices and meanings can be unstable (Shove et al., 2012). As changed bathing practices spread across the city, meanings also changed. While bathing was maintained, the symbolic significance of bathing in bowls and buckets was not the same as when water was reasonably available and householders could frequently immerse themselves in bathtubs or showers. Bathing became a luxury. When joy derived from bathing became inaccessible because people could no longer soak themselves in water, they felt deprived from one of the true pleasures of life and started seeing water as a luxury instead of a utility as they initially labelled it. In this case all the elements were involved and they all shifted. Bathing first became connected to a bowl and a bucket, then later, as the water shortage increased it became a cloth exercise. Brushing teeth was also performed by avoiding running water from the tap to the use of a cup. The required amount of water was then measured and teeth brushing was linked to a cup. Just like the skills, meanings of bathing and brushing teeth were not restricted to an individual, but were practiced by many people across the city.

The fact that cleanliness is organised by and undertaken in the midst of routines indicates that the doers and practices interconnect (Warde, 2005). The transformation of bathing relates to the number of householders who were involved in this new practice of bathing and when everyone performs the practice, it is not attributed to that individual. As Shove and Walker (2010) argue, it is not about an individual but what an individual does in the process of collectively making a change. From this understanding, Shove et al. (2012) state that it can be argued that people appear to value forms of social significance with the understanding that previous meanings are overlain rather than abolished. As new linkages were broken between bathing elements and new connections between

the elements developed, previous material objects, meanings and competences lapsed while new ones were introduced. The introduction of a bowl and bucket to bathe meant that people could no longer use bathtubs and showers, as a result the meanings and skills for bathing changed.

The expansion of meanings means breaking of others (Shove, 2003b; Shove et al., 2012). The thought of refreshment and relaxation is normally linked to a good sleep but respondents had also found this possible with a nice long bathe. As it was no longer possible to find this comfort, previous elements of comfort were changed and displaced. The concepts of cooling off the body, freshness and relaxation need frequent bathing and showering and people have become dependent on comfort and reliability of supply so much that they felt obliged to satisfy their desire for comfort. The assumption that water is abundant because of the supply infrastructure has created people who are seekers of high levels of cleanliness, comfort and convenience (three Cs) as a result of systems of delivery which facilitate this desire. The technological networks of water provision are the carriers of the three Cs services that promise to convey a happier life with the provision of abundant water. However, as stated, the role of these non-human technological dimensions of water use are often not brought into the analysis of resource use.

The scripting of practices and competences on humans and non-humans are determined by material objects (Latour, 1991). There was a change in how people wash clothes. Old habits of using hands to wash clothes were retraced by those who had found comfort and convenience in using washing machines. Since the frequency of washing clothes had changed, essential clothes were washed and the rest were worn without being washed. People developed skills to tell if the clothes were dirty or not, to wear partly dried clothes and the same clothes many times and still maintain some degree of cleanliness. Cleanliness became focussed on appearance (e.g. collars of clothes). Cultural values and beliefs played a significant role in the use of washing machines (including dish washing machines). The Botswana society disapproves of these modern luxurious applications. Visiting housekeepers or children are preferred to assist with households chores over machines but convenience was still achieved. Apart from encouraging fitness, manual work moulds particularly the growing generation to embrace and subscribe to societal norms and values. These cultural values that were in the process of being superseded became important in the resource-stress context of Gaborone.

In addition, before the water crisis, kitchen utensils were washed using running hot water from the tap. With the water shortages, small bowls were used and utensils with oily food were washed by boiling water and adding detergents to separate oil and water for easy wash up. The new competences acquired were to use detergents and heat to achieve the same effect. Washing of the utensils also required scraping and wiping before washing can be done. It can be drawn from these

illustrations that changing relevance of certain skills and lapsing of others is as a result of what people carry out as individuals and collectively at a societal level (Shove et al., 2012).

Reproduction of practices leads to spreading and shaping of practices (Shove et al., 2012; Warde, 2005). With all these practices being performed, cleanliness was not fully achieved, rather there was an attempt by the people to at least retain and maintain some level of hygiene. Hence the meaning of cleanliness stayed the same but expectations had to shift. Cleanliness was reproduced through practices of bathing, brushing teeth, and washing clothes, kitchen utensils, pots and cutlery. Undertaking these practices contributed to shaping individuals during the irregular supply, which implies that as practices circulated across the households, individuals were transformed by developing specific characteristics from the performed practices (Røpke, 2009). However, emotions of people changed since they could not adequately perform activities they felt they needed to perform because of lack of water. With the situation seeming to improve, some old habits performed at the time of water shortage died out while some were retained. For example, bucket and bowl bathing as well as bucket watering are still relevant in some areas of the city and the skills involved have been retained.

The introduction of new elements of practices leads to and also relies on the disappearance of others (Warde, 2005). The residents used to flush toilets by pressing the button to flush from the full cistern. Modern living and our systems of service provision dictates that everything goes into the wall or underground – out of view. This is an argument made by Kaika (2005) who observes that clean water comes in through the wall and waste goes out because the systems that deliver water on the inside of the house are hidden from the sight of the users and embedded in the walls of houses. While this technology operates in a way that serves the inside logic (Kaika, 2005), it is also seen to be producing a progressively better society in which water is invisible yet important. It is for these reasons that people become disconnected from what happens to their waste and expect it to miraculously disappear by pushing the button. This hidden system of input and output pipes does not require people to be physically and emotionally involved in disposing off their waste. In Gaborone, with water becoming scarce, these requirements for water provision and waste disposal became far more visible and detectable through smell and sickness. Flushing became connected to a bucket and the use of other sources of water such as wastewater. Unlike before the crisis, when freshwater was used to flush everything, wastewater from bath or laundry was scooped from a container to flush the toilet with a bucket. The failure of the piped system delegated responsibility back to householders. New competencies were developed for people to deal with their waste. When people first transformed to using buckets to flush, it felt a bit strange for some people but with time it became a normal activity.

According to Shove et al. (2012), the rate and extent of the circulation of elements depends largely on the existence of material infrastructure at hand and that relevant elements need to go together if practices are to spread or remain in existence. This means that as meanings are scripted in infrastructure, people start to see it as the provider of luxury, and in the case of Gaborone anything less than their expectation was viewed as punishment. The infrastructure brings the illusion and the dream of an enhanced happier society.

With regard to gardening, freshwater was used for sprinkle irrigation. This practice was later changed to using buckets to water plants with wastewater. New skills to water plants by scooping wastewater from the container were learnt. When water was abundant, a garden was a site of beauty and mind relaxation and a place to keep active doing manual work maintaining the garden. With the supply becoming intermittent, residents became passive. Because of limited water, watering of plants became focussed on the use of a bucket.

To perform practices, Røpke (2009) argues that new material objects need to be introduced in order to carry out new practices. To perform daily household activities meant accessing and obtaining water using trucks, cars, trailers, wheelbarrows, bowls, buckets and storage tanks. These material objects played an important role in accessing and enabling the distribution of water and also establishing the reproduction of some practices. Material objects facilitate the establishment of systems of provision (Sofoulis, 2005) and improvisation. The introduction of different materials required different competences which actually changed the meanings attached to different practices previously done. Hence all the elements of practices were shifted but not so far that they could not sustain living, although how much longer people could last without social unrest is impossible to tell. Examples discussed in this section demonstrate that the boundary between material and competence elements is not stable and is likely to change depending on circumstances (Shove, 2003b; Shove et al., 2012). Squatting in the bowl to take a bath or scooping the oily stuff from the pot in preparation for washing, for example, imply defining the skills for the practice of amateur performers. It also suggests there are limits to these new practices - not everyone can squat in a bowl. For example, people with back problems, elderly people and people living with disability could not squat.

As Røpke (2009, p. 2495) asserts, "the emphasis on doing implies attention to the competence of consumers since things are only useful to those who have the skills to use them". These words call for the appreciation of these skilful performers. Human beings are regarded as skilful carriers through which practices are performed (Reckwitz, 2002b). As new materials were introduced in and between households so was the increased need for the householders to acquire new skills to undertake the activities. Material objects are connected together as a network of heterogeneous

artefacts through which practices can be traced (Latour, 1987). A range of material objects, for example storage tanks, buckets, and cars, aided in making changes in practices that the residents of the city of Gaborone adopted to deal with the water situation.

While a network of material objects is needed to perform practices (Latour, 1987), bringing into view the complications, realities and the essentials of everyday life, as has been done in this study, we can see why it is incredibly challenging and complex to change what people are doing. The findings illustrate how the approach of focussing on individuals and seeking to change their attitudes and behaviour in an effort to change their choices is too narrow to capture everything involved in behaviour change interventions (Hargreaves, 2011; Shove, 2003b, 2010). In this research, applying the social practice theory lens to what occurred in Gaborone widened the perspective beyond the constricted frame of individual and apparently rational thinking to encompass other routine aspects of everyday practices, such as usually unidentified competences and material objects (Hargreaves, 2011). Elements featuring in new practices were rolled out across households, repeatedly performed and consequently sustained (Shove & Pantzar, 2005; Warde, 2005) until the disappearance of some when water became reasonably abundant again. For example, storing water was widely practiced while sprinkle irrigation, sprinkling the surface of the compound and the use of washing machines were stopped.

According to Shove and Walker (2010), what practices symbolize depends at any moment on a group of people carrying out the practice, keeping it going; their interaction with the practice defines the meanings they attach to it. In the case of Gaborone, new relations were created and issues of trust became key. People trusted the water that came through the tap, but with water being scarce there were new directions and dynamics to the supply. Residents did not know where the water being sold by unknown providers was coming from, and all of a sudden they did not know whether they would get sick or not. New trust relations with respect to who was providing water had to be developed, for example the Muslim community, the private water sellers and the area councillor were trusted water providers. This creation of new relations brings into view different connections and illustrates what can happen when things are irrevocably changed. People also assumed storage was the solution when they did not know where water was coming from, but all of a sudden people realised storage was not a solution at all as the water was going 'bad' because of the high temperatures. Therefore understanding practices helps to explore relations between elements and the triggers of drastic changes at the individual or societal level (Shove & Walker, 2010).

In Gaborone, people's collaborative efforts in sourcing and managing water gave rise to new identities. Householders had to become water managers and team players. There was increased social interaction between neighbours, friends and relatives as they become water stewards. The

collaborative effort between the residents of Gaborone proved worthwhile in low and middle income areas. It facilitated water sourcing and information sharing among the residents. Although it did not guarantee automatic water supply, it served a good purpose in bringing people together, collectively owning the problem and recognising that such situations can be best dealt with by collective responsibility.

However, while this was the case for participants residing in low to middle income areas, the people from high income areas who were interviewed did not engage in collaborative activities. By taking part in some practices but not others, residents are positioning themselves within the society and in doing so, particular structures of meaning to social order are reproduced (Shove et al., 2012). There are social implications in the sense that those who do not adequately interact with others or their neighbours cannot learn and reproduce practices performed by others. The fact that social interaction was declining in the high income areas of Gaborone is an illustration to the extent which householders can reproduce practices and let others lapse. The high income residents were therefore not the carriers of new practices.

Although collaboration between residents was evident mostly in low and middle income households, many people embraced it such that it became widely spread in most parts of the city. Their collaboration demonstrates that a radical transformation in many places and times in the city occurred. This relationship has implications for how collaboration is perceived and understanding meanings. Collaborative efforts and water storing established new water saving cultures in the low and medium income areas. Where practices are shared between households or any one group, chances of capturing and spreading are high (Shove et al., 2012).

To sum up, practices were altered as new materials, meanings and competences became necessities in everyday life activities under the conditions of severe water shortage in Gaborone. The research findings illustrate the manner in which practices were approached, understood and experienced among the people and how they significantly changed. Table 6.1 below makes a summary of what has been explained above.

Table 6.1: How elements of practices have shifted

How materials have shifted	How meanings have shifted	How competences have shifted	Outcomes of shifts in elements
<p>-From tap to use of storage tanks</p> <p>-From use of shower/bathtub to use of bowls and buckets, cup, wet cloth</p> <p>From the use of running water to brushing teeth to the use of a cup</p>	<p>-From cleanliness to attempting to maintain hygiene</p> <p>-From bathing as a social act to bathing as a luxury</p> <p>From cleanliness to attempting to maintain hygiene</p>	<p>-From sitting in the bathtub or standing in a shower to squatting and wiping the face</p> <p>-From flushing water down the drain to ability to capture wastewater and use it again</p> <p>From free use of water to measuring the required amount</p>	<p>-Storage as the solution</p> <p>-Bathing became connected to a bowl and bucket</p> <p>-Bathing became a cup and cloth exercise</p> <p>-Creation of new relations e.g. trust towards those providing water (from tap to Muslims, area councillor).</p> <p>-Change of emotions e.g. people became moody</p> <p>-Brushing teeth became connected to a cup</p>
<p>From flushing toilet with full cistern to flushing with a water from a bucket</p> <p>From flushing with freshwater to flushing with wastewater</p>	<p>From cleanliness to attempting to maintain hygiene</p>	<p>From pressing the button to flush from cistern to scooping water from a container to flush with a bucket</p>	<p>Flushing became connected to a bucket and use of other sources of water (wastewater)</p>
<p>From supply infrastructure (pipes, dams, wellfields) and reticulation systems to improvising with available water conserving material objects</p> <p>From fetching water from the house tap to use of trucks, cars to access water</p>	<p>From water as a utility to water as luxury</p>	<p>From freely acquiring water to improvising</p>	<p>Acquiring water became connected to introduction of new material objects and associated competences</p>
<p>From using washing machine to hand washing</p>	<p>From cleanliness to attempting to maintain hygiene</p> <p>From laziness to activeness</p> <p>From time-saving to employment generating</p>	<p>From freely choosing clothes to wear, to assess if they are dirty or not</p> <p>From freely wearing clean and dried clothes to ability to wear partly dried clothes and the same clothes over and over and maintaining the cleanliness</p>	<p>Cleanliness became focussed on appearance (e.g. collars of clothes)</p>
<p>-From washing dishes, pots and utensils with hot running water from the tap to boiling water to separate oil and water</p> <p>-From washing using running water to use of small bowls and stopper blocked sink</p>	<p>From cleanliness to attempting to maintain hygiene</p> <p>From laziness to activeness</p>	<p>From using detergents without boiling the water to use washing detergents on heat to change the same effect when washing oily food</p>	<p>Washing became focussed on the use of a bowl</p>

		From freely washing to scraping and wiping of the utensils before washing can be done	
From watering with sprinklers to the use of a bucket	Developed more desire for gardens	From freely watering plants to scooping wastewater from the container	Watering became focussed on the use of a bucket Storage became the solution
From drinking litres of water to measuring and rationing using a cup From preparing heavy meals to light food	From freely available, no concern about quenching thirst to need to careful monitor body water balance and eke out supplies From freely available, no concern about preparing heavy food to preparing light food just for energy	From freely drinking water to measuring the required amount From freely eating when need be to ability to stay for a longer time without eating/survive hunger	Drinking water was restricted to a cup Eating became connected to light food and time (how long one can stay without eating a proper meal)

6.7 Surviving disasters and resilience strategies

Government programmes have been to encourage people to use less but these programmes have not taught the people how best to go about achieving the government's vision of efficiency. In the context of a paradigm that seeks to change individual behaviours, the policy focus on how to manage the demand was limited to improving efficiency but not self-sufficiency. This section focuses on what happens to people who do not have water and provides insights on surviving disasters by illustrating resilience strategies.

6.7.1 Improvisation and experimentation

Kuijer (2014) and Warde (2005) maintain that adapting, improvising and experimenting are important interactions between elements of practices that are created to attain a transformation. Adjusting to situations, focussing on improvising and experimenting with what the environment offers can make and contribute to a significant change. What this means is that people adapt to comfort levels but, through a range of socio-technical solutions to deliver it, can lose their connection with the systems that deliver this level of comfort. In other words, what might start out as comfort becomes accepted as normal everyday life. This research has shown that when that comfort is lost, the people of Gaborone were able to develop skills to survive.

Improvising and experimenting with practices involves acting outside the norm and hence having a different judgement about the situation (Hargreaves, 2011; Warde, 2005). Improvisation and

experimentation with practices places focus on “how options could work instead of whether they work” (Kuijjer, 2014, p. 180), and calls for developing and adopting options that may be intolerable to others because it is their first encounter with the practices. For example, the older generation, many of whom had grown up in rural areas, were familiar with the form of bowl and bucket bathing that was exercised, but the younger generation who grew up in a town found it strange at first to bathe from a small bucket, bowl or even to just wipe the face instead of a full shower/bath they are used to. Similarly, avoiding flushing or using wash up water to flush the toilet as well as wearing the same clothes many times and washing collars of clothes but still maintaining hygiene were practices which gained momentum as the water crisis intensified but were practices which originally were unacceptable to city residents. Probably rural dwellers are more used to not having flushable toilets. In this kind of a resource crisis situation, a whole lot of skills were developed and this is what people could not have envisaged themselves doing before the crisis but learnt to do to help them cope with the situation.

From a social practice angle, interrogating the environment, Gaborone residents were instigating ways which can assist them cope with the water situation. Hence, they introduced new material objects together with competences to perform the new practices. The meanings, material objects and competences have all changed. Introducing new materials can change the meaning of practices and people achieved these meanings through collaborating with each other and sharing water.

When there is water people use it, but when it was intermittent, unpredictable and in some cases unknowable people survived. Practices changed to include washing all the clothes in advance (before water was cut or rationed) and acquiring clothes that can be worn many times without washing them, for example dark coloured clothes that do not show the dirt as much. In terms of flushing, not all the toilet activities were flushed. Flushing only occurred when it was brown and when it was yellow it was left to mellow. It is important to have other alternatives to take care of that waste. Not flushing is a serious issue, not only because of the unpleasant smell but also the safety and sanitation of people and their environment becomes a concern. The use of the backyard by children can create pollution not only to play areas but also to the underground water aquifers because of the untreated raw waste. These activities also attract flies and encourage the spread of diseases. Some people delayed using the toilet as long as they could just to preserve the little water that was available. This practice carried a health risk such as infection of the bladder. Hence one has to wonder how much longer things could have lasted.

A wide range of strategies to cope with the water situation were devised. Water was accessed from either the house when water was back flowing (albeit intermittently) or from alternative areas in and around Gaborone. Strategies for how to obtain and transport water were developed through the use

of cars, trailers, bicycles, wheelbarrows, trucks and heads. The acquired water was then stored and people made sure the stored water lasted them for a reasonable period until the water is flowing again. Storing water provides a valuable buffer when supply is uncertain, and if stored appropriately water should not spoil or become stagnant. However not all residents had the knowledge or skills to do it safely. Some of the things that residents needed advice on included how to ensure the tank is clean and sterile before adding water; how and how frequently to disinfect the tanks; how to manage turbidity (not usually a health problem); how to ensure the tank is shaded from the sun and how much water to store to get them through a period when the regular water source is disrupted. The competences to adequately use the newly introduced material objects for changed practices were lacking.

Many residents bought the biggest storage tank they had space for or could afford, being much more focused on the volume of water, than on the quality water and how it is going to be used. The focus on volume is important. It illustrates the efforts to keep doing what had been done, to emulate the infrastructure and delivery system they had become accustomed to. People who had not stored water before and suddenly start doing it, were storing it in a way that it could easily get contaminated. Bulky tanks often were too large to fit into shaded areas and the high temperatures increased biological activity in the water and reduced oxygen content so the water quality quickly deteriorated. Additionally, most competences were developed by the people on their own learning (without any help from the government), as the government remained focused on supply and efficiency and was disinterested in promoting self-sufficiency. This means the government did not assist in a competency that would have greatly improved the people's ability to maintain hygiene and other factors during the drought.

This research shows that when people are confined to difficult situations they can adapt and work out how they can survive (Warde, 2005). It is in such situations that people are forced to move away from their comfort zones and live according to how the situation dictates. However, people can be much more self-sufficient if they know how to harvest, store and use water efficiently, and at the same time maintain adequate hygiene practices. If people are not adequately prepared to manage ongoing threats to the water supplies, then there is little drive and capability to achieve water use efficiency. The aim of the government was not to encourage self-sufficiency. It was assumed that efficiency was the solution so the water resources could be spread more widely by rationing it. This approach continued to constitute or frame householders as seekers of 3Cs and an abundant resource when both are illusory. This could have been (and still could be) a disastrous situation. Promoting self-sufficiency would appear to be a more appropriate response.

However, this situation opens questions about whether a self-sufficiency approach could be adopted given the reliance of government on people paying for water. The self-sufficiency approach, e.g. issues of health and safety on how to harvest and store water, and how to use the toilet at the same time retaining hygiene practices, would be suggesting a disconnection from the system which is not what governments want people to do. Governments want people paying water bills to the water supplier and enough people are paying for water utilities to pay dividends to the government and infrastructure. Efficiency that might involve disconnection from the system is likely to be an abomination for governments.

However, using social practice theory as a lens to explore how to adapt and survive disasters, illustrates that notions of efficiency and demand management are not only about using less water but also about how you use less water, and what to do when you do not have water or you have less. There are different components expected to survive situations that should be addressed holistically.

Applying social practice theory brings into view the realities, complexities and imperatives of everyday life - it focuses on what people do. It also brings to light the co-evolution of supply and demand and how it has affected people's lives and instilled particular meanings to be derived from water and entrenched particular socio-technological path dependencies and resource use trajectories. The relationship between supply and demand illustrates how we have become addicted to comfort and convenience and how current systems of water provision create expectations, e.g. when water was intermittent, residents defined where their trust lies-trusted those who could provide water like their area leaders (Muslims, councillor).

Collective performance of practices constructs a community of practice (Shove, 2010). Most people were committed to collaborative efforts to better deal with the situation at hand. They developed a shared range of resources (cars, containers etc. to access and share water), experiences (when water was usually available during the night and what happens when water is cut for a little longer), and ways of addressing the problem of water shortage (how to acquire it and lessen the impact of the problem). When this happens, Shove (2010) calls it a community of practice which questions the status quo to embrace relevant societal innovations. According to Shove, a community of practice organises itself, and although not all people will contribute equally towards the societal organisation, there are no regulations to govern people. Hence that gives them unlimited opportunity to explore their environment and develop practices which conform to their expectations and what they deem right. However, to form a community of practice takes time and continuous interaction (Wenger, 1998). Gaborone was a community of practice in a time of resource crisis and it was possible for it to be sustained. But it was constrained since any change has to take place in the context of a range of social norms and rules.

Further, principles for how the resource can be used are set up which include negotiations and agreement for allocations for various water uses e.g. no to hose and sprinkle irrigation, filling of swimming pools and car washes when water is in short supply. When people started knowing that freshwater can no longer be used for anything other than potable uses, innovative ways of how best they can take care of activities requiring non-potable water were devised within their constraints. The residents in Gaborone had to make a shift from their apparently normal way of water use and management to embrace different living conditions as they continued understanding and exploring the water situation.

6.8 Extending the 3Cs

In this study, the concepts of 3Cs describe the dominant services provided by water resources which are cleanliness, comfort and convenience. This formulation is relevant in a western type situation where resources are not usually intermittent or severely disrupted as we saw in Gaborone. In such a context, the 3Cs do not cover everything necessary for life. This study brings into view the imperative and drive for survival that goes well beyond the desire for the 3Cs. The need to drink water as a normal practice and during heat wave period is essential not just convenient. Not having water to cook or drink is more than just comfortable. Water is needed for survival. While the infrastructure constitutes people as seekers of an abundant resource to satisfy desires-cum-imperatives for cleanliness, comfort and convenience, this study shows that important questions need to be asked about the implications of the infrastructure for those dependent on it when the pipes (and governments) can no longer deliver on their promises of abundant water supply. I therefore add an S to expand Shove's model of resource consumption to highlight that water is needed for survival not just pleasure.

6.9 Limitations of social practice theory

Social practice theory investigates how practices transform, and recognises the relevant elements taking place in the processes of change (Shove et al., 2012). It is a creative approach by which social change and stability can be understood and conceptualised (Reckwitz, 2002b). But there is a danger in seeing these elements as too fixed. The elements of a practice (material objects, meanings and competences) are all distinctive but interconnected which makes it potentially disingenuous to separate them out. However, identifying these elements is useful for heuristic purposes and needs to be done to examine their interconnections. Even though it can be a problem, I was able to demonstrate the interconnectedness of the elements and how they constitute social order in a resource disrupted city of Gaborone and the role of material objects in scripting practices. I have also been able to show that these elements shifted which has been shown in the chapters 5 and 6.

6.0 Conclusions

Applying social practice theory brought into view the interconnection between the elements of materials, competences and meanings of household practices in relation to power. It has been shown how these elements have shifted in a time of resource disruption in Gaborone. Evidence of people's ability to transform their behaviour or what they do has been shown through the use of a social practice theory framework of the three interdependent elements that Shove et al. (2012) have identified as combining in a practice. Environmental managers implementing efficiency policy encourage people to conservatively use resources. However, this study found that people do not just use resources. Water satisfies their desires of and apparent imperatives for cleanliness, comfort and convenience. These three Cs explain and legitimise different interconnecting practices people find themselves carrying out. They also demonstrate the interconnectedness between elements of practices and how practices constitute social order. People felt obliged to satisfy societal expectations of cleanliness and live according to their comfort levels with ease. The co-evolved and entrenched relationship between supply and demand encourages people to be highly dependent on the systems of production which actually create expectations that water is always available and abundant and hence shape consumption and the characteristics of the elements of practices related to water use. The water situation in Gaborone forced people to challenge the status quo and transform their old practices: accept the world they were living in, interrogate the environment around them, develop some consistency in their practices and within the constraints they encountered. However, although there was scope for change, there were limits to their adaptability imposed by the infrastructure and the identities it scripts for its users.

Chapter 7

Conclusions and recommendations

7.1 Introduction

This chapter draws together the key findings of the study which describes water shortage as not just a situation that can only be addressed through technical solutions and calls for efficiency but as part of the complex myriad imperatives of everyday life. The chapter will conclude with brief recommendations and areas of future research.

7.2 Conclusions

This study was pursued to understand how the government has responded to the water crisis and how the experiences of water shortages have influenced people's water use and management practices in the city of Gaborone. In exploring the government response and consumption practices through the analytical lens of social practice theory, it is shown that consumption can be explained in two ways: the co-evolution of supply and demand, and the need to achieve acceptable societal standards.

7.2.1 The co-evolution of demand and supply

People were stuck within their normal expectations of water use because the systems of supply instigate water use within the regular infrastructural framework. Most Gaborone residents have not experienced a different system of water supply other than the build and supply paradigm while they have been living in the city which suggests consistency in availability and reliability of water. Concentrating on supply, management solutions result in overexploitation of the available water. The build and supply model creates a strong belief that water is always readily available and that its management is linked to development of water projects and depends entirely on technical solutions. The water crisis in Gaborone has, however, given visibility to the resource that was previously missing due to services embedded in the walls, invisible and hidden underneath the city. During the crisis period, invisible elements appeared and the familiar infrastructural objects known to be providing the services of three Cs started responding in an unexpected and disruptive way. This moment revealed how people are constituted by resource supply technologies that provide taken for granted everyday services.

An expectation by the people is that water will always be available on demand at the turn of a tap. Currently, water in Botswana is commercialised and the organisation mandated with water provision

cannot adequately meet these expectations. People have become dependent on the comforts and the reliability of supply, and so they were stunned when the situation changed and they were not getting the services of cleanliness, comfort and convenience they expected. Acquiring profit through this utility exacerbate the problem of water in the country. The fact that water has been commercialised in Botswana appears to be creating feelings of distrust by the users and other stakeholders on the water provider. The focus on the build and supply model turns water supply into something that can be managed through technological objects while excluding the participation of the society in its management except to follow directives to save water.

7.2.2 The need to achieve acceptable societal standards

Water is used to meet the services needed and desired by the people. While it is standard practice for governments to encourage people to consciously use water, this study has shown that water using practices are shaped by desires, imperatives and conventions that have been conceptualised by Shove (2003a) in terms of cleanliness, comfort and convenience. Water is used for personal hygiene, health reasons and pleasure. Practices associated with these activities are performed to meet the acceptable societal standards in relation to cleanliness and comfort. These expectations are achieved through routines that the people engage in. Routines differ between households depending on circumstances. Convenience is the main service enabling the design of these routines. The concept of 3Cs is a good context that covers issues found in the western type situation but in a resource constrained situation, it misses the need for survival. Thus this research suggests an additional S for survival to the 3Cs. People needed water for drinking and cooking.

Societal standards achieved through the fulfilment of the services of 3Cs dictate how individuals fit into the society. The examples discussed in this study demonstrate that practices changed and that they were flexible but this flexibility was limited. Flexibility was still dictated by the supply infrastructure and the challenges people had in doing their own storage illustrate how their enrolment by the infrastructure left them unprepared for storage failure of the infrastructure. Issues of sustainability therefore lead to questioning how services provided by water resources can be rearranged. Water disruption in Gaborone exemplifies that water shortage can no longer be understood as just a temporary crisis. In the challenging context of recurring droughts the vulnerability of water infrastructure needs to be addressed as part of the complicated myriad essentials of everyday life. For these reasons, a focus on green consumption relating to change of individual behaviour contributes little to addressing this issue. Equally clear is that even the emphasis on cleaner technologies is not sufficient. A holistic approach that encompasses how and why people do what they do is necessary in addressing resource provision and consumption. This involves recognising the material objects, meanings and competences needed to make a change.

People's ability to change their water use behaviour is enabled or constrained by the framework of interrelated elements of social practices, namely material objects, meanings and competences. Residents adapted to the disruptions in their everyday water use and the result has been a change in materiality, meanings and competences. People can adapt their way of living by accepting the world they are living in, interrogating the environment they live in, and developing consistency in practices within the constraints they encounter. Fully understanding ways in which people adjust to changes in water provision can be useful to inform policy aimed at building resilience and adaptive strategies to issues of crisis such as water scarcity. The people of the city of Gaborone present a remarkable example of adaptation to water shortage in many respects for cities finding themselves in a similar dilemma. However, this research illustrates that there is much to learn in order to improve on the supply demand relationship.

7.3 Recommendations

7.3.1 Co-management of infrastructure/resources and social practices

In order to break the trajectory of everyday practices that support an unsustainable producer and consumer relationship, a new paradigm shift is required. Strengers (2011) proposes an alternative demand and resource management paradigm which combines concepts of co-management of infrastructure and social practices. With co-management, the ways in which water resources are provided to householders entails characteristics of collective management and therefore breaking down the production-consumption divide. This research has demonstrated that people are constituted as abundant resource seekers and there is a need for shared responsibility of the water resources. In this case, co-management might involve the introduction of new technology and institutional arrangements that empower users to generate water provision on their own (Strengers, 2011) and "engage [people] in constituting what makes sense to them" (Strengers & Maller, 2012, p. 260).

This notion calls for construction of systems of provision closer to home (Strengers, 2011), for example, provision of subsidized equipment for wastewater reclamation, storm water collection, rainwater harvesting and shelter for storage. In that way people are brought into the process of how infrastructure works and the flows of water will be more visible to people rather than the current systems of provision which are hidden in the walls of houses and underground creating invisible flows. This will also help in building householders' resilience and adaptive capacity and decrease their susceptibility and risks to climate change.

7.3.2 Establishment of an independent organisation

Government restructuring of the services and mandates for water provision were completed in 2013. With the commercialisation of water, its provision was turned from a public commodity to a commercial service and hence the supply is now a profit making enterprise. WUC is required to promote water efficiency. The corporation however, has little incentive for efficiency when its revenue is based on payments for water bills which are better off when more water is used. The WUC charges are based on monthly usage and aim to recover production and transport costs. As long as the ultimate aim of the corporation is profit making, issues like efficiency are secondary and hence there is no incentive to go any further than this to facilitating self-sufficiency, adaptation, resilience and co-management. There is, therefore, a need for an independent organisation to be accorded the responsibility for water efficiency. This will create a fair atmosphere by which the same organisation avoids being a supplier at the same time sending messages of water use reduction while their revenues are dependent on water bills. By so doing, the new organisation and users will liaise and be constituted as part of the design process of a collective change which translate into a real life changed character, rather than exacerbating the current production and consumption relationship.

7.3.3 Development of home grown ideas

Local ideas do not penetrate in the local market in Botswana. It is thus necessary to institute a development council or a local think tank that is accessible to everybody that will look at all the suggestions and see how the country can come up with home grown ideas that can help move forward.

7.4 Future research

Water use and management practices are greatly featured in this study. It would be beneficial to investigate ways in which the value of water can be raised by other means that do not involve financial implications. Research on the impact of pricing water should be instigated.

I have suggested co-management of resources and social practices as a promising method to alter the relationship between production and consumption, it would also be imperative to establish how a co-management paradigm shift might take place in a resource constrained place of Gaborone.

The response by the residents of Gaborone show the shifting of elements and the ever-changing nature of water use practices. According to social practice theory, the mediations and understanding how practices are constituted by elements might shape water use in a certain way. Further studies on the impact of social practices and socio-technical objects to everyday life are therefore ideal.

Extending research in Gaborone (due to its water shortage persistence) would be useful to probe insights and use of water changes that have occurred ever since the start of water shortages.

Understanding and adjusting the taken for granted every day routines according to how the residents understand the impact they have on how they use resources is something that could be explored. Investigating these routines allows for either endorsing or modifying and constraining the existing ones or even eliminating the undesirable ones.

In Botswana, the provision of water has been commercialised. Exploring the difference between people's meanings and expectations of water supply when it was state/public owned and now when it is commercialised is something to investigate. In terms of infrastructure changes, it would be worth exploring other forms of water supply e.g. rainwater harvesting, storm water collection and wastewater use. The impact of these systems can be documented over time and this will also inform other research.

The 2009-2013 water reforms were undertaken to improve service delivery and equity in distribution of water resources. However, it might be worthwhile to conduct a comparative study on water provision in big villages which were initially under the custodian of the Department of Water Affairs and the selected villages and towns currently under WUC to explore the impacts of commercialisation and water provision perceptions.

Finally, this thesis has used the social practice theory lens to consider the practices of *users* of water resources when the supply is constrained or disrupted. It could be fruitful to apply the same lens to the social practices of *suppliers* of water resources. Questions that could be explored include what are the elements (materials, meanings and competences) of the social practices of those involved in developing and managing water resources, how do these influence the type of solutions they design, and how might these change if the goal was co-management of the resource and developing the resilience of householders.

Appendix A

Interview questions

Interview questions used for semi-structured interviews for the public

Questions about the current

1. What age group do you belong to (18-25 years), (26-35 years), (36-45 years), (46-55 years), (56- 65 years), other.
2. Which location of the city do you reside?
3. How long have you lived in Gaborone?
4. How many are you in the household?
5. How can you describe the current water situation in Gaborone?
6. How is it affecting your daily activities (cooking, bathing, laundry etc.)?
7. Do you watch what others do when the pipeline goes down?
8. What routine do you have when you are told there is going to be no water?
9. Can you explain what type of bathe you are? (Showering or...) how frequent do you shower for how long. What do you use to shower soap, shampoo and how often?
10. How do you collaborate with others (neighbours) to source water when there is no water?
11. What does it mean to have limited water?
12. What do you think are the main reasons for all these? (E.g. rain, people or the department responsible for water supply, climate change, rich countries, fossil fuel use) and why?
13. What water system do you have in your household (taps in the house or in the yard)?
14. Describe the water systems your household has access to.
15. Do you have rainwater harvesting tanks?
16. How do you describe how you use water, would you consider yourself a high or low water user?
17. Describe the frequency of washing dishes, doing laundry, showering or bathing. What are you doing and why?
18. How often do you flush the toilet in the process of cleaning?

Questions about the past

19. From your experience with the water shortage in Gaborone, when was the worst period you were severely hit by the water shortage?
20. How can you describe that period/situation?
21. How has the situation changed your life?
22. What did you do during the time?
23. How did you cope?

24. What did you use/ what did you do?
25. How has the situation changed the way you use water?
26. What do you think would make it easier for you to save water?
27. Do you use rainwater water, if yes how and what for?
28. Do you make use of wastewater? What for?

Looking forward

29. What are your expectations about this crisis?
30. Do you see any solution any time soon?
31. What do you think can be done to solve the problem/what are the options?
32. Given the situation, are you willing to change how you use water?
33. Would you be interested in implementing changes which can benefit you and your city in terms of conserving water?
34. What do you think would make it easier for you to save water?
35. Do you think if every household can implement water efficiency measures, water can be saved?

Interview questions used for semi-structured interviews for the policy makers

Water Utilities Corporation and Department of Water Affairs

1. How long have you worked here?
2. What is your role?
3. How do you explain the water situation in Gaborone?
4. Do you live in Gaborone?
5. Are you directly affected by the water situation in Gaborone? (explain)
6. How do you deal with the situation personally?
7. What do you think are the causes for all these?
8. What are the implications of a city with no water?
9. What are the current strategies used to supply water to the city's residents?
10. How effective are the currently implemented strategies? (Successes and challenges for implementing them).
11. How do you reinforce the successes?
12. How do you address the challenges?
13. Are the actions expected to significantly reduce future water stress?
14. According to DWA (2013) 46 % of the water is lost through the NSC leakage, how do you respond to that, what has been done to address this?

15. What have been the responses and attitude of people/ how is the response from people?
16. What are the expectations of the public?
17. What role do you play in ensuring people conserve water?
18. Are the current world water trends and concerns met by the existing legislations, explain your answer.
19. What are the plans of the government regarding the water policies/the way forward?
20. What do you think can solve the issue of water in Gaborone?
21. How do you think enforcing water efficiency measures through the law can assist address the problem?

Demand management

1. What is the current and future water demand of the city?
2. What are new policy areas and options for addressing water shortage?
3. Is there any policy on water demand management?
4. What is it saying?
5. Is it implemented to its fullest to control the demand? Explain your answer

Answer: no...

- a. Why and what can be done to improve the effectiveness of WDM?
6. What are other possibilities, not currently implemented are there to augment supply to the city?

Interview questions used for semi-structured interviews for the NGOs

Somarelang Tikologo and Kalahari Conservation Society

1. How do you describe the water situation in Gaborone?
2. Do you live in Gaborone?
3. Are you directly affected by the water situation in Gaborone?
4. How do you deal with the situation personally?
5. What are the implications of a city with no water?
6. What are the current gaps in addressing water shortage in Gaborone?
7. What role do you play in the water sector?
8. What support to you provide in the water sector?
9. Where do you see this situation in the next few years?
10. What do you think are the causes of all these?
11. How can the problem be addressed?
12. Any anticipated challenges in trying to address the water issue?

Interview questions used for semi-structured interviews for the academics

1. What are the issues surrounding water shortages in Gaborone?
2. Is this a new scenario?
3. Do you live in Gaborone?
4. Are you directly affected by the water situation in Gaborone?
5. How do you deal with the situation personally?
6. What do you think are the causes of all these?
7. What are the implications of the situation?
8. What are the current gaps in addressing water shortage?
9. What is your role in the water sector/ how did you advise the government?
10. What was the reaction of the government to your recommendations?
11. Where do you project Gaborone 5 years to come?
12. What do you think can best solve this problem?
13. Any anticipated challenges in trying to address the water issue?
14. What can be learnt from this situation? /what do you recommend?

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