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**OPPORTUNITY FOR IMPLEMENTING RECLAIMED WATER FOR  
DOMESTIC APPLICATIONS IN SOUTH AFRICA: INSTITUTIONAL  
ENGAGEMENT AND PUBLIC PERCEPTIONS**

*By*

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**A thesis submitted in partial fulfilment of the requirements for the degree of  
Doctor Philosophiae in the Department of Earth Sciences, Faculty of Natural  
Science, in the University of the Western Cape, Bellville**

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## KEY WORDS

Water Scarcity

Water Resources Management

Reclaimed water for domestic use

Institutional Engagement

Trust

Public Perceptions

Emotions

Capability Approach

Equity

Social Justice



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## ABSTRACT

Water scarcity which impacts negatively on humans, as well as on the natural environment, is a real problem facing developed and developing countries. The reuse of wastewater is a critical component of the effective and environmentally sustainable management of South Africa's municipal water supplies. Recycling municipal wastewater for domestic applications is generally less common because people are repelled by the thought of water that has been in toilets going to taps. This repulsion of 'toilet to tap' is a symptom of the disgust or 'yuck' emotion. The study aims to address negative public perceptions by proposing an approach of terms of engagement with local government, which is likely to shift negative responses to more positive responses. The study used a qualitative methodology and a case study design was deployed for the study. Data was collected through individual interviews and focus group discussions and involved the use of Participatory Action Research tools. A sample size of eighty-eight respondents comprised of municipal officials and members from the public. The Capability Approach, which advocates for social justice and well-being is the theoretical framework that grounds this study. Data was analysed using categorical aggregation analysis. The study proposes that inadequate engagement between the institutions and the public is the premise for negative perceptions and emotions because it inhibits public understanding regarding the safety and benefits of the reclaimed water scheme. Equity concerns are particularly visible due to the cleavages created by the past apartheid era. The study argues that there is an over reliance of the Environmental Impact Assessment stakeholder engagement which is the modus operandi of public engagement. The study develops terms of engagement and specifies when and how institutions should engage with the public to avoid obstacles to the implementation of reclaimed water. The study posits that the public should be involved in all decision-making stages, from the initial stages right through to the final stages of the project, giving them an opportunity to make informed choices regarding reclaimed water. This study provides evidence that the interface between the institutions and the public is likely to foster dialogue between the public and local government where reclaimed water is no longer a threat but becomes a solution to water scarcity.

## DECLARATION

I hereby declare that *Opportunity for implementing reclaimed water for domestic applications in South Africa: Institutional engagement and public perceptions* is my own work, that it has not been submitted, or part of it, for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

Ndoh Owen Bella Germaine

Date.....

Signature .....

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Date.....

Witness .....



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## DEDICATION

This thesis is dedicated to my paternal and maternal family.



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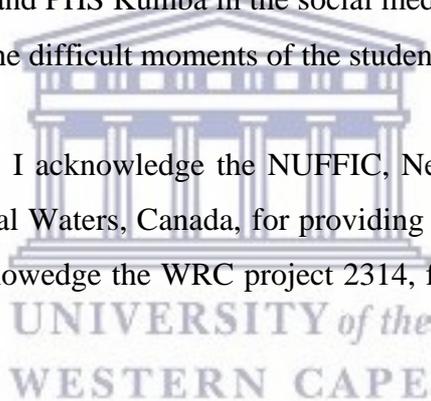
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## ACRONYMS AND ABBREVIATIONS

- ARCWIS: Australian Research Centre for Water in Society
- ASR: Aquifer Storage and Recovery
- AWR: Australian Water Recycling
- CA: Capability Approach
- CBOs: Community Based Organisations
- CGIAR: Consultative Group on International Agricultural Research
- COAG: Council of Australian Governments
- COGTA: Cooperative Governance and Traditional Affairs
- CSOs: Civic Society Organisations
- CUWA: California Urban Water Agencies
- DAD: Decide Announce Defend
- DEA: Department of Environmental Affairs
- DEADP: Department of Environmental Affairs and Development Planning
- DPR: Direct Potable Reuse
- DWA: Department of Water Affairs
- EIA: Environmental Impact Assessment
- EIB: European Investment Bank
- EPA: Environmental Protection Agency
- FAO: Food and Agricultural Organisation
- FBO: Faith Based Organisation
- HIV/AIDS: Human Immuno-deficiency Virus/Acquired Immune Deficiency Syndrome
- I&APs: Interested and Affected Persons
- IDP: Integrated Development Plan
- IPCC: Intergovernmental Panel on Climate Change
- IPR: Indirect Potable Reuse
- IWRM: Integrated Water Resources Management
- IWRMP: Integrated Water Resources Management
- NGO: Non-Governmental Organisation
- NGWRP: New Goreangab Water Reclamation Plant
- NPOs: Non Profit Organisations
- NWQMS: National Water Quality Management Strategy

NWRS II: National Water Resources Strategy II  
NWWTP: Northern WasteWater Treatment Plant  
OECD: Organisation for Economic Co-operation and Development  
PAR: Participation Action Research  
PRA: Participatory Rapid Appraisal  
RW: Reclaimed Water  
SANBI: South African National Biodiversity Institute  
SCADA: Supervisory Control and Data Acquisition System  
SRF: State Revolving Funding  
UN: United Nations  
UNDESA: United Nations Department of Economic and Social Affairs  
UNWWAP: United Nations World Water Assessment Program  
USA: United States of America  
USCB: United States Census Bureau  
WESSA: Wildlife and Environmental Society of South Africa



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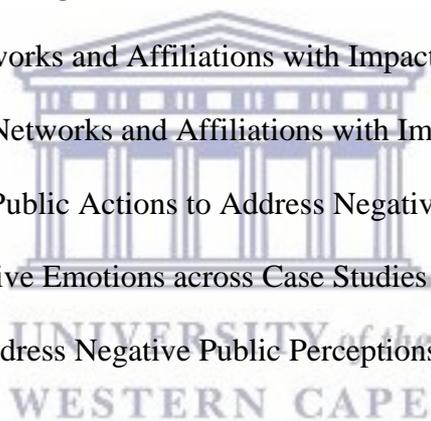
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## CHAPTER ONE

### 1 INTRODUCTION

#### 1.1 Background to the Study

Water scarcity is a global issue and it impacts negatively on humans, as well as on the natural environment. There have been predictions that there will not be enough freshwater to meet the needs of the world's population (Consultative Group on International Agricultural Research (CGIAR), 2006 & Intergovernmental Panel on Climate Change (IPCC), 2007; 2008). According to Lemonick (2013), more than 97 percent of the earth's water is saline which is unfit for drinking; of the remainder, more than two-thirds is frozen in glaciers and icecaps, leaving just 1 percent of all the water on our planet fresh. About one-hundredth of that 1 percent resides in lakes, rivers and other waterways; the rest is in aquifers beneath the surface or trapped in soil (*ibid*). Pressure on this invaluable resource is growing and over the last decades, regional and local water shortages are becoming increasingly common (*ibid*). According to the United Nations World Water Assessment Program (UNWWAP) (2015), the world is projected to face a 40 percent global water deficit by 2030.

The IPCC (2007; 2008) anticipated that climate change will decrease the reliability of water supplies, due to reductions in rainfall, and the increasing variability of rainfall events. Due to higher water temperatures and changes in extreme climatic events, including droughts and floods, water quality will also be affected with many forms of pollution such as from sediments, pesticides, pathogens, salt and dissolved organic carbon being exacerbated (IPCC, 2008). All this is likely to have negative effects on ecosystems, human health and water system reliability as well as on related maintenance and operating costs (*ibid*). In addition, rise in sea level is projected to increase salinisation of ground water as well as the state of estuaries; with the result that freshwater availability for humans and the ecosystems in coastal areas will be reduced (*ibid*). The Food and Agricultural Organisation (FAO) (2011) affirms that water scarcity is growing and that water courses and bodies are polluted, ground water is salinised in coastal areas and the degradation of water related ecosystems are on the rise.

There are multiple reasons that account for increasing water scarcity in the world. Rapid population growth is found to be a major challenge for most cities and this has a serious effect on water due to increases in water demand (Aravinthan, 2006; Vigneswaran & Sundaravadivel, 2004 & United States Census Bureau (USCB), 2012). The world's population is growing by about 80 million people per year (USCB, 2012). By 2050, the world population is predicted to reach 9.1 billion, with 2.4 billion people living in Sub-Saharan Africa - the region with the most heterogeneously distributed water resources (United Nations Department of Economic and Social Affairs (UNDESA), 2013). The situation is exacerbated by accelerated urbanisation, economic development as well as climate change impacts such as droughts, urban floods and reduced run-off. All of which has led to increasing water demands (Cain, 2011; Morrison *et al.* 2009, Piao *et al.*, 2010 & UNWWAP, 2015), causing specific and often localised pressures on availability of freshwater resources, especially in drought-prone areas (UNWWAP, 2015). Global water demand is projected to increase by 55 percent by 2050 and this is primarily due to growing demands from thermal electricity generation, manufacturing and domestic use (UNWWAP, 2015).

Following global trends, in South Africa, rapid population growth is a major challenge for most cities, significantly increasing water demand (Aravinthan, 2006 & Vigneswaran & Sundaravadivel, 2004). Recurrent droughts in some parts of the country have occurred (de Ronde *et al.* 1999; Rouault & Richard, 2003) and dramatically increase water demand. According to the National Water Resource Strategy (NWRS) II, the country's growing economic and social development is giving rise to increasing water demands and the sustainability of the country's freshwater resources has reached a critical point (Department of Water Affairs, 2013).

Water plays a crucial role in human societies and its sustainable management is thus critical. The conservation of water resources is a critical component of the effective and environmentally sustainable management of municipal (South Africa) water supplies (Dolnicar *et al.*, 2011). The NWRS II confirms that the country's limited water resources require careful management to enable the provision of basic water services to every citizen, while meeting the needs of economic growth without compromising the environmental integrity of water resources (Department of Water Affairs (DWA), 2013).

In many instances in the developed as well as developing countries, government and the private sector are coming together to examine alternative ways of providing water including the harvesting of rainwater, storm water, grey water and reclaimed water (Organisation for Economic Co-operation and Development (OECD,) 2009). Within this context reclaimed water for potable applications is an attractive alternative to desalination or alternatives such as expensive dams and it has the potential to augment water supplies, proffering a suitable way to address water shortages (Tchobanoglous *et al.*, 2011; Menge, 2010 & OECD, 2009). The development of water reuse schemes for potable applications in many countries emerges because of scarcity of potable water sources, water pollution control measures, an impulse to protect aquatic environment, variable rainfall, increase water demand and population growth (Jimenez & Asano, 2008; 2010; Rodriguez *et al.*, 2009, Cain, 2011 & Vigneswaran & Sundaravadivel, 2004).

In South Africa, the Department of Water Affairs has set out a number of development projects to ensure that there is sufficient water and of good quality for the socio-economic needs of the country (DWA, 2013). These projects include; the development of surface water resources, trans-boundary water transfer schemes such as the Lesotho Highlands Water Project, groundwater development, seawater desalination, management of acid mine drainage, water harvesting (rainwater and fog) and water reuse (*ibid*). The reuse of water is becoming more acceptable and feasible due to increasing water shortages, improved purification technology and decreasing treatment costs (DWA, 2013). Importantly, within the context of this study, recurrent droughts in South Africa have also led to the decision of recycling municipal wastewater for domestic applications (de Ronde *et al.*, 1999 & Rouault & Richard, 2003).

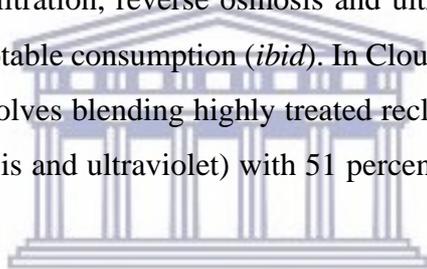
Most of the significant developments in wastewater reclamation and reuse have occurred in arid regions of the world including Australia, Israel, Middle East, Spain, Tunisia and the west and south western United States (Tchobanoglous *et al.*, 2011; Jimenez & Asano, 2008; 2010 & Crook, 2010). Two broad categories of applications for water reuse include: potable and non-potable applications.<sup>1</sup> Non-potable uses include irrigation (for parks, crops, and golf courses), some industrial applications,

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<sup>1</sup> Or domestic and non-domestic uses or applications.

some uses for households, including outdoor uses (such as gardening) and indoor applications (for example flushing toilets or washing machines) (OECD, 2009). Potable applications imply that this water would be suitable for human consumption such as drinking and other household uses such as washing and bathing (*ibid*). Recycling wastewater for potable applications can be done through indirect potable reuse (IPR) or direct potable reuse (DPR) (*ibid*).

Spurred by serious constraints on water resources, several countries, for instance, Singapore, Australia, Spain and some states in the United States of America are pioneering new technologies for potable and non-potable applications (Cain, 2011). Singapore for example, has developed one of the world's most advanced water reuse programs. The reuse program, called NEWater is produced by DPR treatment trains, bottled as drinking water but is used as IPR for tap drinking water. This technology relies on advanced microfiltration, reverse osmosis and ultraviolet exposure to clean and treat wastewater for potable consumption (*ibid*). In Cloudcroft, New Mexico in the USA, the DPR project involves blending highly treated reclaimed water (which relies on chlorine, reverse osmosis and ultraviolet) with 51 percent spring water and/or well water.



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Indirect Potable Reuse (IPR) is a conventional drinking water treatment and has been the status quo in most parts of the United States (Cain, 2011). In California for example, planned IPR by groundwater recharge has been practiced since the 1960s (California Urban Water Agencies (CUWA) *et al.*, 2010). However, despite the success of IPR in the United States, Australia and other countries, there is considerable interest in DPR internationally. DPR offers the most sustainable option as it provides more flexibility than IPR and does not require an environmental or hydraulic buffer (Cain, 2011; CUWA *et al.*, 2010; Leverenz *et al.*, 2011 & Arnold *et al.*, 2012). In a number of countries, limited supplies of freshwater are being augmented via the DPR technique by adding highly treated wastewater to their drinking water treatment process (Cain, 2011 & Lazarova *et al.*, 2013). The practical experience in Windhoek, Namibia, shows that direct reclamation of wastewater can augment potable water supplies even in arid regions, although this does require careful planning, training and on-going commitment for sustainability (Kasperson *et al.*, 1974; Okun, 1985; Crook, 1985 & City of Windhoek, 2005). In Windhoek, one third of the population (250,000 people) is served

this way (OECD, 2009).

According to Schroeder *et al.*, (2012) there are benefits accrued for agriculture, energy conservation and environmental preservation and enhancement through the implementation of DPR. Other alternative solutions to meet urban water supply such as inter-basin water transfer schemes and desalination of brackish and/or sea water, have negative impacts on the environment (*ibid*). With water transfer schemes, water for food production is limited, ecosystems are frequently destroyed and transmission pipelines are subject to damage from disasters such as earthquakes and floods (*ibid*). Desalination entails large energy requirements. Brine disposal poses a serious environmental issue (*ibid*). DPR shows potential for a new and stable source of water supply for cities given its comparatively low energy requirement and less subjectivity to natural disasters (*ibid*). This technique is therefore the most cost-effective alternative for long-term water supply sustainability (Cain, 2011; Tchobanoglous *et al.*, 2011 & Schroeder *et al.*, 2012).

The use of reclaimed water (RW)<sup>2</sup> for potable applications is less common, largely because many people are repelled by the thought of water that has been in toilets going to taps (Lemonick, 2013). According to Po *et al.* (2003) this experience of repulsion of ‘toilet to tap’ is a symptom of the disgust or ‘yuck’ factor. As with any water project, the success or failure of a proposed reuse project depends on public perceptions of how the project relates to public health, public finance, taste and aesthetics, land use, environmental protection, and economic growth (National Academy of Sciences, 2012). A few countries like Australia, Namibia, and United States of America (in particular states such as California, Texas, Kansas, Colorado and New Mexico) are already drinking recycled water, demonstrating that reclaimed water can be safe and clean, and that it helps ease water shortages (Jimenez & Asano, 2008 & Crook, 2010).

According to Boucher *et al.* (2011) the negative public perception and public concerns regarding direct potable use is a result of a lack of awareness about the benefits as well as a lack of awareness of why the process of wastewater reclamation has been embarked

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<sup>2</sup> Or recycled wastewater, reclaimed wastewater and recycled water. These terms are used interchangeably in the literature.

on in the first place. The ‘decide-announce-defend (DAD) approach (Beck, 2009), tends to be dominant and aggravates public mistrust of water institutions because decisions are taken without consultation despite public opposition to this modus operandi.

Several studies (e.g. Beck, 2009; Po *et al.*, 2003 & Po & Nancarrow, 2004) suggest that public acceptance of reclaimed water is a product of attitude, emotion and control over the source of water. Subjective norms are shaped within social contexts. There are a range of factors that contribute to public acceptance: knowledge of the problem, knowledge of the decision-making scheme, associated risks, knowledge of implementing activities and trust in the implementing authority, satisfaction in the quality of the end product, opportunity to make choices, specific use, source(s) of recycled water, cost, water scarcity and lastly a combination of socio-demographic factors (Nancarrow *et al.*, 2008; 2010 & Po *et al.*, 2003). These are factors which have been investigated in various places where water reuse schemes have been implemented or are planned.

The public is more likely to accept water reuse when the range of factors isolated above are taken into consideration. In some instances, knowledge of the problem of water scarcity is a factor that contributes in itself to public acceptance. For example, in Israel which is a semi-arid region with limited water resources, there has been no need to convince the public of the need for wastewater reuse since they are aware of the water shortage (Rebhun, 1985). However, according to Boucher *et al.* (2011) people in Israel are more accepting of reclaimed water when there is no direct human contact. In South Africa, public perceptions are strongly informed by the general attitude that water scarcity is largely to do with poor operation and maintenance of municipal wastewater treatment plants (DWA, 2013) and this perception poses a challenge when municipal officials seek to build trust and public acceptance of direct potable reuse (*ibid*).

To gain public acceptance of direct potable reuse of reclaimed water, Kotler and Zaltman (1971) suggest that it is first and foremost the experts (including engineers, scientists and physicians) who should agree that reclaimed wastewater is safe to use from a public health standpoint. Once there is consensus by the experts, the success of any reuse project is likely to be dependent on the willingness of the public to accept the new source of drinking water (Dishman *et al.*, 1989, Po *et al.*, 2003 & Hartley, 2006).

Public involvement and transparency throughout the process – from the decision-making stage through to implementation - is critical when alternative ways of providing water are considered (OECD, 2009 & DWA, 2013). This is because by engaging the public in this process, the public gains a clear understanding of the water situation first and foremost and of the benefits of using reclaimed water, showing how the water is not only a reliable water source, but that it also decreases the amount of water discharged into the environment (Jhansi & Mishra, 2013) and thus minimises the wasteful use of water.

The role of public participation in natural resource management, development projects and processes is becoming more important as new policies are approved and adopted (Naidoo, 2008). Water management is the responsibility of different decision-makers in the public and private sectors (UNWWAP, 2015; Owen & Goldin, 2015 & Goldin, 2010). However, the challenge is to convey a message that this is a shared concern and that the problem of water scarcity can be dealt with constructively, promoting a platform where different stakeholders gather and participate collectively to make informed decisions (UNWWAP, 2015).

Kraft and Clary (1991) claim that one of the reasons for resistance by authorities to public participation processes is fear that the community might interfere in the decisions of authorities and that this would be counterproductive to the implementation of innovative solutions. However, advancing the understanding of water issues can facilitate real, workable, and implementable solutions tailored to meet specific needs (Environmental Protection Agency (EPA), 2012). The National Water Resource Strategy II argues that top-down consultation should be replaced by citizen's participation, facilitated through community forums and civil society organisation structures, in order to achieve a balance in decision-making processes within a developmental water management agenda (DWA, 2013).

The interactive participation between all interested and affected parties, NGOs and all relevant organs of state is important as it leads to joint decision-making and achievement of more transparent and responsive outcomes (Tortajada & Joshi, 2013). A meaningful participation of communities will broaden the responsibility for effective and sustainable management of water resources and will serve to strengthen

accountability from all stakeholders (Tortajada & Joshi, 2013 & Dent, 2012). It is now recognised that involving the community prior to the uptake of a decision is an important component for obtaining long-term public support in implementing water reuse projects (Recycled Water Task Force, 2003).

Goldin *et al.* (2013) and Wutich and Ragsdale (2008) suggest that people are connected to issues of water in an emotional way. Public acceptance of reuse projects is locked into attitudes and emotions that people have around water. These attitudes and emotions play an important part in determining whether or not new technologies, such as reclaimed water for potable applications, will be accepted or not. As Goldin (2010) claims, attitudes and emotions are embedded within social structures and subjective beliefs, norms and values that are the product of interaction between people who engage or disengage and in the process create opportunities to influence one another.

The focus of this study<sup>3</sup> is on the interface between the public and the municipalities who serve them. It illustrates the links between perceptions and emotions and claims that perceptions generate emotional responses which further shape public decisions to accept or reject reclaimed water. It is at this interface that trust is brokered or/and destroyed. According to Owen and Goldin (2015), trust is a vital asset or – as described in the theoretical chapter of this thesis – a critical intangible good – because it offers freedom to engage with people and to learn what works and does not work. Trust enhances collaboration (Goldin, 2010 & Owen & Goldin, 2015) and bearing in mind that collaboration is about working together, it would be hard for municipalities and the public to work together when trust is a scarce resource. According to Luhmann (1979,

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<sup>3</sup> This study draws from the wider study of the Water Research Commission of South Africa (WRC) project K5/2208, which is “An investigation into the social, institutional and economic implications of using reclaimed water for potable applications in South Africa.” The WRC study objectives amongst others include: to develop strategies that can be used to influence public opinion regarding the use of reclaimed water for potable applications: to develop strategies for ensuring safety and monitoring the quality of reclaimed water: to develop a tool that will allow planners and water utilities to predict potential public behaviour in relation to the proposed water reuse schemes. The researcher was actively involved in the project and took a key role in the social team that looked at the applicability of two social theories (The Capability Approach and the Social Network Theory) deployed for the study. This thesis discusses the applicability of one of these theories – the Capability Approach.

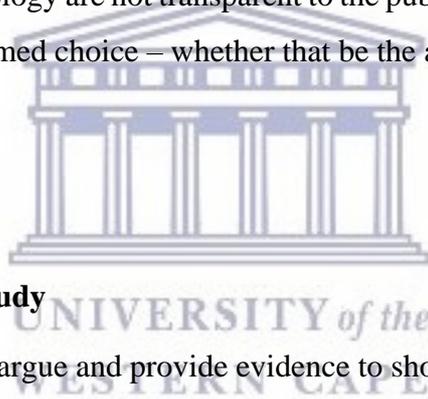
p. 8), “when there is trust, there are increased possibilities for experience and action.” And as Goldin (2015) claims, it is of intrinsic value – as well as instrumental value – to provide an opportunity for people to express their fears, hopes, concerns etc. and to be heard to be doing so. As Martin *et al.* (2010) suggests, this is far better than speaking on their behalf. Negative perceptions can change when the public is involved and when adequate responses are provided directly (and timeously) to their negative perceptions (*ibid*).

The racial, religious and cultural diversity of South Africa, with cleavages aggravated by the legacy of apartheid, has created a particularly divided society in which social groups are locked into their particular traditions and beliefs. These cleavages have generated differences in perceptions amongst the general public, differences, which cause tensions and have repercussions on the public perceptions of RW. These racial, religious, class and cultural differences make the South African case for RW particularly interesting and challenging. Public perceptions are shaped not only in the way that municipalities present the issue of RW but by the convolutions and patterns of difference that abound.

## 1.2 Problem Statement

The principal challenge in the implementation of RW, especially for domestic applications is not around the technological know-how but rather the challenge of gaining public acceptance of RW. This is often linked to people’s perceptions and beliefs (Chen *et al.*, 2015). Although there are some ‘success stories’ as discussed above, on the whole public perceptions around the use of RW for domestic applications are negative in both international and local cases. Scholars (Hartley, 2003; 2006; Po *et al.*, 2003; Cain, 2011 etc.) have shown that the public in most communities has little or no knowledge of what a reuse scheme entails and very little knowledge around issues pertaining to water quality. This knowledge deficit can be attributed to inadequate engagement of institutions (predominantly municipalities) with the general public. A disconnect – at the interface between municipality and public - results in low trust or complete distrust which is likely to result in the outright rejection of RW for domestic applications. It follows that the implementation of RW for domestic applications can be achieved only if public perceptions are adequately addressed.

In South Africa, public perceptions are being considered as the principal obstruction for the successful implementation of reclaimed water for potable applications. In eThekweni municipality, for instance, the implementation of DPR has in fact been halted due to negative perceptions and lack of political support from the water institutions themselves. On the other hand, in the town of Beaufort West, DPR has been successfully implemented despite the fact that efforts to addressing public perceptions were minimal. Furthermore, in this site, there is very little documentation on the ‘how to do it’ making it more difficult for other sites to replicate and improve upon Beaufort West’s strategy. As a result, other municipalities, which are planning to adopt RW, such as the Overstrand in the Southern Cape, do not have much to draw on when embarking on the process of implementing RW. Without adequate engagement between the service providers (municipalities) and the end users (public) first of all around the issue of water scarcity and then around the issues related to the proposed solution via RW, the benefits accrued from such a technology are not transparent to the public. The public is therefore limited in making an informed choice – whether that be the acceptance or the rejection of RW.



### **1.3 Aim of the Study**

#### **1.3.1 The Aim of the Study**

The aim of this study is to argue and provide evidence to show that it is at the interface between the public and the municipality that perceptions are shaped and that there are ways in which these spaces can open up public debate where the issue of RW is no longer a threat but a solution to water scarcity. The study proposes an approach that could enable institutions<sup>4</sup> to address negative public perceptions by addressing inadequate public engagement, which hinders the implementation of RW in municipal contexts.

#### **1.3.2 Objectives of the Study**

The objectives of the study are to:

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<sup>4</sup> There are several institutions, which are interconnected in dealing with water issues. DWA for instance is the regulatory department, but for the purpose of this study, institutions refer to municipalities as service providers.

- Investigate reasons contributing to the adoption of reclaimed water for domestic applications and the implication on public decision towards reuse
- Examine ways in which institutions engage the public with regards to the implementation of reclaimed water for domestic applications and the implications of this modus operandi on public decision around reclaimed water
- Identify predominant public perceptions and the way in which these perceptions impact on the implementation process around reclaimed water for domestic applications
- Address negative public perceptions by proposing terms of engagement that result in positive perceptions around reclaimed water

#### **1.4 Theoretical Framework and Research Design**

The Capability Approach (CA) has been used as the theoretical framework for this research and it is an approach that seeks to evaluate a wide range of projects and programs around civil society issues (Sen, 1999). It is especially appropriate where people are engaged with decisions that affect their lives – in this case the decision to use – or not to use, reclaimed water. It has been used in many studies including, the evaluation of institutional settings in the context of water resources management (Goldin *et al.*, 2013), assessing youth capabilities and food security in a rainwater harvesting project (Owen & Goldin, 2015) and climate change contexts (for example, Gender and Climate Change in the Water Research Commission project K5/2314 and Climate Justice (Atique, 2014, Goldin *et al.*, 2016). The CA does not prescribe a rigid list of capabilities but rather it is an approach that allows for complementary ideas around social justice, equity, trust and so forth to be incorporated into it. It has been used within the context of this research to better understand public perceptions and engagement processes around the introduction and use of RW for domestic applications by shining the torch on a wide range of ‘intangible goods’ such as trust, disgust, fear, self-esteem, confidence and pride.

The study uses the qualitative approach, which allows for an in-depth understanding (Babbie & Mouton, 2001) of ‘intangible assets’ and the underlying reasons for negative public perceptions. The research design used for this study is that of a multiple (embedded) case study design (Yin, 2009 & Baxter & Jack, 2008). A case study

approach is considered suitable for empirical phenomenon within the real life problem context (in this case public perceptions and engagement process) and particularly when the researcher has little control over events (Yin, 2003). As such, the researcher gains insight into the issues around RW as the processes of data collection unfolds.

Three case study areas were selected in South Africa as sites of investigation: Beaufort West, Overstrand and eThekweni Municipalities. These sites were deliberately chosen because of their different levels of engagement with the concept of RW. In Beaufort West, reclaimed water has already been implemented whilst in the case of Overstrand and eThekweni, the municipalities are still in their planning stage. eThekweni is at a more advanced stage than the Overstrand and was about to implement, but the process has been stalled due to negative responses from some segments of the population. There were two units of analysis for this study (Babbie & Mouton, 2001) namely, municipal officials and public respondents. Public respondents were targeted from a wide range of stakeholders including; non-governmental organisations (NGOs) representatives, religious leaders, individual and group community members and leaders/elders, schools (principals and learners) and media representatives (radio and print).

Two types of data collection were used namely, secondary and primary data collection. Secondary data was obtained through a desktop literature search using the Internet, books, libraries, reports, journal articles and newspapers. Existing literature was used to unravel the complexities around public perceptions and engagement processes first at the global level and then to develop a framework that could be applied at the local case study level.

Primary data was gathered through individual or face-to-face interviews, telephonic interviews and focus group discussions. Semi-structured interview schedules were administered for the face-to-face interviews and participatory methods, in particular Participation Action Research (PAR) were used to extract data from focus group discussions. The PAR is used in this study as a process to produce data in a participatory way. PAR methods included, a Story with the Gap, Emoticons, Venn Diagrams, Participatory Community Mapping and the Resistance to Change Continuum. Data was analysed using categorical aggregation analysis. Data was clustered according to sub-

themes under the corresponding four main themes namely, knowledge, social capital, emotions and perceptions.

### **1.5 Expected Outcomes**

The anticipated outcomes of this study include:

- A deeper understanding of the impacts of the decision for using reclaimed water on the public
- Improving the engagement process between the institutions and the public by providing evidence of instances where engagement has brokered or broken trust relations between municipalities and the public
- The development of an approach to address public perceptions and public engagement towards reclaimed water for domestic applications

### **1.6 Limits of the Study**

The study is limited to recycling of municipal wastewater for domestic applications only. The study focuses only on the role of municipalities in engaging with the public and on social aspects including emotions and perceptions in the reuse scheme. Other aspects such as detailed treatment processes and the economics of reuse of wastewater in a wider sense are beyond the scope of this study.

### **1.7 Significance of the Study**

The researcher makes three contributions; the one has theoretical implications, the other has practical implications and lastly, research methods implications. On the theoretical side, the researcher advances the benefits of the Capability Approach, which considers ‘intangible’ assets such as emotions and which has not yet been applied within the context of wastewater reuse in general and for domestic applications in particular.

On the practical side, the researcher proposes an approach that is more likely to shift negative perceptions of reclaimed water into acceptance. This approach aims to improve the way in which municipalities engage with communities to advance the claims of use of reclaimed water as a solution to water scarcity. The premise is that the proposed approach will foster trust and a range of positive emotions such as pride, dignity, hope etc. because it brings people into the decision-making processes. In so

doing it pays attention to positive ‘intangible assets’ such as trust, self-esteem, confidence, hope and pride as well as the negative ‘intangible assets’ such as fear, disgust etc. In the long run, an approach that is able to take negative ‘intagibles’ such as fear and mistrust and convert them into positive ‘intangible’ assets such as hope and trust is likely to help change public perceptions on the reuse scheme for domestic applications and in so doing to better promote DPR as a solution to water scarcity.

On the research methods side, the study opens up the Capability Approach by introducing the Emoticon tool and emphasising the usefulness of this approach when considering addressing public perceptions in DPR.

## **1.8 Structure of the Thesis**

The thesis is divided into six chapters. Chapter one introduces the study background, the aim and objectives, problem statement, rationale, methodology and gives an outline of the thesis. Chapter two gives a review of literature on reasons for adopting reclaimed water for domestic applications, the role of institutions (including service providers) in engaging with the public, perceptions on RW and how this informs public’s decision regarding RW, and strategies for introducing RW. Chapter three presents the methodology, expands on the qualitative methods and tools used and explains how the data is organised and analysed. This chapter also introduces the theoretical framework for the study and the application of this approach within the context of reclaimed water for domestic applications. Chapter four presents the results and findings of the study objectives. Chapter five provides a discussion of the findings. Chapter six gives the conclusion of the study and provides recommendations.

## CHAPTER TWO

### 2 LITERATURE REVIEW

#### 2.1 Introduction

Around the globe, there are sites where the use of reclaimed water for domestic applications has become a viable option for water augmentation as a response to water scarcity. This chapter surveys the relevant literature covering specific aspects of reclaimed water and highlights the gaps in addressing negative public perceptions around the use of reclaimed water for domestic applications.

The term wastewater reuse is often used synonymously with the terms wastewater recycling and wastewater reclamation. For the purpose of this research, wastewater reclamation refers to the treatment or processing of wastewater to make it reusable, while 'wastewater reuse' refers to using wastewater in a variety of ways. It should be noted that 'reclamation' or 'reuse' of water frequently implies the existence of a pipe or other water conveyance facilities for delivering the reclaimed water (Asano & Bahri, 2010). Because, the general public often does not understand the quality difference between treated and untreated wastewater, many communities have shortened the term to water reuse, which creates a more positive image (Lemonick, 2013).

This chapter is divided into five main sections as follows: 1) overview of water management strategies, 2) reasons for adopting reclaimed water for domestic applications, 3) role of institutions in reclaimed water 4) factors influencing public perceptions and 5) approaches and strategies for addressing public perceptions.

#### 2.2 Reasons for Adopting Reclaimed Water for Domestic Applications and Impacts on Public Decision

##### 2.2.1 Overview of Water Management Strategies

Fresh water accessibility to meet the increasing needs of humanity is a grave concern (Lemonick, 2013). The burden on existing water resources has increased because of rapid urbanisation, economic booms, climate change impacts, drought and increased

urban populations all of which have resulted in high water demand (Aravinthan, 2006; Vigneswaran & Sundaravadivel, 2004; Cain, 2011; Piao *et al.*, 2010 & Bahri, 2012). Drought, attributable in significant part to climate change, is already causing acute water shortages in large parts of Australia, Asia, United States and Africa (Morrison *et al.*, 2009). South Africa is no exception and some parts of the country, such as the Northern and Western Cape Provinces have a semi-arid climate where drought is a normal recurrent feature (de Ronde *et al.*, 1999; Rouault & Richard, 2003 & Ivarsson & Olander, 2011).

Urban water management has become more integrated as cities struggle with unprecedented patterns of urbanisation and an uneven spread of water and sanitation services, along with increasing water quality crisis that threaten water security around the world (Corcoran *et al.*, 2010). Improving urban services provision is viewed by the United Nations (UN) Habitat as part of Integrated Water Resource Management (IWRM), where the demand-side is acknowledged as of immediate and significant relevance to water and sanitation management (UN Habitat, 2003).

The integration of local communities into solving problems of water management is critical (Bahri, 2012; DWA, 2013; Tortajada & Joshi, 2013 & Dent, 2012). In general, whenever individuals face problems unsolvable on their own they tend to come together to find solutions, so that when there is a crisis that multiple stakeholders acknowledge is affecting their essential interests, collective action is doable (OECD, 2003). Collective action becomes a necessity rather than opting for individual choice. This is in line with theories by Wolf (1998) and others (for instance Alam, 1997 & Priscoli, 1992) that there is more co-operation than conflict when it comes to a crisis and that individuals are more likely to co-operate than not to find a solution to a common problem.

There is a need to urgently find alternative water resources to supply the growing population and to address the impacts of climate change and economic growth that aggravate shortages of water. Water conservation and demand management, desalination and wastewater reuse are some of the strategies that have been proposed in the South Africa National Water Strategy II (2013) to supplement dwindling water sources. Reclaimed wastewater for potable purposes has also become a viable

alternative (Cain, 2011; OECD, 2009; Tchobanoglous *et al.*, 2011; Jimenez & Asano, 2008; 2010 & Crook, 2010). In Africa (including South Africa) and in urban cities located around coastal areas, there is the possibility of desalination of sea water whereas the inland cities explore wastewater reuse – but as a last resort for direct potable use to combat water shortage (Aravinthan, 2006).

## **2.2.2 Reclaimed Water as Alternative Water Augmentation Option**

The use of reclaimed water attracts considerable attention, as it provides an alternative source of water (OECD, 2009; Cain, 2011; Bahri, 2012; Tchobanoglous *et al.*, 2011 & DWA, 2013). The foundation of water reuse is built upon three principles: (i) providing reliable treatment of wastewater to meet strict water quality requirements for the intended reuse applications, (ii) protecting public health, and (iii) gaining public acceptance (Asano, 2002; CUWA *et al.*, 2010 & Khan, 2013).

### **2.2.2.1 History of Reclaimed Water**

The process of reclaimed water has been around for several millennia. The Minoian civilisation built the first recorded system in 3000 BC, in Crete, Greece (Boucher *et al.*, 2011). The Minoans used wastewater for irrigation of their crops, and since then most improvements in wastewater reuse occurred in the mid-19<sup>th</sup> century with the creation of sewage systems, flush toilets and water-piping systems in homes (*ibid*).

The development of human societies is heavily dependent upon the availability of water with suitable quality and adequate quantities, for a variety of uses ranging from domestic to industrial supplies (Vigneswaran & Sundaravadivel, 2004). The need for increased water for the growing population in the new century is generally assumed, without considering whether available water resources could meet these needs in a sustainable manner (*ibid*). The question of where the extra water is to come from, has led to a scrutiny of present water use strategies (*ibid*). As one considers the rational use of already available water, it becomes evident that if used sensibly, there could be enough water for all – an approach that identifies recycling of wastewater as a viable option (*ibid*).

Wastewater discharges from domestic, industrial and agricultural practices pollute more than two-thirds of total available run-off through rainfall, thereby leading to what can be called “man-made water shortages” (*ibid*). Despite the seeming abundance of water, water scarcity is endemic in most parts of the world (*ibid*). A study by Noga and Wolbring (2013)<sup>5</sup> on perceptions of water revealed that participants in the study showed very little concern about running out of water. The authors note that the reason could be because most of the participants live in Canada and the USA where water is abundant. The authors however note that despite the seeming lack of interest in running out of water, conservation efforts in these places are still apparent. Given the large quantities of wastewater generated by domestic, commercial and industrial activities, wastewater has the potential to become a valuable water resource that can be reused at a variety of scales ranging from a decentralised household level to large-scale centralised reuse schemes from wastewater treatment works (Pithey, 2007 & Bahri, 2009). Reclaiming water is not only important for water supply but it also helps in reducing the amount of wastewater discharged to the environment (Pithey, 2007).

The (direct and indirect) use of reclaimed water for potable applications, however, is less common, largely because many people are repelled by the thought of water that has been in toilets going to taps (Lemonick, 2013). Although the idea of reclaiming water may be repugnant to the public, technologically, the use of treated wastewater effluent for potable applications has been feasible for many years (Menge, 2010). Most of the significant developments in water reclamation for (direct or indirect) potable applications have occurred in arid regions of the world including Australia, Israel, Middle East, Spain, Tunisia and the West and South Western United States (Tchobanoglous *et al.*, 2011). A few countries like Australia, Namibia, and United States of America (states such as California, Texas, Kansas, Colorado and New Mexico) are already drinking reclaimed water, demonstrating that such purified water can be safe and clean, and that this practice can help ease water shortages (Asano & Bahri, 2010 & Crook, 2010). These examples provide an indication of the potential of reclaimed water for DPR as an alternative viable water augmentation option. Therefore, it is evident that there are classic examples of using reclaimed water for direct potable

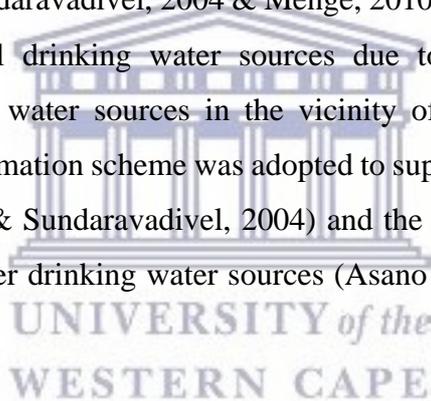
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<sup>5</sup> An online survey conducted on perceptions of water and water related issues. The total sample size was 164 with 74 participants from Canada, 65 from the USA, and 1 each from Taiwan, France, Austria, UK, Norway, Finland and Italy.

applications in many countries. The most well known examples being USA (Kansas) and Namibia (Windhoek) and most recently Beaufort West (South Africa).

In the USA, the first reclaimed water for direct potable applications occurred in 1950s in the town of Chanute, Kansas due to a continuous drought for five years, which resulted in the drying up of the river Chanute in 1956 (Crook, 2010; Vigneswaran & Sundaravadivel, 2004). After considering all other alternatives, the river was dammed just below the towns' sewage outfall, and the treated wastewater was used to fill the potable water intake pool (*ibid*).

In Windhoek, Namibia, because of extreme drought conditions, extensive research was conducted in 1968 on direct potable reuse technology and an epidemiological study was conducted to assess the health effects of reclaimed water consumption (Asano & Bahri, 2010; Vigneswaran & Sundaravadivel, 2004 & Menge, 2010). The city approached the limits of its conventional drinking water sources due to severe water shortage. Groundwater and surface water sources in the vicinity of the city had been fully harnessed. The water reclamation scheme was adopted to supplement the potable water to the city (Vigneswaran & Sundaravadivel, 2004) and the highly treated wastewater was commingled with other drinking water sources (Asano & Bahri, 2010 & Menge, 2010).



#### **2.2.2.2 Different Uses of Reclaimed Water**

Producing reclaimed water of a specified quality to fulfill multiple water use objectives is now a reality due to the progressive evolution of water reclamation technologies coupled with regulations and environmental and health risk protection. However, the ultimate decision to promote water reclamation and use is dependent on economic, regulatory, public policy and, more importantly, public acceptance factors around concerns of safety and the need for reliable water supply in local conditions (Asano & Bahri, 2010).

The use of reclaimed water can reduce the demand for fresh water resources, diversify water sources and enhance reliability of access to the resource; it can also reduce the volume of wastewater discharged into the environment (OECD, 2009). The two broad categories of applications include: potable and non-potable applications. Potable or

domestic applications occur when reclaimed water is directly or indirectly treated and supplied to consumers for drinking, washing, bathing etc. Non-potable or non-domestic applications include irrigation (for parks, crops, and golf courses), industrial applications, households (including outdoor uses such as gardening and indoor uses such as flushing toilets or washing machines (*ibid*).

***a) Non-domestic Applications***

Jhansi & Mishra (2013) propose that the growing use of recycled water for irrigation, landscaping, industry and toilet flushing, is a good way to conserve our fresh water resources. Recycled water is also used to replenish sensitive ecosystems where wildlife, fish and plants are left vulnerable when water is diverted for urban or rural needs. In coastal areas, recycled water helps recharge groundwater aquifers to prevent the intrusion of saltwater, which occurs when groundwater has been over pumped (Asano & Bahri, 2010).

While agricultural irrigation reuses in general require lower quality levels of treatment, domestic reuse options (direct or indirect potable) need the highest treatment level. The level of treatment for other reuse options lies between these two extremes (Vigneswaran & Sundaravadivel, 2004). The type of treatment process of the wastewater will have economic implications (*ibid*).

***b) Domestic Applications***

In the context of trends in urban development, wastewater treatment for domestic applications (including, washing, drinking and cooking) deserves greater emphasis. Treatment costs are very high because the water has to meet stringent regulations which tend to be increasingly restrictive, both in terms of the number of variables to be monitored as well as in terms of tolerable contaminant limits. Despite these precautions, its reuse for potable applications raises concerns in public health, and also religious and cultural concerns among consumers (Po *et al.*, 2003). Water reclamation is particularly attractive in the situation where available water supply is already overcommitted and cannot meet expanding water demands in a growing community. Increasingly, society no longer has the luxury of using water only once (Vigneswaran & Sundaravadivel, 2004).

### **2.2.3 Reclaimed Water for Domestic Applications**

Extreme scarcity of freshwater resources for drinking purposes in many parts of the world creates a dreadful situation that must be addressed (Cain, 2011). Millennium Development Goal Target 7.C is to “halve by 2015, the proportion of people without sustainable access to safe drinking and basic sanitation (WHO & UN Water, 2010). Establishing a method of supplying stable, sufficient and safe drinking water to communities is crucial (Cain, 2011). As a result, the adoption of wastewater reuse for domestic applications has become an alternative option to augment the water supply (*ibid*).

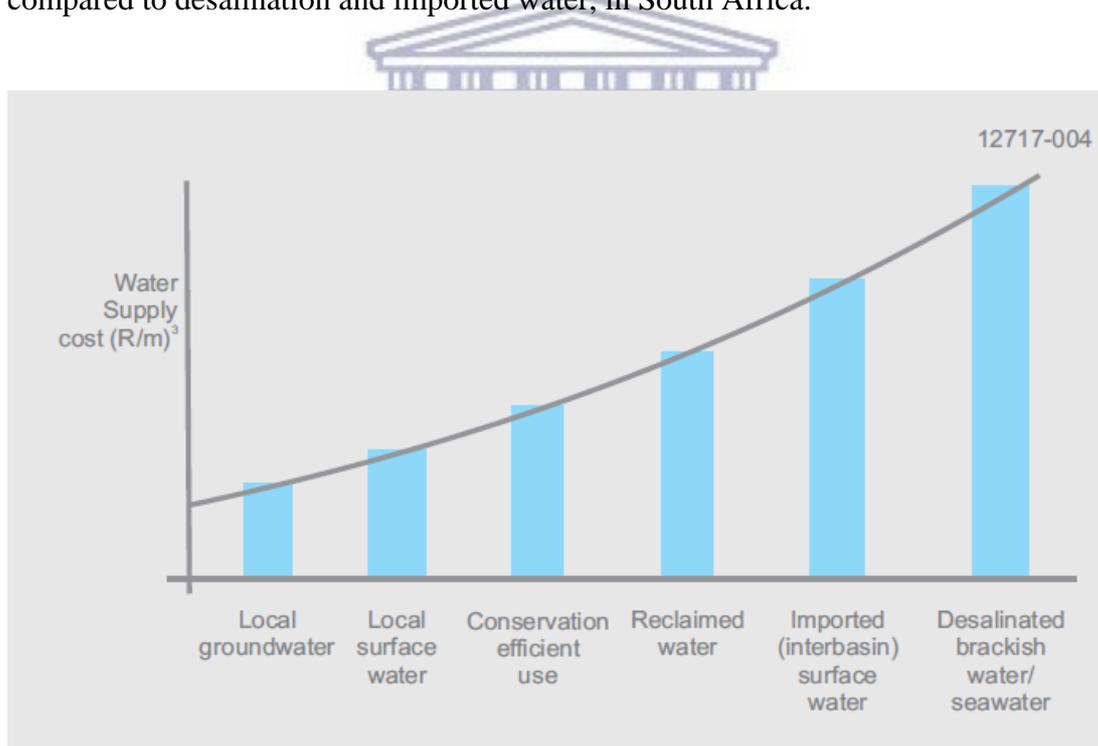
#### **2.2.3.1 Reasons for Adopting Reclaimed Water for Domestic Applications**

Rapid population increase in urban areas gives rise to concerns about appropriate water management practices (Jhansi & Mishra, 2013). Inadequate water supply and water quality deterioration is a major concern in many parts of the world (Cain, 2011 & Smith, 2011). Furthermore, water resources are unevenly distributed, leading to intense regional and local water shortages (Kochhar *et al.*, 2015 & Asano, 2002). The problem of available water is all too often exacerbated by surface and groundwater pollution and unsustainable water resources management (EIB, 2009 & Bahri, 2012).

Several scholars have identified reasons that have triggered or may trigger the reuse of reclaimed water for domestic applications. Some of these reasons include; the right to water and exponential economic growth (Cain, 2011), climate change impacts and high population growth (Cain, 2011 & Morrison *et al.*, 2009), recurrent droughts (Cain, 2011; Morrison *et al.*, 2009; de Ronde *et al.*, 1999 & Rouault & Richard, 2003) and rapid population growth (Aravinthan, 2006; Jimenez & Asano, 2008 & Cain, 2011). Vigneswaran and Sundaravadivel (2004) identify the costs associated with water supply or wastewater disposal, opportunities to augment limited primary water sources, prevention of excessive diversion of water from alternative use and possibilities to manage in-situ water sources. Over above the issue of scarcity, water pollution control measures, and an impulse to protect aquatic environment, increase water demand (Jimenez & Asano, 2008; 2010; Rodriguez *et al.*, 2009, Cain, 2011 & Vigneswaran & Sundaravadivel, 2004) are amongst the reasons for the use of reclaimed water for direct domestic applications.

Other reasons for opting for reuse for domestic applications include; depletion of available water sources (Keremane, 2011), lack of alternative water resources and limited supply of fresh water (UNESCO, 2003), limited traditional surface water sources, overdraft of groundwater and lack of available alternatives in the proximity of the demand (Tchobanoglous *et al.*, 2011) and decreasing, irregular rainfall patterns with reduced runoff (Foley *et al.*, 2007). Cain (2011) & Kamizoulis *et al.* (2005) are concerned with the environmental impacts – poor effluent quality and stringent policies for wastewater discharge and limited water resources (water scarce environment threatened by pollution).

Kamizoulis *et al.* (2005) and Tchobanoglous *et al.* (2011) point out the cost effectiveness of using reclaimed water compared over and above other alternatives such as desalination. Figure 2.1 below shows the cost effectiveness of reclaimed water compared to desalination and imported water, in South Africa.



**Figure 2.1: Comparative cost of different water sources (source: South African National Water Resource Strategy, 2013).**

Scholars have advanced the benefits of using DPR technology over IPR technology. According to Steirer and Thorsen (2013), the cost of treating reclaimed water for domestic application can be significantly lower if no buffer dam or reservoir for storage is constructed. This implies that pumping reclaimed water directly to the normal water

treatment plant can reduce the cost of water as there will be no cost related to the construction and management of reservoirs used for storage.

Table 2.1 below presents the reasons for reclaimed water for domestic applications in selected international case studies.

**Table 2.1: Reasons for Reclaimed Water for Domestic Applications: International case studies<sup>6</sup>**

Australia	USA				Namibia
	New Mexico	California	Colorado	Texas	
<ul style="list-style-type: none"> <li>- Droughts</li> <li>- No potential additional water resources (depletion)</li> </ul>	<ul style="list-style-type: none"> <li>- Drought</li> <li>- Need for long term alternative</li> </ul>	<ul style="list-style-type: none"> <li>- Semi-arid climate</li> <li>- Limited local water sources</li> <li>- No large ground water basins,</li> <li>- Increasing costs of imported water</li> <li>- Pipelines bringing imported water across earth quakes faults</li> <li>-Reduced snowpack and runoff</li> </ul>	<ul style="list-style-type: none"> <li>- Construction of an advanced water treatment plant</li> </ul>	<ul style="list-style-type: none"> <li>- Severe drought conditions</li> <li>- Reduction in reservoir yields</li> <li>- Growing water demand</li> <li>-Increase population</li> </ul>	<ul style="list-style-type: none"> <li>- Desert conditions</li> <li>- Water shortages</li> <li>- Repeated periods of erratic rainfall</li> <li>- Droughts</li> <li>- Cost importing water</li> <li>- High population growth rates (increasing water demand)</li> <li>- Need for Supply authorities had to develop new resources</li> <li>- Reduced water quantity</li> </ul>

In view of all these reasons identified in the table above, establishing a method of supplying stable, sufficient and safe drinking water to communities is crucial (Cain, 2011). The adoption of reclaimed water has become an alternative option to augment

<sup>6</sup> From sources including: AWR (2013), Steirer & Thorsen (2013), Schroeder *et al.* (2012), Menge (2010); Du Pisani (2005); Central Areas JV Consultants, 2004); Alan Plummer Associates (2011).

the water supply (*ibid*). However, several factors can make a seemingly ‘easy solution’ very difficult and even impossible (*ibid*).

### **2.2.3.2 Clustering of Reasons for Domestic Use of Reclaimed Water and Related Impacts**

As is clear from the discussion thus far, there are a number of reasons which have led and are leading to water reclamation for domestic applications. These reasons can be clustered into natural, human induced, institutional, technical, financial and motivational (Muanda *et al.*, 2014).

#### **a) Natural Factors**

Natural factors refer to those factors, which occur naturally. These factors include extreme climate events such as droughts, violent storms and irregular rainfall patterns (Muanda *et al.*, 2014; Cain, 2011 & Costello *et al.*, 2009). This results in water scarcity that poses negative impacts on people and the environment (Cain, 2011; Kochhar *et al.*, 2015 & Bahri, 2012). Some of these impacts include food and water insecurity, vulnerable shelter, diseases, migration (Costello *et al.*, 2009 & Kochhar *et al.*, 2015), local conflicts over water rights (Kochhar *et al.*, 2015) and environmental degradation (Bahri, 2012).

#### **b) Human Induced Factors**

Human induced factors refer to anthropogenic influences such as pollution of water sources (by illegal discharge of waste for example), increased population growth, urbanisation and rapid population growth, over exploitation of water resources and reduction of catchment volume (Aravinthan, 2006 & Jhansi & Mishra, 2013).

#### **c) Institutional Factors**

Institutional factors refer to those factors that have led institutions (such as municipalities) to find alternative sources of water provision in order to fulfill their institutional mandate (Muanda *et al.*, 2014). These factors are used to inform decision-making at the political level and include government duties to fulfill their institutional mandate (Kidd, 2011), to provide water of good quality and quantity and fulfill the obligations to address the right to water (Cain, 2011). At the institutional level there is also the need to avoid negative environmental problems by reducing risks of pollution

of estuaries and natural water resources (Golder Associates, 2012). The main impact of institutional factors is risk management related to water security (Muanda *et al.*, 2014).

**d) Technical Factors**

Technical factors refer to factors related with the reuse technology, such as factors that deal with treatment technology, operation and maintenance, monitoring and evaluation, water quality monitoring and compliance with regulations (Muanda *et al.*, 2014). These factors are mainly used to determine the technical feasibility of reclaimed water project/initiatives and often concerns of engineers and technical staff. The main factors in this category include the availability of sound technology that can treat water to meet international standards (Tchobanoglous *et al.*, 2011) which guarantees good public health and sufficient water to meet up with basic human needs (Cain, 2011).

**e) Financial Factors**

These factors refer to the financial implications when reclaimed water is implemented or envisaged, such as the cost of construction of the plant, operation and maintenance, water tariffs, affordability and willingness to pay (Kamizoulis *et al.*, 2005 & Tchobanoglous *et al.*, 2011). Further factors include the costs associated with importing water from one place to another (Schroeder *et al.*, 2012 & Steirer & Thorsen, 2013) and costs associated with wastewater disposal (Steirer & Thorsen, 2013).

**f) Motivational Factors**

Motivational factors refer mainly to those factors used to demonstrate the importance of reclaimed water as a viable alternative water augmentation option, taking into consideration technical, institutional and social factors (Muanda *et al.*, 2014). Motivational factors have a positive impact on the public because they help institutions to explain to the public the importance of and the reasons for adopting or introducing reclaimed water (Jhansi & Mishra, 2013). The public then gains a better understanding of the need, the significance and the benefits of reclaimed water reuse (*ibid*). The motivational factors include the opportunities to augment limited primary water sources (Vigneswaran & Sundaravadivel, 2004), reduction and elimination of discharges of wastewater (treated or untreated) into receiving environment (Vigneswaran & Sundaravadivel, 2004; Jhansi & Mishra, 2013 & Devi & Samad, 2008). They also include the possibility of managing in-situ water sources as well as the scope to

overcome political, community and institutional constraint (Vigneswaran & Sundaravadivel, 2004).

Table 2.2 summarises the reasons for the reuse of wastewater for domestic applications, discussed above.

**Table 2.2: Reasons for Reclaimed Water for Domestic Applications<sup>7</sup>**

<b>Natural</b>	<b>Human induced</b>	<b>Institutional</b>	<b>Technical</b>	<b>Economic</b>	<b>Motivational</b>
<ul style="list-style-type: none"> <li>- Drought</li> <li>- Lack of alternative water resources</li> <li>- Limited traditional surface water sources</li> <li>- Decreasing and irregular rainfall patterns</li> </ul>	<ul style="list-style-type: none"> <li>- Increases in population growth in urban areas</li> <li>- Agricultural irrigation have significantly increased global water use</li> <li>- Uneven distribution of water resources;</li> <li>- Water scarcity and increasing water demand and water stressed areas</li> <li>- Rapid urbanisation</li> <li>- Contamination of ground and surface water</li> <li>- Heterogenic distribution of water resources</li> <li>- Reduction of catchment volumes as a</li> </ul>	<ul style="list-style-type: none"> <li>- Government duties to fulfil their constitutional mandate for ensuring the well-being of its citizens (Right to water – access to water as human rights)</li> <li>- The lack of effective conservation of available or existing sources of water</li> <li>- Avoidance of environmental problems arising due to discharge of treated/untreated wastewater to the environment</li> </ul>	<ul style="list-style-type: none"> <li>- Types of wastewater to be treated</li> <li>- Treatment technologies available and cost</li> <li>- Energy requirements</li> <li>- Extent of operational requirements</li> <li>- Availability of sound technology that can treat water to meet international standards</li> </ul>	<ul style="list-style-type: none"> <li>- Costs associated with water supply (imported) or wastewater disposal</li> <li>- Reuse is frequently practiced as a method of water resources management (this looks at economic efficiency)</li> </ul>	<ul style="list-style-type: none"> <li>- Opportunities to augment limited primary water sources;</li> <li>- Prevention of excessive diversion of water from alternative uses, including the natural environment;</li> <li>- Possibilities to manage in-situ water sources</li> <li>- Reduction and elimination of discharges of wastewater (treated or untreated) into receiving environment</li> <li>- Scope to overcome political, community and</li> </ul>

<sup>7</sup> Muanda *et al.* (2014)

	result of population growth - Overdraft of groundwater - Lack of available alternative in the proximity of the demand				institutional constraints
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### 2.3 Role of Institutions in Reclaimed Water for Domestic Applications

Internationally, reuse of wastewater has been applied in a number of countries where there are water restraints around agriculture, where the concern has been for decades now around irrigation and more recently for domestic applications (Angelakis & Bontoux, 2001). Within institutional settings, reclaimed water is being recognised as a key component in water and wastewater management and has many benefits including protection of water resources, prevention of pollution, recovery of nutrient for agriculture, augmentation of river flow, groundwater recharge and sustainability of water resource management (*ibid*).

Water demand management requires the implementation of structures and strategies that take into account water conservation requirements, public engagement, water costs and the inclusion of the private sector (Tortajada & Joshi, 2013; Bourblanc, 2010 & OECD, 2011). The participation and co-operation between all interested and affected parties, and relevant organs of state is important as it leads to joint decision-making and the achievement of transparent and responsive outcomes (Tortajada & Joshi, 2013). The role of public participation in natural resource management, development projects and processes is becoming more important as new policies are approved and adopted (Naidoo, 2008).

According to Tortajada and Joshi (2013), Lahnsteiner and Lempert (2007), Boucher *et al.* (2011) and the City of Windhoek (2005), the role of institutions as service providers in the context of water reclamation is (but not limited to):

- Ensuring availability of water (by identifying available resources) mainly for projecting future water demand versus available resources;
- Regulations and monitoring - formulating and enforcing regulations pertaining to number of issues emerging from water reuse (raw water quality, treatment processes, water quality, public health protection);
- Funding – examining available funds for construction, operation and maintenance of the treatment works and water quality monitoring;
- Liaison with the public and other institutions; and
- Service providers and water quality compliance assurance

***a) Identification and Management of Available Resources – International and Local examples***

In the USA, the State’s Ground Water Storage and Recovery Act was enacted in 1999 and allowed governmental and semi-governmental entities to create a bank of water that can be utilised under a permitting system that is outside of a specific water right. This legislation creates a water rights permitting approach to aquifer storage and recovery (ASR). The overall ramifications for water rights holders are not yet clear, but New Mexico is poised to enact ASR as a water management strategy. In Texas, a Water Development Board develops a comprehensive state water development plan every 5 years (a kind of water reconciliation study) intended to assess the status of water demand against needs in response to future water shortage scenarios (Western States Water Council, 2011).

Closer to home, in Windhoek, reconciliation strategy studies were undertaken, which aimed at increasing public awareness about water scarcity in the city. The local authorities in the City of Windhoek have been working towards reducing water demand through the implementation of a comprehensive Water Demand Management Strategy in the serviced areas. The Namibia Water Partnership Forum was established in 2001 to facilitate the formulation of an Integrated Water Resources Management Plan (IWRMP). The formulation of the IWRMP resulted in the achievement of integrated and sustainable water use and management for Namibia (Africa Water Facility, 2006). The African Water Facility (2006) stated that the water resource challenges of Namibia could only be addressed by efficient water resource management including the

development of an integrated institutional framework and provisions of infrastructure for water security.

In South Africa, the Department of Water Affairs has the objectives, functions and responsibilities of control over and conservation of water resources, as well as the provision of bulk water supply services (Heys, 2005). The Department aims to facilitate the decentralisation of water management to the local community level via the establishment of regional and local water management institutions, namely Catchment Management Agencies, Water User Associations and Catchment Forums (Naidoo, 2008). According to Kidd (2008), the role of DWA is to manage water resources in the interest of the public and to provide sufficient water of acceptable quality to the citizens whilst conserving the aquatic environment.

The Department has water reconciliation strategies in place to help determine the availability of water for a particular region and to determine how long that water will last in order to sustain or supply the needs of the region. According to Hay *et al.* (2011) a Water Reconciliation Study was conducted by DWA for the Eastern Cape and Western Cape provinces of South Africa for a 25-year timeframe. The reconciliation strategy included Beaufort West. The main objectives of the study were to determine water availability for all towns in both provinces, to determine the towns with no developed strategy for water resources and to help those towns that did not have a strategy by providing available information that would enable authorities to ensure water availability for a time frame of 25 years. According to van Rensburg (2006) these efforts seem to be futile due to the fact that it is only actively pursued in times of water shortage.

#### ***b) Regulations and Monitoring***

Regulations governing the use of reclaimed water are necessary to ascertain that there are no negative impacts on public health (Cain, 2011; Wu, 2006 & WHO, 1996). At the global level the World Health Organisation (WHO) is tasked with the establishment of international norms to protect human health. There are guidelines for drinking water quality that have been the basis of long-standing normative publications by the World Health Organisation and these provide an evidence-based point of departure for standard setting and regulation (WHO, 1993; 1996). They include an assessment of the

health risks presented by the various microbial, chemical, radiological and physical constituents that may be present in drinking water and hazardous to human health (*ibid*).

In Australia the regulations as well as monitoring criteria applicable include the Australian Drinking Water Standards and the World Health Organisation guidelines (WHO, 2006). In the USA, the health regulations include United States Environmental Protection Agency (USEPA), Guidelines for Water Reuse, Health and Human Services (HHS) and the WHO guidelines for monitoring (Cain, 2011). The federal state and local regulations are intended to ensure that water is treated to a level that protects the health of the public and environment (Alan Plummer Associates, 2011).

In Namibia, the health regulations are guided by the WHO, Namibia Water quality standards for Group A water and Rand Water (South Africa) and Potable Water Quality Criteria 1996 (NamWater, 1998). In terms of monitoring, in order for the New Goreangab Water Reclamation Plant (NGWRP) to adhere to the regulation guidelines, water samples are taken every four hours at various points throughout the treatment plant and are analysed in the laboratory (Lahnsteiner & Lempert, 2007). Refrigerated composite samples are taken twice per week and used for extensive analyses of all major water quality parameters as defined for guarantee values (*ibid*). The process taking place at the NGWRP is fully automated based on a monitoring supervisory control and data acquisition (SCADA) system (*ibid*).

In South Africa, regulations governing drinking water include SANS 241: 2005 and the Green Drop Certificate for wastewater management (Ivarsson & Olander, 2011). The Department implemented the Blue and Green Drop certifications as incentives in view of sustainable water quality and environmental conservation (DWA, 2010).<sup>8</sup> In Beaufort West, the wastewater treatment process is constantly monitored and uses the same equipment that is used for on-line monitoring (Ivarsson & Olander, 2011). If any of the on-line monitored values go out of specification, the plant automatically shuts

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<sup>8</sup> Blue Drop Certificate is an excellence award for sustainable drinking water quality management while Green Drop Certificate is an award for sustainable wastewater management in South Africa.

down and consequently, the alarms decrease the probability of low quality water leaving the system or permanently damaging the membranes (*ibid*).

### ***c) Funding***

Funding involves examination of available funds for construction, operation and maintenance of the treatment works and water quality monitoring and public awareness. In the USA, in New Mexico, for example, reuse projects are funded through State Revolving Funding (SRF), Community Development Block Grants, state legislative appropriations, Environmental Protection Agency (EPA) funding and private funding sources. SRF Finance Authority also helps communities develop infrastructure, public facilities, and permits them to address the utility and economic development infrastructure needs through mechanisms such as the community development block grants, the special public works funds and water/wastewater financing (Western States Water Council, 2011).

A reclaimed water reuse project was initiated and funded by the central government of Namibia (Menge, 2010). Funding was earmarked for conducting the feasibility studies that looked at alternative options, project initiation, construction (implementation), monitoring and continuous public awareness (Menge, 2010 citing City of Windhoek).

### ***d) Liaison with the Public and Other Institutions***

The foundation for successful water reuse programs requires a combination of providing reliable treatment to meet water quality requirements and environmental regulations for the intended reuse and appropriate and timely stakeholder engagement. The protection of public health on the one hand, and the environment, on the other, go hand in hand with achievements in public acceptance and economic viability (WHO, 2006).

Importance has been placed on public participation to achieve optimal social outcomes in decision- making (Lockie & Rockloff, 2005). A number of projects have failed due to lack of community support (*ibid*). Public participation and social acceptance have also been highlighted as a specific imperative in water resource management, including integrated catchment management (Falkenmark *et al.*, 2004). As with the adoption of other technologies, implementers of recycled water projects were often of the opinion

that the community would interfere in the decisions of authorities and that their involvement would be counterproductive (Kraft & Clary, 1991).

In Australia, the Council of Australian Governments (COAG) agreement encouraged greater community participation in the planning and implementation of new water resource sharing arrangements to ensure that social, ecological and economic imperatives were adequately addressed (McKay, 2005). The public was consulted through a number of means including:

- Participation in surveys and opinion polls; and
- Community consultation and collaboration with the appropriate agency (*ibid*).

In the USA, regulation suggests public coverage with regards to reclaimed water reuse should be undertaken through public meetings, establishment of data sharing, memorandum of understanding, development of environmental protection agency document, formation of EPA work group and a public involvement campaign (Lee, 2011).

In Namibia, the government of Windhoek provided brochures, which contained the necessary information for the public. There are also comprehensive school programs that are used to pass on the information about reuse. Information about the state of water in the city is published through the media: radio, television and local newspapers (Lahnsteiner & Lempert 2007 & Boucher *et al.*, 2011), as well as community meetings and reinforced through one on one interviews with key stakeholders. The Integrated Water Resources Management Plan (IWRMP) also helped in facilitating information sharing between the government institutions, private sector, public and all the interested and affected parties (*ibid*).

In South Africa, a study by Wilson and Pfaff (2008) in the eThekweni municipality reveals that public participation regarding reuse is weak. It has been recognised that better information flow between consumers and eThekweni Water and Sanitation (EWS) is required for the department to accelerate learning to sustainably meet the

challenge of service backlogs (*ibid*). The authors propose the following as strategies for involving the public:

- A community engagement strategy that is open, transparent and builds trust;
- Engagement with purposeful sample whose impartiality and authoritativeness in terms of commenting on the link between community health and well-being and water and sanitation services would not be the subject of dispute;
- A questionnaire whose results could serve as a legitimate departure point for discussion (i.e. make either consensus or divergence of ‘community’ opinion apparent on all or most issues of interest to the group); and
- A report-back meeting where results are discussed between survey participants and senior management.

#### **2.4 Factors Influencing Public Perceptions and Implications on Reuse Implementation**

Several authors have noted that successful integration of water recycling into future sustainable water management encounters various impediments including public perceptions. The first planned use of recycled water for drinking purposes started in the 1950s but only twenty years later did researchers begin to look into public perceptions and acceptance of water reuse (Po *et al.*, 2003).

According to the National Academy of Sciences (2012), the public is a major stakeholder in any water management decision and community members often play a vital role in decision-making on water reuse projects. As with any water project, the success or failure of a proposed reuse project can ride on public perceptions of how the project relates to public health, public finance, taste and aesthetics, land use, environmental protection, and economic growth (*ibid*).

People have a natural dislike to water that is perceived to be contaminated, and sometimes that feeling can translate into opposition to using treated wastewater, even when reclaimed water is shown to be of high quality (*ibid*). In some cases, people tend to prefer low quality water from a source perceived as ‘natural’ over high quality water coming from an advanced wastewater treatment facility (*ibid*). Reclaimed water’s

history as wastewater causes a psychological barrier for many people that can be hard to overcome (*ibid*).

According to Jimenez & Asano (2008) direct potable reuse of wastewater raises public concern because of a real or perceived perception of aesthetics and long-term health concerns. The reuse acceptance is addressed through resolving concerns regarding treatment technology, health risks, regulatory issues, management and operational controls, public perception issues and cost (Cain, 2011). According to Boucher *et al.* (2011), the negative public perception and public concerns regarding direct potable use is a result of lack of awareness about the benefits and the longer view of why the process of wastewater reclamation has been embarked on in the first place.

Survey and case study research since the 1970s has found that the public in many of USA's states supports the general concept of using reclaimed water and has been somewhat supportive of non-potable reuse initiatives (USEPA, 1992). People generally favour reuse that promotes water conservation, provides environmental protection benefits, protects human health, and the cost effectively treats and distributes a valuable and limited resource (Hartley, 2006). However, as the water options become more tangible to people with specific proposed projects in their communities and the likelihood of human contact with the water increasing, attitudes begin to change and the public's support fades (Bruvold, 1998 cited in Hartley, 2006).

Sub-sections 2.4.1 and 2.4.2 below give a detailed review of perception factors according to Po *et al.* (2003) and factors promoting acceptance and rejection of reclaimed water by other authors, respectively.

#### **2.4.1 Review of Factors Influencing Public Perceptions**

Although public perception has often being viewed as the principal obstacle to implementing water reuse projects, Po *et al.* (2003) note that many reuse projects have failed despite having received favorable support from the potential users. An example is the case of the San Diego project<sup>9</sup> in the USA where reasons have been attributed to

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<sup>9</sup> The San Diego's drinking water supply was conceived during the 1991-92 drought (D'Angelo Report, 1998). The project proposed mixing recycled water with imported freshwater in reservoirs. After a year's

politics where political campaigns engineered issues of environmental justice and health (Recycled Water Task Force, 2003 cited in Po *et al.*, 2003).

Public perception remains one of the key obstacles to achieve successful reclaimed water reuse initiative. Several factors related to negative public perceptions have been identified through surveys and focus groups. Po *et al.* (2003) give a literature review of factors influencing public perceptions as follows:

***a) Disgust or “yuck” Factor***

Research has shown that communities have acknowledged a psychological barrier when it comes to water reuse. The psychological barrier is expressed through the disgust emotion derived from the thought of using recycled water. The disgust emotion has been defined as “the emotional discomfort generated from close contact with certain unpleasant stimuli” (Angyal, 1941 cited in Po *et al.*, 2003 p.15). The disgust reaction in using recycled water is generated from people’s perceived dirtiness of the water and the fear of contamination from using such water.

***b) Perceptions of Risks Associated with Using Recycled Water***

Another factor, not delinked from the above and influencing public acceptance, is the perceived risk of using recycled water that is often related to health issues. An example was apparent in the Sydney Water Study of 1999, for instance, where respondents were asked about the disadvantages of using recycled water.

Po *et al.* (2003) note that despite constant assurances of the quality of recycled water by the experts, the public still perceives a risk associated with recycled water. The authors affirm that risk perceptions differ between the experts and lay people. Slovic (1998) cited in Po *et al.* (2003) notes that the public tends to capture a broader concept of risk, including attributes such as uncertainty, dread, catastrophic potential etc. into their risk equation. On the other hand, the experts define risk in terms of event probabilities and treat subjective factors as accidental dimensions of risk (Po *et al.*, 2003). Experts consider one in a million risk of getting sick as acceptable, whereas this

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detention, this water would go through the conventional water treatment process before being piped to domestic homes. The project was introduced to the community as means of protecting the city from possible future droughts.

could be totally unacceptable to the public as that one case is close to home - it could be themselves or one of their children (*ibid*).

**c) *The Specific Uses of Recycled Water***

Po *et al.* (2003) note that the way recycled water is used affects people's perceptions and acceptance of the water. When the water is closer to human contact or ingestion, people tend to oppose using the water (*ibid*). Studies in the USA (for example Bruvold *et al.*, 1981; Kaspersen *et al.*, 1974 & Bruvold, 1972 cited in Bruvold, 1988) and Australia (for example Sydney Water, 1999 & Australian Research Centre for Water in Society (ARCWIS), 2002) have revealed more acceptance of reclaimed water for non-potable uses such as irrigated agriculture. According to the D'Angelo Report (1998) cited in Po *et al.* (2003) recycled water has been generally accepted especially when food crops are to be peeled or washed prior to human consumption. The above-mentioned studies revealed that in comparison to other uses, use of reclaimed water for domestic applications remains the less preferred option. For example, use for drinking scored highest percentage of rejection across the studies, followed by cooking.

**d) *The Sources of Water to be Recycled***

The "use history" of the water was found to be a factor affecting acceptability of recycled water (Jeffrey, 2002 & Nancarrow *et al.*, 2002 cited in Po *et al.*, 2003). Different studies show different responses around the source of recycled water. The reuse of grey water from one's own household was more acceptable than water obtained from other public sources (Jeffrey, 2002 & Nancarrow *et al.*, 2002 cited in Po *et al.*, 2003). Meanwhile, in the Australian Research Centre for Water in Society (ARCWIS) focus group participants preferred a more public source of recycled water (Kaercher *et al.*, 2003 cited in Po *et al.*, 2003). They also preferred using recycled water from the whole City, rather than their neighbourhood (*ibid*). The authors propose that two underlying factors could be the reason for these differences: the perceived quality of the recycled water and the perceived control over the quality of recycled water.

**e) *The Issue of Choice***

Some studies have shown that where there is a water shortage issue, people more readily accept use of recycled water because they are aware of the need to conserve water although it does not necessarily guarantee public acceptance, as other factors

need to be considered in parallel. For example in the case of the San Gabriel Valley Groundwater Recharge in California USA, the project failed despite being conceived during periods of droughts. Where there is an alternative water source available, people question the need for reuse. For example the Melbourne Water focus group participants (1998) cited in (Po *et al.*, 2003) indicated that there had to be a genuine need for using recycled water and it should only be considered if other solutions were impractical and economically unfeasible.

***f) Trust in the Authorities and Scientific Knowledge***

Trust in the authorities to provide safe recycled water as well as in the scientific processes and technologies, plays a vital role in influencing public acceptance of water reuse. Syme and Williams (1993) and Porter *et al.* (2000, 2002) cited in Po *et al.* (2003) note that trust in the Water Authorities is the main indicator of how acceptable people perceive the quality of their drinking water to be. Despite public trust in certain institutions, Jeffrey and Jefferson (2002) cited in Po *et al.* (2003) note that people may remain unwilling to use recycled water because of the higher risk associated with this application. They found that people usually relied on their impressions of the water quality to make a decision whether they could accept using recycled water or not.

***g) Attitudes toward the Environment***

With regards to attitudes towards the environment, Po *et al.* (2003) note that reviews of general conservation indicate a need to look at more specific attitudes around particular issues rather than a broad general attitude around environmental concerns. People might have strong environmental values but choose to show these in different contexts. Some people may respond more strongly to wildlife conservation or other environmental concerns whilst others might be more concerned with water conservation.

***h) Environmental Justice Issues***

Environmental justice issues can influence how people perceive recycled water. In the case of the San Diego Repurification Project, there was opposition to the project due to the perceived injustice to the low and medium income communities who were the major recipients of recycled water (Recycled Water Task Force, 2003 cited in Po *et al.*, 2003). This resulted in strong community resentment and subsequently the end of the project. Aesthetic concerns over neighbourhood treatment plants were expressed by participants

in the Sydney Water (2002b) and ARCWIS (Kaercher *et al.*, 2003) focus groups. In this instance, people showed less opposition to neighbourhood-based treatment plants as long as they were located away from the main residential areas.

*i) The Cost of Recycled Water*

Po *et al.* (2003) note that cost consideration has been proposed in the National Water Quality Management Strategy (NWQMS) as a vital factor for community acceptance. Marks *et al.* (2002) cited in Po *et al.* (2003) found that the majority of residents in their study expected to pay less for using recycled water because of the water quality and because of restrictions on its use. Some residents considered that the lower price might be a way to encourage acceptance and investments in the up-front costs.

*j) Socio-demographic Factors*

Demographic factors have been identified as prominent in public perception of water reuse. McKay and Hurlimann (2003) cited in Po *et al.* (2003) noted that people aged fifty years and over have the greatest opposition to recycled water. Hartley (2003) cited in Po *et al.* (2003) found that older women were less supportive of potable water reuse. In contrast, Jeffrey (2002) cited in Po *et al.* (2003) found no significant difference in the public support of grey water reuse across gender, age or socio-economic groups. The Sydney Water (1999) study cited in Po *et al.* (2003) showed differences in the responses of participants from different genders, levels of education, place of residence and language spoken. The Hamilton and Greenfield (1991) study in Australia showed no significant global relationship between age, gender and income in acceptance or rejection of potable reuse across the different study areas.

## **2.4.2 Extent of Influence of Public Perceptions Factors on Public Decision**

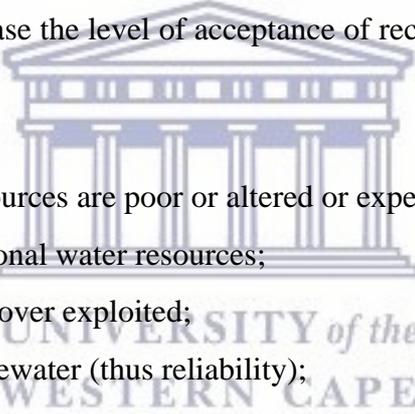
*a) Factors triggering Public Acceptance*

Responding to some of the factors that may negatively influence public perception of reclaimed water reuse, scholars have identified a number of factors, which if adequately framed, can improve public acceptance. Hartley (2003) cited in AWR (2013) indicates that acceptance of water reclamation can be triggered when the following are evident:

- The degree of human contact is minimal;

- Protection of public health is clear;
- Protection of the environment is a clear benefit of the recycling;
- Promotion of water conservation is a clear benefit of recycling;
- Cost of treatment and distribution technologies and systems is reasonable;
- Perception of wastewater as the source of recycled water is minimal;
- Awareness of water supply problems in the community is high;
- The role of water recycling in the overall water supply scheme is clear;
- Perception of the quality of recycled water is high; and
- Confidence in local management of public utilities and technologies is high.

Menge (2010) suggests that droughts, population growth, lack of alternative resources and depletion of existing resources are factors which can affect users/public to accept direct reclaimed water for domestic uses. For Tchobanoglous *et al.* (2011), the following factors can increase the level of acceptance of reclaimed water for domestic applications:

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- Alternative water sources are poor or altered or expensive;
  - Reduction of traditional water resources;
  - Groundwater being over exploited;
  - Availability of wastewater (thus reliability);
  - Lack of suitable hydrogeology for groundwater recharge;
  - The cost of reuse is lesser than other options;
  - DPR requires less energy;
  - DPR avoid water quality issues;
  - Water scarcity; and
  - Limits of conventional water supplies and maximise beneficial use of all water resources.

The above-mentioned factors are those factors which have led to reuse of reclaimed water for domestic applications in general. According to Menge (2010) and Tchobanoglous *et al.* (2011), these factors should trigger public acceptance for reuse.

### ***b) Factors triggering Rejection of Reclaimed Water***

Reclaimed water's history as wastewater causes a psychological barrier for many people that can be hard to overcome (National Academy of Sciences, 2012). Drinking recycled water has traditionally been met with resistance. From as early as 1970, drinking has been one of the least popular uses of reclaimed water (Kemp *et al.*, 2012). In the United Kingdom, the public preferred using reclaimed water from their own sources than from a common public sources (Jeffrey, 2001).

In Australia (City of Toowoomba), consumers voted against the use of reclaimed water (Christen, 2005 & Hurlimann & McKay, 2004) and in South Africa (eThekweni municipality in Durban city), the reclaimed water initiative was rejected by a religious and cultural group (Golder Associates Africa, 2012 & Pfaff & Wilson, 2008). Residents in Windhoek prefer to drink tap water (Lahnsteiner & Lempert, 2007 cited in Smith, 2011) but that public acceptance of reclaimed water is limited. This is so because, some residents of Windhoek still doggedly oppose its use for personal consumption (Marks, 2003 cited in Smith, 2011). Boucher *et al.* (2011) have also noted that the public in Windhoek is reluctant to accept the idea of reuse for domestic applications as a result of the 'yuck' factor.

Ivarsson & Olander (2011) note that in South Africa, not all people feel comfortable with drinking water originating from sewage. Buying of bottled water is increasingly common despite the fact that this poses a threat to the environment (*ibid*). This is confirmed by Alhmoud and Madzikanda (2010)<sup>10</sup> whose study revealed that 75.3% of the public interviewed believed that reclaimed water should be used only for non-potable purposes.

Non-acceptance of reclaimed water is often attributed to a plethora of reasons including health and water quality concerns (Dolnicar & Saunders, 2006; Marks *et al.*, 2006; Po *et al.*, 2005 & Olson *et al.*, 1979), age (Hurlimann & McKay, 2003), knowledge/education level (Olson *et al.*, 1979 & Boucher *et al.*, 2011) and

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<sup>10</sup> A survey of 2000 random households residing in 64 districts in Metropolitan Kuwait, on reclaimed water

psychological reasons and beliefs (Alhmod & Madzikanda, 2010 & Boucher *et al.*, 2011).

Boucher *et al.* (2011) suggest that learning from other studies is essential in helping researchers to avoid making the same mistakes and in demonstrating successful techniques which could be applied to gain public support. The section below gives a review of the approaches and strategies for addressing public perceptions.

## **2.5 Approaches and Strategies for Addressing Public Perceptions**

A fundamental aspect in the success of a wastewater reuse program is public acceptance (Boucher *et al.*, 2011; Dishman *et al.*, 1989, Po *et al.*, 2003 & Hartley, 2006). Reclaimed water initiatives were implemented predominantly by engineers who ‘decide, announce and defend’ based on technical considerations only (Beck, 2009). This approach, referred to as DAD is seen by many as inadequate (Baggett *et al.*, 2004) because of lack of consideration of many other issues including social processes and specific socio-demographic concerns.

According to Jhansi and Mishra (2013), the most important strategy for the implementation of reuse of wastewater is to conduct a full risk assessment which minimises negative impacts and enhances positive impacts. The very crucial and important part of the risk assessment is to engage and involve the public in every step of the process (*ibid*). This is because it would be a waste of time and cost to implement reclaimed water for domestic application only to find out at the end that the public would not use the water (*ibid*). Public engagement also helps in persuading or improving the chances of the public accepting the reuse of wastewater in the first place (*ibid*). This is because by engaging the public in this process, the public gets a clear understanding of the water situation first and foremost and of the benefits of using the reclaimed water, showing how reclaimed water is not only a reliable water source, but that it also decreases the amount of water discharged into the environment (*ibid*).

Different municipalities use different strategies for the implementation of reuse of wastewater for domestic applications. However, the most commonly used strategy is educating the public about the water resources in that specific area and the ideas behind

the wastewater reuse process. Each municipality educates the public in different ways; for example in Windhoek, the municipality collaborates with institutions such as education where students are then educated in schools. The municipality also collaborates with the media (radio, television and printed media) to improve public knowledge of water conservation and direct potable reuse and to inform the public about the water services in the area (Lanhsteiner & Lempert, 2007 & Boucher *et al.*, 2011).

### **2.5.1 Institutional Process for Introducing Reuse Schemes**

Public participation and social acceptance are imperative in water resource management in general, including integrated catchment management (Falkenmark *et al.*, 2004). Traditional approaches to implementing technologies, such as ‘decide announce defend’ (DAD) and other methods of persuasion are seldom effective, not only for recycled water projects, but for introducing new technologies and new ways of going about business with water users (Po *et al.*, 2003). These approaches have resulted in many failed reuse projects, for instance the San Diego Water Repurification project (*ibid*). According to Po *et al.* (2003), it is surprising that despite the advances made by social scientists such as Robert Chambers and others in the 1990’s, the ‘decide announce defend’ method of engagement is still so persistent.

The issue of choice is also an important determinant for public acceptance of water reuse. In places where there had been or still have water shortages, people were reported to more readily accept water reuse because of the heightened awareness of the need to conserve water (Dishman *et al.*, 1989). The benefits of enhancing public participation and negotiation in decision-making include opportunities to improve environmental decision-making by reducing conflict and polarisation over management goals and actions (Lockie & Rockloff, 2005).

Important to note is the fact that, for the promotion of new technology, strategies must include local participation as well as municipal action (Jhansi & Mishra, 2013). Local communities can contribute valid indigenous ideas for cost savings in a project. Agreement on key issues between design engineers and the local residents is vital early

on in the project (*ibid*). When the level of participation is extensive, capital costs can be greatly reduced (*ibid*).

In reviewing community campaigns against recycled water projects in Australia, White (2003) reiterates the importance of public participation. Strategies used in Australia included community involvement to obtain public support prior to the implementation (Recycled Water Task Force, 2003) and the development of a public and media communication strategy before any incident or emergency situation occurs (Weeramanthri, 2011). This was achieved through a community survey for the purpose of identifying the range of potentially significant issues that would need to be addressed in order to make a comprehensive assessment of the benefits and risks of implementing a reclaimed water use initiative (AWR, 2013). The survey was administered to the broad public including a variety of industry bodies, academic organisations, state government departments and agencies, health regulators, drinking water providers/managers, local government associations, local governments, Commonwealth government departments and agencies, interested individuals, and private companies (*ibid*).

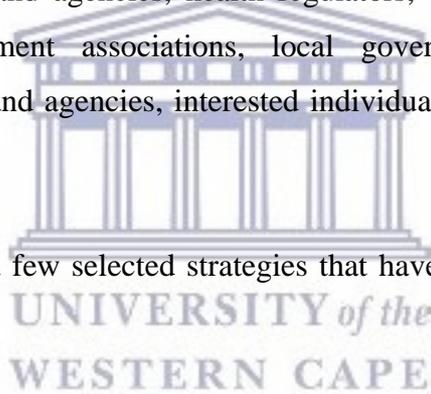


Table 2.3 below reflects a few selected strategies that have been used to implement reclaimed water schemes.

**Table 2.3: Strategies to Implement Reclaimed Water Schemes – International experience**

<b>Tchobanoglous <i>et al.</i> (2011)</b>	<b>Janshi and Mishra (2013)</b>	<b>Weeramanthri (2011) AWR (2013)</b>	<b>Steirer and Thorsen (2013)</b>
<ul style="list-style-type: none"> <li>- Exposure of technical issues</li> <li>- Promotions of social (user acceptance)</li> <li>- Public meetings</li> <li>- Radio interviews</li> <li>- Articles in media</li> </ul>	<ul style="list-style-type: none"> <li>- Appropriate technologies</li> <li>- Promotion of technology</li> <li>- Risk assessment</li> <li>- Public engagement</li> </ul>	<ul style="list-style-type: none"> <li>- Community involvement</li> <li>- Public &amp; media communication</li> <li>- User surveys</li> </ul>	<ul style="list-style-type: none"> <li>- Public education</li> <li>- Information sharing</li> <li>- Media coverage</li> <li>- Tours and presentations</li> </ul>

Clearly, the way water reclamation is introduced differs from one country to another. Differences and similarities are dictated by local contexts in which water reclamation is proposed and the nature of the perceptions around this issue from the public.

### **2.5.2 Addressing Public Perceptions in Reclaimed Water**

Research has shown that negative public perceptions regarding water reclamation pivot around distrust of the service provider (Po *et al.*, 2003 & Ilemobade *et al.*, 2011) and a public knowledge deficit. Therefore, addressing public perception is a step towards ensuring that water reclamation is accepted as an alternative water augmentation scheme. This implies mitigating for the knowledge gap or deficit about water reuse for domestic purposes.

Perception is defined as the process by which individuals select, organise, and interpret the input from their senses to give meaning and order to their environment (George & Jones, 2005 & Shaver & Tarpy, 1993). Many scholars believe that addressing, measuring and managing perceptions are challenging exercises that require in-depth understanding of the issue being addressed. Scholars and social scientists (Kemp *et al.*, 2012; Boucher *et al.*, 2011; Martin *et al.*, 2010; Lahnsteiner & Lempert, 2007; Dolnicar & Saunders, 2006; Po *et al.*, 2003 etc.) have addressed public perceptions around a range of issues covering drinking water, youth behaviour, food and beverage, government officials, educators or students at higher education institutions. The review of some of these studies shows that many approaches are being developed to address and improve public perceptions with regard to a number of broad issues that affect people and their everyday lives. These strategies vary according to the nature of the problem being addressed but have one thing in common and that is the way in which key issues concern the public. Drawing from such studies, the main approaches proposed to address public perceptions include:

- Behavioural modification (Dolnicar & Saunders, 2006)
- Communication (Kemp *et al.*, 2012; Hartley, 2006, Lahnsteiner & Lempert, 2007 & Boucher *et al.*, 2011)
- Public participation (Lockie & Rockloff, 2005)
- Public relation campaigns (Martin *et al.*, 2010)

- Social marketing (Kotler & Zaltman, 1971) etc.

All these approaches suggest the use of a number of tools including booklets, brochures, school programs, radio, television, newspapers, use of informational materials, public presentations, presentation of results on health and safety evaluation, promotion of users' participation in the decision-making process and labelling to denote recycle water.

A study by Hurlimann (2009) reveals that engaging the public regarding water management options can change their perceptions. According to Dolnicar and Schäfer (2009), the lack of knowledge pertaining to alternative water options should be addressed if reclaimed water is to be implemented. This infers that people who are unaware of the quality of wastewater and the treatment process are most likely to have low negative perceptions towards reclaimed water. Nonetheless, in these instances, the public believes that reclaimed water is the more environmentally friendly option compared to desalination which is considered less risky from a health point of view (Alhumoud & Madzikanda, 2010). This implies that public perceptions regarding water alternatives (referring to desalination and reclaimed water) are triggered by health concerns. Another study by Hurlimann and McKay (2007) and Hurlimann (2009) reveals that the quality of reclaimed water (low salt, colourless, odourless etc.) and price can significantly reduce negative public perceptions and increase public confidence.

A study by Alhumoud and Madzikanda (2010) regarding people's attitude towards reclaimed water use in Kuwait revealed that only 5.26% of respondents (against 77.91%) accept reclaimed water for potable applications. The majority of respondents suggested that reclaimed water can be used for other purposes including agriculture (75.3 %), car wash (66.8%), housing washing (55.60%), laundry (20.9%), showering (15.2%) and cooking (8.33%). This study further shows that only 14% of respondents have knowledge of the water treatment process and quality standards. This implies that people that have knowledge of the treatment process have greater willingness to use reclaimed water compared to other groups.

According to Alhumoud and Madzikanda (2010) reasons for resisting the use of reclaimed water are mainly health (69%), psychological (54%), beliefs (29%), mistrust in workers – doubt of technical capacity (25%), technical mistrust (machines breakdown – 19%) and other minor issues (7%). This study concluded that to address public perceptions there should be public consultation with regards to the choice and use of reclaimed water as a water augmentation alternative. Public awareness and education are necessary strategies that can promote the use of reclaimed water and change public perceptions. Alhumoud and Madzikanda's (2010) work further suggests that there should be a public relations Directorate at a Ministerial level in charge of public awareness and education and that, political buy-in should be solicited and political leaders should campaign through public meetings, seminars etc. (*ibid*). The authors suggest that tools to be used include information flyers, booklets and household water /wastewater guides (*ibid*).

Hurlimann and McKay (2007) and Alhumoud and Madzikanda (2010) note that education programs should put more emphasis on the negative health and environmental impacts that may emerge from the discharge of wastewater while pointing to reuse as a viable and available alternative. The public awareness and education should be introduced to educate or inform the public about reclaimed water and its suitability for various uses including potable applications (*ibid*).

Regulatory agencies often require some level of public involvement in water management decisions and they also promote stakeholder buy-in. This is strikingly different from the past when members of the public were often informed about projects only after final decisions had been made. Responsible leaders now recognise the need to inform and consult with the public to obtain their values and advice. Advancing the understanding of water issues can facilitate real, workable, and implementable solutions tailored to meet specific needs (EPA, 2012).

Social marketing has been used to address public perceptions. Social marketing is an approach that is concerned with the social good rather than simply commercial gains (Kotler & Zaltman, 1971). McKenzie-Mohr (2000) describes community-based social marketing as an attractive approach to promote sustainable behaviour, drawing on deeper levels of psychological knowledge. While Buurma (2001) advocates the use of

social marketing to achieve social objectives and Dishman *et al.* (1989) believe social marketing can be used effectively to increase acceptance of recycled water use. In contrast, Po *et al.* (2005) claim that social marketing is ineffective in increasing acceptance of recycled water use. However, they do not substantiate why. This argument shows that despite its claimed strengths, social marketing does face criticism and barriers to its implementation. Nonetheless, Marsalek *et al.* (2002) confirm that when social marketing approaches have been applied, water users have shown passion in maintaining and improving communication between researchers and water policy/program managers.

Despite the possibility of using these approaches, Hartley (2006) cautioned that public perceptions could only be improved if there is commitment and willingness of the service provider to public participation - as this can contribute to trust building and the perception of fairness. Martin *et al.* (2010) suggest that to influence perceptions, there must be clarity of purpose, with effective use made of local intelligence to understand the problem better and devise appropriate solutions. Key to improving perceptions is hearing people's voices rather than speaking on their behalf (*ibid*). In brief, perceptions can be improved only when the public is involved and given the opportunity at all stages of the activities and when adequate responses are provided directly to their negativity (*ibid*).

Drawing from different approaches used to address public perceptions, it is clear that information, and knowledge, local context, education and the nature of public participation play an important role in shaping perceptions (Hartley, 2006). People are influenced by information that is presented to them, so that perceptions can change as a consequence of the most recent information campaign they are exposed to (Kemp *et al.*, 2012). The implication is that, uncertainty or incompleteness of information can be addressed through continuous and frequent information campaigns promoting the benefits of a given option (*ibid*).

Po *et al.* (2003) caution that the process of community involvement should not be used to persuade the public to use recycled water. The authorities involved, and the process used to engage the community, should be honest and transparent and, accurate and complete information on water issues should be made available to the public via media

and educators on a continual basis (*ibid*).

Public participation and social acceptance have also been highlighted as a specific imperative in water resource management, in particular concerning integrated catchment management (Falkenmark *et al.*, 2004). The quality and degree of public involvement in decision-making are determinants of acceptance of recycled water (Hartley, 2006). Importance has been placed on public participation to achieve optimal social outcomes in decision-making (Lockie & Rockloff, 2005). As already discussed, a number of projects have failed due to lack of community support.

Interactive participation has been preferred. This is a process where people participate in joint analysis, the development of action plans and formation or strengthening of local institutions (Naidoo, 2008). Generally, major decisions made without involving local communities and those affected by the decisions are more likely to fail (Lundqvist & Gleick, 1997). In order to increase community acceptance of recycled water use, the development of more effective methods of public participation is required (Hartley, 2001). Key factors concerning public participation and perception of recycled water use include: information and context, communication and dialogue, trust and trust building, perception of fairness, and motivation and commitment to participate in decision-making (*ibid*).



While public consultation is increasingly being mandated, it is also increasingly becoming a public expectation (Russell & Hampton, 2005). Russell and Hampton (2005) emphasise the key points for community involvement in the water sector:

- Process should be transparent;
- People should be given comprehensive and credible information;
- Deliberation should encompass general water management in a region and start before specific water reuse schemes are planned;
- There should be open discussion of possible problems; and
- People should be informed at the outset of the extent to which their preferences will be taken into account.

According to Wegner-Gwidt (1998) cited in Po *et al.* (2003), the following critical steps are recommended in community engagement programs:

- Being upfront and proactive;
- Developing a basic information campaign;
- Working with local media;
- Using credible third party testimony;
- Showing successful projects elsewhere;
- Being visible and creative;
- Increasing public awareness; and
- Using demonstration projects

Hartley (2003) cited in Po *et al.* (2003) established a framework consisting of five principles to assist water agencies in the USA to engage the public constructively on reuse issues. The main aim of these principles was to build and maintain public trust and confidence. These five principles are: (1) manage information for all; (2) maintain individual motivation and demonstrate organisational commitment; (3) promote communication and public dialog; (4) ensure fair and sound decision-making and decisions; and (5) build and maintain trust. The author emphasises that these principles should not be viewed as a standard checklist to establish public trust but that the application of these principles has to be context specific of a reuse decision using diagnostic questions and analytical techniques.

The international case studies presented in Table 2.3 below indicate the existence of processes to consult, inform and educate the public about wastewater reuse projects. All types of media were used and the selection of public involvement tools is country or region specific. In Australia, the public has been engaged through public consultation that included a preliminary survey (questionnaire and opinion polls) and community consultation in collaboration with meetings and open discussions via community agencies and community-based organisations (Po *et al.*, 2004). This was further compounded by a series of information sharing sessions between water authorities and the public (*ibid*).

As previously indicated, the USA has federal and individual state regulations governing public services. These regulations can vary in terms of content and context of application. In this research, New Mexico is used to illustrate the way in which the water services institution involved the public in implementation and monitoring. The process outlined below is not generalised to other case cities in the USA where reclaimed water is implemented as they are context specific – one size does not fit all. The strategies applied included public consultation, information sharing sessions and public awareness/education campaign.

**Table 2.4: Institutional Processes in Public Consultation**

Process	Australia	United States of America	Namibia
Public consultation	<ul style="list-style-type: none"> <li>• Preliminary survey questionnaires and opinion polls</li> <li>• Community consultation</li> <li>• Collaboration with the appropriate agencies and community projects</li> </ul>	<ul style="list-style-type: none"> <li>• Public Meetings</li> <li>• Establishment of a Data Sharing Memorandum of Understanding (MOU)</li> <li>• Formation of EPA work group</li> <li>• Public involvement campaign</li> </ul>	<ul style="list-style-type: none"> <li>• Community meetings</li> <li>• One on one interviews</li> </ul>
Information sharing with the public	<ul style="list-style-type: none"> <li>• Public dialogue</li> <li>• Educational activities</li> <li>• Media programs</li> </ul>	<ul style="list-style-type: none"> <li>• Information, knowledge, local context, and education</li> <li>• Repurified Water Review Committee (RWRC) reports</li> </ul>	<ul style="list-style-type: none"> <li>• Media programs</li> <li>• School programs</li> <li>• Brochures</li> </ul>
Strategies used to inform the public	<ul style="list-style-type: none"> <li>• Social marketing</li> <li>• Standing national committee</li> <li>• Electronic networking</li> <li>• Workshops or seminars on key issues or for special groups</li> </ul>	<ul style="list-style-type: none"> <li>• Hosting annual reuse conference</li> <li>• State grant programs on reuse</li> <li>• Establishment of Planning Committee (PC) and</li> <li>• Framework Development Team (FDT)</li> <li>• Legislative session</li> </ul>	<ul style="list-style-type: none"> <li>• Information sharing via media</li> <li>• Information sharing via IWRMP</li> </ul>

Po *et al.* (2003) suggest the application of a social psychological theory of equity, justice and fairness as an alternative approach in reuse projects. These approaches have been successfully applied by social justice scientists in the evaluation of ecological and water allocation policies (Syme & Nancarrow, 2001 & Syme *et al.*, 1999 cited in Po *et al.*, 2003). The authors note that justice concerns are highly relevant in the decision-making processes and are evident in many qualitative and quantitative research projects. They also point out how procedural justice studies have found that community and stakeholder support for developments does not depend only on the possible impacts on their well-being, but also on their perceptions of the decision-making processes (e.g. Lind & Tyler, 1988). According to Lind and Tyler (1988), this means that people are therefore more likely to accept decisions from the authorities if they thought that the process had been 'fair' and unbiased. The implication of this is that processes should be designed in such a way that the community has not simply been confronted with the plan but rather that a genuine partnership with the community unfolds (Po *et al.*, 2003). Po *et al.* (2003) suggest that regardless of the approaches adopted by the water agencies, understanding community values and concerns, and establishing a genuine partnership with the community are most essential in reuse projects.

Drawing from the vast body of literature, it is clear that scholars have proposed several approaches and strategies to improve public participation and address public perceptions. Pertinent factors identified for the purpose of this research are that:

1. Public perceptions are as a result of certain attitudes and emotions, where only the disgust or 'yuck' emotion tends to dominate the reuse discourse. This research offers insights into other emotions which are embedded in public perceptions
2. The public engagement should begin at all stages of decision-making, but there is no clear indication of what these stages are and no indication of how and when water institutions should engage with the public according to these stages. This study demarcates different stages and proposes an approach to address public perceptions during the different phases, proposing context specific terms of engagement between water services providers and the end users at each stage. Institutional decision-making processes vary across countries and the proposed approach should be viewed in the South African context. However, such an

approach will illuminate the idea of ‘when’ and ‘how’ to address public perceptions.

## **2.6 Summary of the Literature**

The reasons for implementing reclaimed water for domestic applications have been due to a number of reasons caused by water scarcity such as climate change impacts including droughts, high population growth and increasing economic activities. The implementation of reuse projects has very often been challenged as a result of negative public perceptions regarding the reuse of wastewater. Some of these perceptions pivot around the disgust emotion, lack of trust in authorities, water quality issues, religious and cultural values, cost and water use. Importantly, the literature emphasises that the public is likely to accept reclaimed water for non-potable uses – where there is minimal human contact. Negative perceptions around potable reuse have been aggravated because the public lacks knowledge on the water issues and decision-making processes and there is, in the main, inadequate engagement between the service provider (institution) and the public. The commonly used approach by experts, ‘decide announce defend’ has been criticised as it does not consider public voice in decision-making. The literature shows that projects using this approach have failed. Processes of participation involving the public are now becoming popular because they are acknowledged as a way to ensure successful implementation of reuse projects.

The role of institutions in water reuse can vary significantly across and within countries. For this reason any decision around water reuse must remain context specific. In most cases, the central government plays an important role in funding the project and in acting as the regulator. Other roles such as the technical aspects of water treatment and quality monitoring and the social aspect of public liaison are consigned to local government, municipalities and community organisations. Different institutions involved in reclaimed water reuse play different roles and these roles are defined according to their (institutions) level of influence or mandate. In general, official institutions such as government departments, local governments or municipalities have different roles to play. It is evident from the available literature that central and local governments have played varied roles (ranging from feasibility studies, pre-implementation, implementation, monitoring and public awareness) in ensuring that

additional water resources are made available, whilst at the same time monitoring existing ones and ensuring that the quality of water produced meets the agreed standards.

In addressing public perceptions, a number of approaches have been suggested to nurture trust between government and the public – amongst which are social marketing, community meetings, educational programs, schools programs and media programs. Through these approaches, institutions are better able to gain an understanding of community values and concerns and to establish relationships with key stakeholders, which are critical to the success of any reuse project. Approaches that are framed within the idea of social justice are helpful in ensuring that these relationships are meaningful and that the playing field is levelled. Within a developmental frame, human well-being is critical but this involves not only human health but also the ability to choose and to be part of decision-making processes that impact on everyday living. As already emphasised, the formulation of any approach should be context specific as reasons for implementing reclaimed water for domestic applications vary from one site to another and from one community to another.

The following chapter presents the research methodology used in the study. This includes discussions on the Capability Approach as the theoretical framework in which this study is lodged, and its practical application within the study context.

## CHAPTER 3

### 3 RESEARCH METHODOLOGY AND THEORETICAL FRAMEWORK

#### 3.1 Introduction

This chapter presents the Capability Approach (CA) as the theoretical framework and considers its application in the study context. It outlines the methodology utilised in the implementation of this study. The sources of data are identified and justified and the rationale for the selection of study areas is put forward, and the study sites are then described. Instruments for data collection and their application are discussed. The methods used to analyse the raw data from the field are also presented.

#### 3.2 The Capability Approach and Context of Application

The Capability Approach was introduced by the Nobel Prize winner Amartya Sen in the 1980's. It is a broad normative framework for evaluating individual well-being and social arrangements, policy designs and proposals about social change in society (Robeyns, 2003). The theory is used in a wide range of fields, most prominently in development thinking, welfare economics, social policy and political philosophy (*ibid*). It can also be used to evaluate a wide variety of aspects of people's well-being, inequality and poverty (*ibid*). Clark (2005) also notes that the capability approach has emerged as the leading alternative to standard economic frameworks for thinking about poverty, inequality and human development. The main argument of Sen's (1999) seminal work '*Development as Freedom*' is that individuals achieve freedoms – or fail to achieve them – because of social, political and economic constraints or opportunities. People can be deprived of physical (material) goods – such as pipes, toilets and taps and this lowers their living standards, narrowly defined.

The Capability Approach has two major components which include; functionings and capabilities. The terms 'capabilities' and 'capability' are used inter-changeably. Sen defines functionings and capability as follows:

“Functionings represent parts of the state of a person - in particular the various things that he or she manages to do or be in leading a life. And, the

capability of a person reflects the alternative combinations of functionings the person can achieve, and from which he or she can choose one collection” (Sen & Nussbaum, 1993, p. 31).

Sen (1987) differentiates the terms functioning and capability more clearly as:

“A functioning is an achievement, whereas a capability is the ability to achieve. Functionings are, in a sense, more directly related to living conditions, since they are different aspects of living conditions. Capabilities, in contrast, are notions of freedom, in the positive sense: what real opportunities you have regarding the life you may lead” (Sen, 1987, p. 36).

The CA has often been criticised because Sen does not prescribe a list of capabilities, however, this allows for the development of the approach rather than the presentation of a rigid frame. Robeyns (2011) argues that the CA is not a closed framework but rather an approach and she formed the term “Capabilitarianism” which aims to open more space within the CA to emphasise issues around social justice and invites scholars to expand the framework to suit their own work.<sup>11</sup> The CA has been applied in different contexts. Comim *et al.*'s (2008) work on the CA brings to the fore contributions of a number of authors. For instance, Ardeni and Andracchio (2001) who work on gender and poverty, Mehrotra (2008) who works on democracy, decentralisation and access to basic services, De Herdt (2001) whose work is on social policy and the ability to appear in public without shame: lessons from a food relief program in Kinshasa and Unterhalter's (2008) work on the CA and gendered education: some issues of operationalisation in the context of HIV/AIDS in South Africa.

In the water sector, Anand (2007) cited in Goldin *et al.* (2008) note that the CA has only been recently applied to the water sector. Nonetheless, it is a useful development framework within which to reflect on the extent of achievements in the water sector (Goldin *et al.*, 2008). The multi-dimensional poverty approach, with particular reference to Sen's (1993, 1999) CA, embraces notions of development that pay particular attention on the expansion of human capabilities (Goldin *et al.*, 2008). According to Goldin *et al.* (2008), the expansion of human capabilities is built on principles of social justice and equity, which includes the just allocation of resources.

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<sup>11</sup> Cited in Goldin (2015) – paper on Hope as a critical resource.

The authors note that the multi-dimensional approach encourages an expanded set of poverty indicators that are of great importance to the water sector because it brings to the fore vital capabilities and functionings that are necessary for human systems to be capable of managing the ecosystems on which they depend. The authors state that it is useful to select measurement indicators that tap into constructs such as self-esteem, empowerment and agency as measurements of well-being.

More recently, it has been applied by Owen and Goldin (2015) in assessing the relationship between youth capabilities and food security in the context of a rural rainwater harvesting project in South Africa. The CA has been useful in making the linkages between opportunities that youth have to feel good about themselves and to get involved in community issues (*ibid*). It has been useful as well in tapping into some strengths and weaknesses of youth which could be opportunities or challenges for them to engage with water and food related projects (*ibid*). Sen's CA considers social justice: fair treatment and opportunities, such as universal access to water supply and necessary goods that are required to make this possible, sanitation and education (Goldin, 2010).<sup>12</sup> More recently the Capability Approach has been used in a Water Research Commission Project (K5/1971) by Goldin *et al.* (2013)<sup>13</sup> to evaluate institutional settings within the context of water resources management.

Apart from deprivation of physical (material) goods – such as pipes, toilets and taps there is also deprivation of intangible goods and this has an effect on dignity, agency and empowerment that undermines multiple aspects of well-being (Goldin *et al.*, 2008; Goldin, 2010 & Goldin *et al.*, 2013). These deprivations are in domains that are less easily measured because they are invisible and as Krishna (2002) in Goldin (2010) says, when speaking of attitudinal components of social capital such as trust, these are often only carried around in people's hearts and heads.

Goldin (2010, p. 3) in her article in the '*Review of Radical Political Economics*,' makes the links between knowledge, agency and shame explicit and argues, "unequal relations

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<sup>12</sup> See also Goldin (2015). Hope as a critical resource for small scale farmers in Mpumalanga in *Human Geography*, a new radical journal, volume 8 (3) pp. 24 - 36

<sup>13</sup> Entitled "Development of an institutional adequacy index using the multi-dimensional poverty framework."

of power and knowledge restrict agency, jeopardize the building of trust and may perpetuate feelings of shame.” Goldin goes on to state that, “where there is an unequal distribution of resources and knowledge to gain access to those resources, there is also social exclusion that can create vicious cycles that entrench feelings of unworthiness, embarrassment - and shame” (*ibid*). Smith (1776)<sup>14</sup> cited in (Goldin *et al.*, 2008; Sen, 2000; Sen, 1990; Zavaleta Reyles, 2007) has reflected on the right of people to appear in public without shame. Shame is something a person carries around inside his/her head that makes that person feel bad about him or herself (Goldin, 2010). Goldin (2010, p. 7) claims that “shame does not sit comfortably with dignity, pride and self-esteem, which are important attributes of social justice and anticipated outcomes of the equitable distribution of resources” - such as water.

### 3.2.1 Capability Failure and Conversion Factor

Capability failure is the failure to respect or promote social justice and human dignity and this can be because people are denied choice. Within this context the word capability can be replaced by opportunity – and capability is therefore the opportunity to choose. The notion of freedom to choose is thus built into the idea of a capability. The example of Sen’s (2002) person who is starving and person who is fasting is pertinent – the person who fasts is able not to fast but the starving person has no choice.

Sen (2002) also introduces the notion of conversion factors as one looks at conversion factors to see whether individuals are able to convert opportunities so that they can lead a better life. The conversion factor can, for instance change disadvantage to advantage and misrecognition to recognition and can ‘convert’ opportunities so that they open up new freedoms. Using these ideas of conversion, this study considers whether a given opportunity will ‘convert’ into a set of expanded choices and fulfil desires for an individual. In the long run, this conversion would lead to a better life and enhanced well-being.

Sen’s (2002) work differentiates between intrinsic and instrumental value arguing that there is an intrinsic value of having choice and freedom and that it is not simply ‘good’

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<sup>14</sup> Smith (1776) notes that appearing in linen shirts and leather shoes were necessary to appear in public without shame in the England of his days.

because it is instrumental for achieving a better life but because it is the right thing to do to enhance democracy, providing opportunities for public reasoning. The empowerment of citizens through public reasoning and public debate is a recurring theme in CA discourse. Some development approaches hold that the right thing is for government (or others) to make people lead healthy lives, do activities (that they decide on), take on technologies – and so on – and as long as they deliver the goods they do not need to consult the public. With this focus, the emphasis is on top-down decision-making and ideas of freedom, choice and agency are compromised.

### **3.2.2 The Capability Approach and Study Context**

As is clear from the above discussion, the CA framework is used (i) to define people's well-being, (ii) to assess social arrangements and (iii) for the design and evaluation of social interventions, social arrangements and policy interventions. It is therefore ideal when considering social interventions around reclaimed water. It is a normative framework because it claims that freedom to achieve well-being and an improved quality of life is of primary moral importance. It is also normative because it claims that people can decide for themselves what works and what does not work. Certain social environments and social interventions will promote positive attributes, such as a sense of agency, empowerment, self-respect, autonomy - and others will perpetuate deprivation and exclusion and even, as Goldin (2010) and Wutich and Ragsdale (2008) have shown, feelings of disgust, fear or shame.

Collective capabilities (opportunities) are crucial for public reasoning and democratic processes and these are *group*-based phenomena that affect human capabilities (Sen, 2002). Collective capabilities are also instrumentally valuable, especially for the poor, to enhance their bargaining power and encourage resource sharing (Thorp, Stewart & Heyer, 2005) and importantly within the context of this study to create a sense of self-esteem through encouraging public participation in local decision-making and by gaining the knowledge required to do so. The CA has a focus on quality of life and is concerned with what humans feel (feeling good about themselves for instance). Attitudes and emotions are embedded within social structures and subjective beliefs, norms and values that are the product of interaction between people who engage with – and influence – one another.

Cleaver (2007) adds that people act collectively to negotiate norms, challenge existing inequalities and to defend their rights. The generation of a notion of collective capabilities demonstrates how individuals can act together as agents of change, rather than each one of them pursuing their choices alone. Capability analysis therefore needs to account for the instrumental role that collectivity can play in promoting the individual's ability to achieve the life that she/he values. Sen asserts that no individual can think, choose, or act without being influenced by the nature and working of the society around them (Sen, 2002) and thus emphasises the importance of collective processes, such as public reasoning. The generation of collective capabilities needs to be through the *free* and *voluntary* participation of the collectivity members, rather than through force or coercion. Ibrahim (2011) emphasises the importance of collective capabilities and uses the notion of self-help analysis to show how the poor can act together to develop and exercise new collective capabilities, and operationalises this notion in three case studies in Egypt. The author emphasises on the intrinsic and instrumental value of social structures and explores the concepts of collective freedoms and collective agency and makes the links between social capital and the CA.

The CA is guided by the fact that it is dealing with humans, not just with the way they feel but also with what constitutes a just society. Mehrotra (2008) cited in Comim *et al.* (2008) notes that while national democracy offers a potential for articulating the needs of the poor for basic social services, the potential for enhancing their capabilities is rarely realised. Deep democratic decentralisation creates the basis for participation, the collective voicing of needs and collective action to ensure that the government delivers services effectively (*ibid*). The application of a new approach in dealing with people's perceptions around reclaimed water might offer new answers because it will have as its central focus on people rather than technology or scientific 'facts' which tend to dominate the realm of water management discourse. It will also shine the torch on people's perceptions and feelings – how they feel about reclaimed water for domestic applications.

Emotions (fear, anger, hope etc.) are a function of social relations and processes and as Goldin's (2003, 2010) work on shame has shown, some water users feel helpless –for instance in the face of extreme climatic events such as droughts and this might result in emotions such as fear, anger, hope, shame etc. These feelings in turn are determinants

of human action and the way in which people act – or do not act – when it comes to environmental concerns and their relationship with the environment. Nussbaum (2011) identifies emotions as the fifth in her list of well-being. According to Nussbaum emotions are: being able to have attachments to things and people outside ourselves; to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to experience longing, gratitude, and justified anger – not having one's emotional development blighted by fear and anxiety. It is necessary to support this capability as it means supporting forms of human association that can be shown to be crucial in their development.

The CA is about an assessment of the quality-of-life. It claims that good societies should be promoting for their people a set of opportunities which people may or may not exercise in action but the choice is theirs. It commits itself to respect for people's powers of self-definition. In the context of this study, examining the way decisions around reclaimed water are taken through the lens of the CA in specific case studies will assist in understanding whether decision-making around reclaimed water is offering new opportunities for learning and for making people feel good about themselves.

Morales and Harris (2014) also highlight community participation in natural resources management in achieving both environmental sustainability and greater social equity. The authors focus on the limitations of common participatory governance approaches and suggest new tools and approaches. Several authors (Goldin, 2013; 2015; Wutich & Ragsdale, 2008; Wutich, 2009; Van Wijnendaele, 2013; Sultana, 2011 & Morales & Harris, 2014) make the link that people are connected to issues of water in an emotional way and that understanding emotions is crucial in when analysing the quality of participatory water resources management.

Participatory governance can trigger emotions such as shame, pride or sadness (Goldin, 2010; 2013 & Sultana, 2009 cited in Morales & Harris, 2014). Within the context of this study, public acceptance of reclaimed water is linked into attitudes and emotions that people have around the topic of water. These attitudes and emotions play a crucial role in determining whether or not new technologies such as reuse of wastewater will be accepted.

As suggested by Sultana (2011), Nightingale (2013) and Van Wijnendaele (2011), emotions are not simply isolated, personal mental states, but rather they are “relationally produced between people and places” (Sultana, 2011, p.164) cited in Morales and Harris (2014). Attitudes and emotions are embedded within social structures and subjective beliefs, norms and values that are the product of interaction between people who engage – and influence – one another (Goldin, 2010 & Morales & Harris, 2014). Goldin (2015) claims that in order to better understand social behaviour within the context of development, it is helpful to study emotions and the way in which emotional states shape the development agenda. The author notes that the intangible attribute, hope, is a mental state that commands commodities and as an opportunity (capability) helps achieve functionings (*ibid*).

### **3.3 Research Design**

The study used a descriptive qualitative research approach which aims at getting an in-depth description and understanding of actions and events as well as a focus on the process rather than the outcome (Babbie & Mouton, 2001). The qualitative research captures the depth and breadth of a phenomenon (Johnson & Christensen, 2008 & Babbie & Mouton, 2001) and in this case, captures perceptions and feelings of respondents and provides the in-depth textured narrative texts that inform the study. Deploying a qualitative study is no less rigorous than a quantitative study because the ‘intangible’ attributes of emotions and feelings are well captured and interpreted in line with the theoretical framework used in the study. A case study design was used for its strength in investigating empirical phenomenon within a real life context (Yin, 2003). According to Algozzine and Hancock (2006) case study research is about identifying a topic that offers itself to in-depth analysis in a natural context using several sources of information. A case study design includes both single and multiple case study design types (Yin, 2009). The multiple-case (embedded) was the most appropriate design for this study to capture in-depth data from the three different case studies (multiple) and from two groups – institutions and the public (embedded – unit of analysis).

The study followed an inductive approach and was guided by some general ideas and expectations from the desktop study (Mouton, 2001). The main research question of the study is: *how can negative public perceptions be addressed to provide an opportunity*

*for implementation of reclaimed water for domestic applications in South Africa?* The discussion above has brought to the fore the idea of opportunity as freedom. It is pertinent to understand whether individuals feel that they have been given the opportunity to choose – rather than been told what to choose. Data gathering methods were designed to tap into the feelings and perceptions of individuals concerning reclaimed water and to ascertain whether or not they were given an opportunity to choose what works for them or what does not work. The capability (opportunity) to choose in the context of this study is dependent on there being the right information or knowledge transfer with the idea of choice around reclaimed water for domestic applications being pivotal.

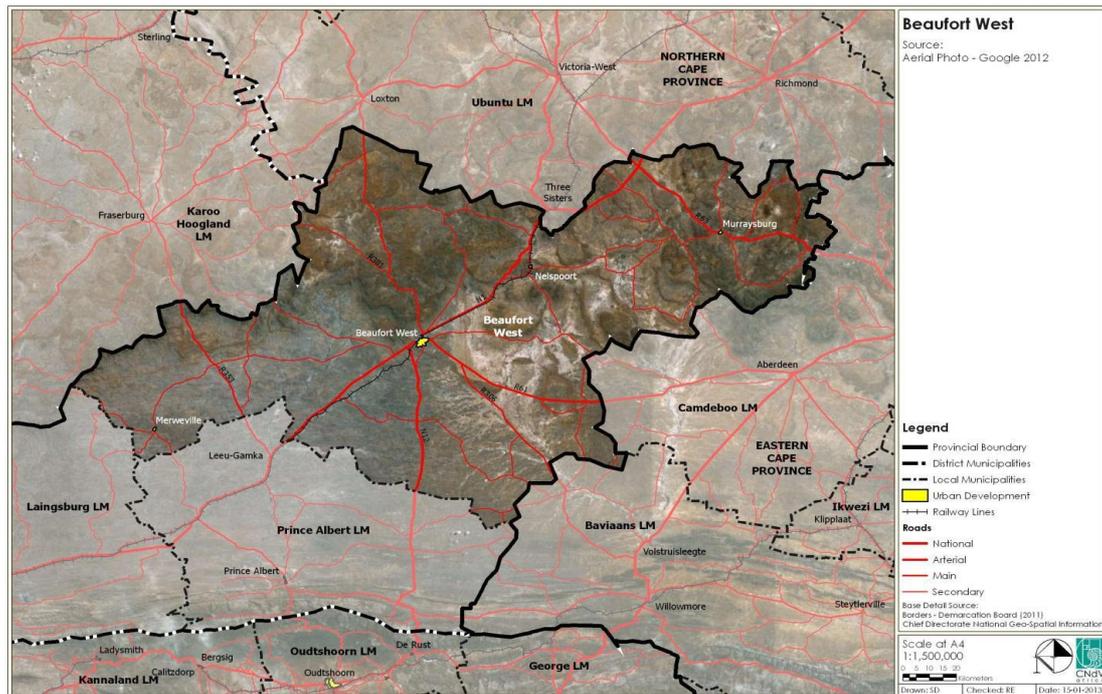
### **3.4 Description of Case Study Sites**

Three case studies were selected; Beaufort West, Overstrand and eThekweni. These sites were selected using purposive sampling (Babbie & Mouton, 2001). Beaufort West Municipality is the first municipality in South Africa that has successfully implemented reclaimed water via the DPR technology. Overstrand Municipality has opted but not implemented the technology and eThekweni Municipality has opted to implement but the implementation phase has been stalled due to negative public perceptions. A description of each case study is presented below.

#### **3.4.1 Beaufort West Municipality**

##### ***a) Location***

Beaufort West is located in the Western Cape province of South Africa. It is the economic, political and administrative heart of the Central Karoo. Beaufort West is about 460km north east of Cape Town. The municipal area covers 16 330.10 km<sup>2</sup> and is structured into seven Wards (Beaufort West Municipality, 2013). Figure 3.1 below shows the location of Beaufort West Municipality.



**Figure 3.1: Location of Beaufort West Municipality (Beaufort West Municipality, 2013).**

### *b) Population and Growth Rate*

There was a total number of 8 996 households that lived in the Beaufort West municipal area, of which 82.2% lived in urban areas and the remaining 17.8% living in rural areas. Between 2001 and 2006, the Beaufort West population increased from 34 999 people to 37 598 people, representing an annual average growth of 1,4%. The 2007 Community Survey showed that 56 323 people live in the Central Karoo District. Beaufort West has the largest population in the Central Karoo District with a population size of 37 091 people in 2007. The population declined marginally by an annual average rate of 0.01% from 37 111 people in 2001 to 37 091 people in 2007. According to the population projections of the Department of Social Development, the population is expected to increase to 37 101 people by 2010 (Beaufort West Municipality, 2011).

### *c) Climatic Conditions*

Beaufort West receives about 160mm of rain per year, with most rainfall occurring mainly during autumn. It receives the lowest rainfall (5mm) in July and the highest (33mm) in March. The average midday temperatures for Beaufort West range from 16.8°C in June to 30.9°C in January. The region is the coldest during July when the

temperature drops to 2.3°C on average during the night (Beaufort West Municipality, 2013).

#### ***d) Available Water Sources***

Beaufort West obtains its water from both surface water and ground water sources - approximately 45% from the Gamka Dam and the remainder from 17 boreholes and two fountains. The actual abstraction from the Gamka Dam is more than double the allocated abstraction. Although Beaufort West is the only user of this source the Municipality takes risks by overutilising the dam (Beaufort West Municipality, 2013). The total indicated abstraction from these boreholes and springs is 1.564 million m<sup>3</sup> per year. A further 0.42 million m<sup>3</sup> per year is proposed to be abstracted from four recently drilled production boreholes in the Droë River and Hans River areas (*ibid*). This can meet all predicted shortfalls up to 2020, and for the low-growth scenario shortfalls until 2030 and 2035 (*ibid*). Reclaimed wastewater for domestic applications is a recent development in terms of available water resources in Beaufort West Municipality (*ibid*).

#### ***e) Water Demand***

The Gamka Dam is located to the north of Beaufort West, and has a capacity of 1.9 million m<sup>3</sup> which is used solely for municipal supply to the town. The registered abstraction from this source is 0.5 million m<sup>3</sup>/a. The dam is owned by DWA but is operated by the local municipality (Beaufort West Municipality, 2013).

As a result of the drought situation, direct re-use (with the building of a reverse osmosis plant) was implemented and the abstraction of 1.042 million m<sup>3</sup>/a from the Gamka Dam is more than double the registered abstraction. As Beaufort West is the only allocated user of this source, it is proposed that the entire firm yield of this dam be allocated to Beaufort West (*ibid*). In order to serve the town of Beaufort West, three ground level concrete reservoirs are used with capacities of 4.55, 4.55 and 5.75 MI respectively. Collectively; a total of 14.85 MI of treated water storage is available (*ibid*).

#### ***f) Rationale for Reuse of Wastewater***

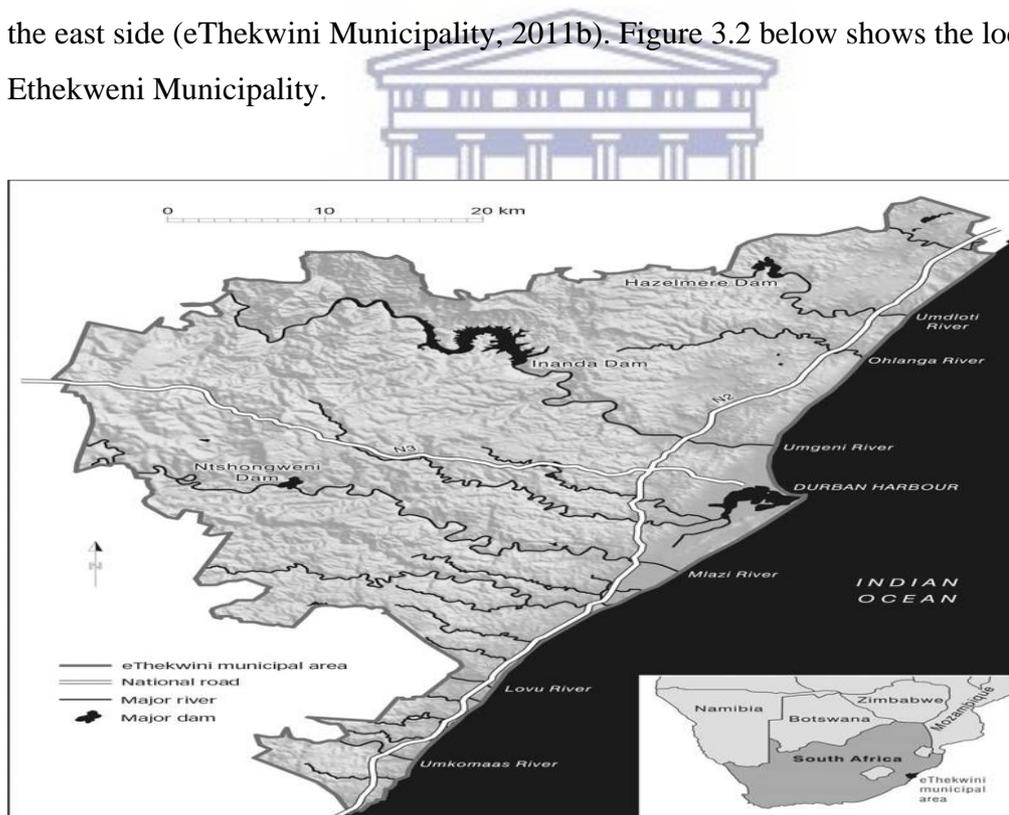
Beaufort West municipality experienced serious problems with drought conditions impacting on the security of future water supply to its consumers. As a consequence of

long period of drought (2009-2012), the municipality relied on ground water that is currently under intense pressure (Beaufort West Municipality, 2013). Alternative options such as desalination were not feasible for a number of reasons; hence reuse of treated wastewater to augment water supply was suggested as a suitable option in this context.

### 3.4.2 eThekweni Municipality

#### a) Location

eThekweni in Durban is the largest city of the KwaZulu Natal province of South Africa. eThekweni covers an area of 2 297 square kilometres (eThekweni municipality, 2011a & eThekweni Municipality, 2011b). eThekweni municipality is at the centre of Maputaland-Pondoland-Albany regions, which is known as a biodiversity hotspot. The area is characterised by steep escarpment in the west to a relatively flat coastal plain in the east side (eThekweni Municipality, 2011b). Figure 3.2 below shows the location of Ethekweni Municipality.



**Figure 3.2: Location of eThekweni Municipality in South Africa (source: Roberts, 2008).**

#### b) Population and Growth Rate

KwaZulu Natal province is the second most populated province following the Gauteng province of South Africa. The population of the province increased by 7% from 9 584

129 people in 2001 to 10 259 230 people in 2007. The city of eThekweni has the highest proportion of population in the KwaZulu Natal province. The population of eThekweni was 3 090 122 people in 2001 and 3 468 086 people in 2007. The majority of the population is living in formal settlements. The population living in informal settlement decreased from 19.1% in 2001 to 17.1% in 2007 (Statistics South Africa, 2007).

### ***c) Climatic Conditions***

eThekweni experiences hot damp summer conditions with the eastern parts being influenced by the warm Agulhas current that brings warm equatorial water southwards. The winter conditions reflect a mixture of tropical and subtropical climate. The winter conditions are influenced by the high relative humidity on the eastern parts. The average annual rainfall ranges between 819mm and 1272mm, with almost 60% of the annual rainfall falling in summer. The evaporation rate of eThekweni is relatively low as a result of the high moisture content (Mucina et al., 2006). The average annual temperature of eThekweni ranges between 20°C -21°C. The summer conditions are hot to very hot temperatures ranging between 24°C-30°C and winter experiencing temperatures of 20°C (Golder Associates Africa, 2012). However these temperatures vary in various areas of eThekweni due to varying topography in these areas.

### ***d) Available Water Sources***

The uMngeni river catchment is the major source of water that supports the heartland of the KwaZulu Natal Province, which includes eThekweni and other cities (eThekweni Municipality, 2011a). Storage dams were built in order to store water from the catchment, which will be used by the municipalities. The water storage dams include Henley dam built on Umzindusi River, the Albert Falls Dam, the Nagle dam and Midmar dam. The Midmar dam contributes a net safe yield of 1228.4 10<sup>6</sup> m<sup>3</sup> to the urban water supply while the Nagle and Albert Falls dam contribute a net safe yield of 170.9 10<sup>6</sup> m<sup>3</sup> together (*ibid*).

### ***e) Water Demand***

There is a growing water demand in the eThekweni Municipality. The growth in water demand is a result of growing urban development, influx of people from the rural areas and economic growth and development. The water supply needs in the municipality have exceeded the reliable yield of the local water resources. The daily water demand

is approximately 1.200 ML. The daily water demand is expected to continue increasing. The municipality conducted studies to estimate the water demand growth rate, which will help the municipality in management of water resources (Golder Associates Africa, 2012).

*f) Rationale for Reuse of Wastewater*

eThekwini municipality explored other alternatives for water supply due to the increase in water shortage and ever growing water demand. The municipality considered several alternatives, which include dams, desalination, water reuse and rainwater harvesting. The advantages and disadvantages of these options were investigated. The municipality chose water reuse because, it was an economically viable, environmentally responsible, technically feasible option and does not take time to implement as compared to the other alternatives (Golder Associates Africa, 2012).

### **3.4.3 Overstrand Municipality**

*a) Location*

Overstrand municipality is a local municipality located within the Overberg District Municipality, in the Southern Cape Province of South Africa. It is located along the south western coastline of the Overberg District Municipal area bordering the City of Cape Town to the west and Cape Agulhas Municipality to the east. The Municipality covers a land area of approximately 2 125km<sup>2</sup> and has a coastline of approximately 200km, and stretches from Rooi Els in the west to Quinn Point in the east (Overstrand Municipality, 2012). Figure 3.3 below shows the location of Overstrand Municipality.



**Figure 3.3: Overstrand Municipality (source: Overstrand Municipality, 2013).**

***c) Population and Growth Rate***

According to the 2011 census, the population of Overstrand Municipality was 80,432 people living in 28,010 households (Stats SA, 2013). The male population constitutes 39, 786 people and female, 40, 646 people (Overstrand Municipality, 2013). The growth rate was estimated at 3.1% per annum for the period of 2007 to 2012. Of the total population, 36.2% consider themselves as black Africans, 31.2% as whites and 31% as coloured. According to Overstrand Municipality (2013), the population can be classified into three main groups namely; children (0-14 years), economic active population (15-64 years) and aged (65 years and older).

***d) Climatic Conditions***

The Overstrand municipality has a distinctly Southern Western Cape climate (traditionally described as a Mediterranean climate comprising cold wet winters and hot dry summers with strong south-easterly winds), which is moderated by winds blowing off the Atlantic Ocean's cool Benguela Current (Overstrand Municipality, 2013). The Municipal area normally receives about 450 – 830 mm of rain per year (Hermanus normally receives about 518mm of rain per year) which falls year-round, but which peaks during the winter months from May to August. (*ibid*). South-easterly cloud brings mist precipitation to the eastern and southern mountain slopes at higher altitudes in summer. Frost may occur on 2 or 3 days per year (*ibid*). The mean average

maximum and minimum temperatures for January and July are 25.6 °C and 6.3°C, respectively. The average midday temperatures for Hermanus range from 15.9°C in July to 24.9°C in the month of February (*ibid*).

#### ***e) Available Water Sources***

Several years after discovering one of South Africa's highest yielding boreholes near Hermanus, Overstrand Municipality has started using this excellent underground water supply and there are plans to link it to a global satellite monitoring system to manage it scientifically (Overstrand Municipality, 2013). Some 1.5 million m<sup>3</sup>/year of underground water have been added to the existing 2.8 million m<sup>3</sup>/year from the De Bos Dam, formerly the only water source for the Greater Hermanus area, including the villages of Fisherhaven, Hawston, Onrus and Sandbaai (Overstrand Municipality, 2012). There are three functional well fields out of five options which have been investigated and implemented. These well fields include; Gateway well field (within the town of Hermanus), Camphill well field (in Hemel en Aarde valley) and Volmoed well field (in Hemel en Aarde valley). The three wells together can provide an additional 2.62 Mm<sup>3</sup>/annum, equivalent to 37% of the required yield in 2035 under the medium growth scenario (*ibid*).

#### ***f) Water Demand***

According to Overstrand Municipality (2010), the local municipality is situated in a water scarce area, and experienced below average rainfall over the past years. Therefore, three different water requirement scenarios were developed, based on population growth rates and the proposed developments were:

- ✓ Low-growth scenario with population growth of 3%/a.
- ✓ Medium-growth scenario with population growth of 5%/a.
- ✓ High-growth scenario with population growth of 8%/a.

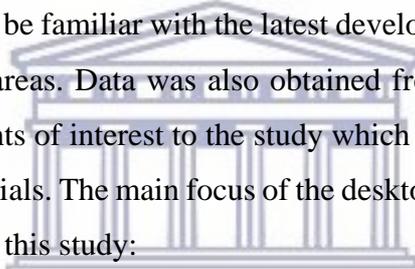
#### ***g) Rationale for Reuse of Wastewater***

As a result of the drought condition experienced in Hermanus, the municipality decided to diversify its water sources. Reclaimed wastewater for potable purposes and desalinated sea water were the two options envisaged to be developed. Currently, 5MI of wastewater per day is available for reclamation in Hermanus. The municipality

envisages that by 2022, the costs of desalination of sea water will have been reduced hence, becoming one of the sources for drinking water (Overstrand Municipality, 2012).

### **3.5 Methods of Data Collection**

Two major data collection methods were used namely, secondary and primary data collection. Brannen (1992) defines secondary data as that which is already available and needs only to be extracted. Secondary data was obtained in this study through a desktop literature search on reports, journal articles and print media. Bless and Higson-Smith (1994) note that in order to apprehend the research topic in a way that permits a clear formulation of the problem and the hypothesis, some background information is always necessary. The literature review provided this background information and it was an ongoing process from the beginning of the research right through to the end as it allowed the researcher to be familiar with the latest developments in the area of study and any pertinent related areas. Data was also obtained from books and peer review articles as well as documents of interest to the study which was made available for the research by municipal officials. The main focus of the desktop search was to investigate five areas of importance to this study:

- 
- An overview of reclaimed water and reclaimed water for domestic applications (international, national and local);
  - Process documents which showed how water service providers engage with their public, international and local;
  - Perceptions around reclaimed water for domestic applications;
  - Strategies deployed by municipalities and civil society for addressing public perceptions; and
  - Identification of gaps and development of research problem.

Obtaining primary or empirical data required a case study selection and a careful selection of respondents at each of the sites of investigation for first hand information around the study objectives (Kumar, 1999). Data was obtained via multiple methods namely; individual interviews, focus group discussions, telephonic interviews and PAR tools and processes (Babbie & Mouton, 2001). Multiple methods are recognised as a

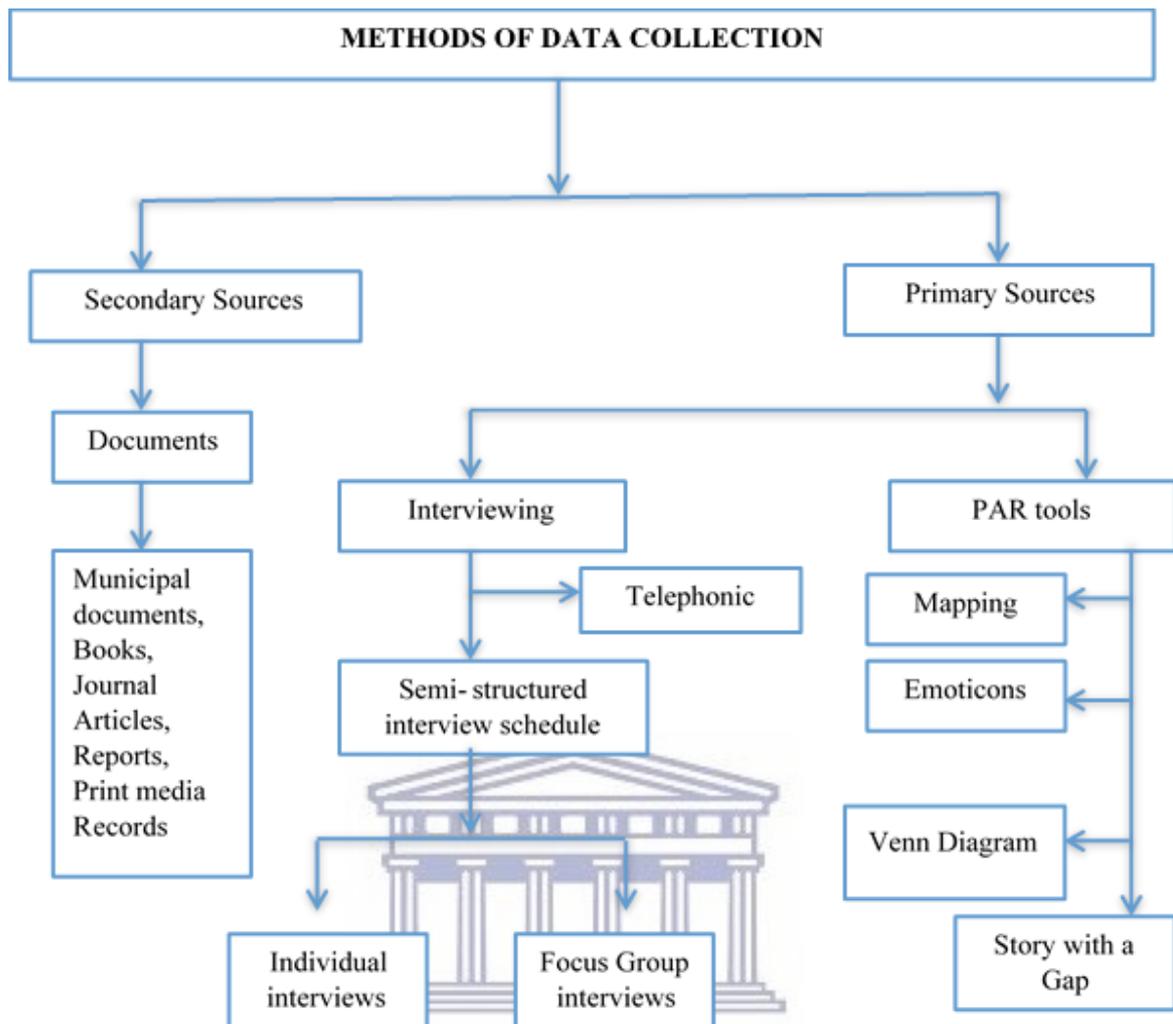
common approach to secure in-depth understanding of a research topic. Because of the recognised difficulty of achieving objective reality, both in quantitative and qualitative research methods, the multiple methods focus attempts to “secure an in-depth understanding of the phenomenon in question” (Denzin & Lincoln, 1998, p. 4). This approach is also referred to as triangulation and can be considered as an alternative method of validation (Denzin, 1989; Fielding & Fielding, 1986 & Flick, 1992 in Denzin & Lincoln, 1998, p. 4). Denzin and Lincoln (1998) use the term ‘bricoleur’ and although it can have a pejorative meaning, implying for instance, an amateur, Denzin and Lincoln (1998) use it to describe the alertness of the researcher who is able to ‘perform a large number of diverse tasks’ (p. 4) in order to achieve rigour and breadth in the study.<sup>15</sup>

Figure 3.4 below presents a schema on the methods of data collection deployed for this study.



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<sup>15</sup> This section draws on the methodology chapter in Goldin (2005)



**Figure 3.4: Methods of Data Collection (Adapted from Kumar, 1999).**

### 3.5.1 Data Collection Process

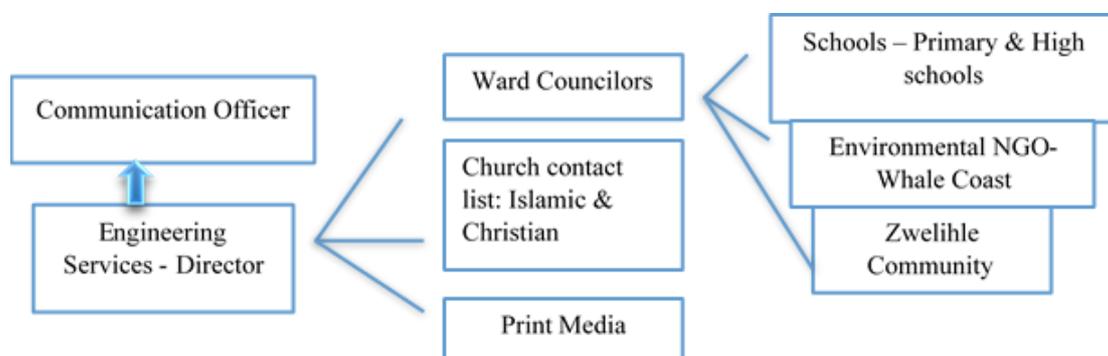
The selection of participants involved purposive sampling where they were strategically selected to meet the informational needs of the study (Patton, 2002 & De Vos, 1998). Study participants were drawn from two units of analysis: firstly the service provider institution (municipality) within each of the three case studies and secondly, the public within each of these three sites.

Stakeholders were chosen according to their level of participation in debates around water reuse and according to whether or not they would be able to provide insights around the research. Respondents from the institutions were strategically selected according to the following criteria: having knowledge of water services in the case study site, involvement in the provision or promotion of water services, involvement in the daily operation of water treatment. Stakeholders were then recruited and categorised

according to their positions, interests, rights, responsibilities, relationships and levels of influence using what Reed *et al.* (2009) and Mayers (2005) refer to as the stakeholders' power tool. Stakeholders from both the municipality and public needed to fulfill the following criteria:

- If they were residing in the case study area;
- If they were being affected by water scarcity;
- Whether or not they showed any interest in the proposed project of reclaimed water; and
- The targeted respondents also needed to be willing to participate in the research.

Prior to collection of data, the study adhered to the ethical procedures of the university and a certificate was issued in this regard (Appendix A). In each of the three case studies, the first point of contact was through the Directors and Managers of the Engineering Services who were approached with the study information sheet (Appendix B) via email and then, via telephone. These respondents were chosen because of their ability to 'open doors' and to allow for access to the field. These officials were also selected because of the direct role they play in the technical services of the municipality. Access to other key municipal officials such as municipal managers, ward councilors and field practitioners was then possible. Once the municipal officers had provided a list of initial participants to sample from the public, selected stakeholders were contacted via email and telephone. Figure 3.5 below illustrates a typical participants access process chart.



**Figure 3.5: Participants Access Process Chart in Overstrand Municipality.**

Respondents from the municipality and municipal representatives included Municipal Managers, Directors of the Engineering Services and field practitioners including Ward Councilors, education officers, consultants<sup>16</sup> and community liaison officers (CLOs). Respondents from the public were selected from a wide range of civil society networks including schools (principals, teachers and learners), representatives of the Non-Governmental Organisations (NGOs), media (print and radio) and religious leaders and elders.<sup>17</sup>

Respondents from the public were targeted according to their socio-economic and demographic characteristics including; race (Black, White and Colored), age (from 14 years to 60 years and above), gender (male and female), education level (low education level, high school, undergraduate and post-graduate), religion (Christian and Muslim leaders), economic (which covered samples from affluent and poor schools).

The data collection process (Appendix C)<sup>18</sup> was undertaken over a period of two years, from February 2014 to October 2016. There were five phases involved in the data collection process – four phases involving physical engagement with the public and the last stage through telephonic interviews. The first phase of data collection was carried out in 2014 (February and March) and covered interviews with municipal officials. The second phase was carried out in 2014 (June, July and August) and covered interviews and focus group discussions including participatory tools with municipal officials and the public. The third phase was carried out in 2015 (March and April) and involved the validation process involving all study respondents. The fourth phase was carried out in 2015 (October and December) and involved additional data collection for Overstrand and Beaufort West Municipalities only.<sup>19</sup> The fifth phase was the wrap up phase and this included telephonic interviews undertaken in October 2016 in eThekweni where there were some gaps that needed to be filled. Telephonic interviews for additional information from Overstrand and Beaufort West were completed within the same period.

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<sup>16</sup> Consultants work on behalf of the municipality where municipal capacity is lacking.

<sup>17</sup> Some of the members served as elders in the community as well.

<sup>18</sup> See Appendix C for detailed data collection process.

<sup>19</sup> Data was taken via telephonic interviews in 2016, which did not warrant any participatory process.

The sample size of study respondents was 16 municipal officials and 72 members of the public, giving a total of 88<sup>20</sup>. Substantive data pertaining to the study objectives was captured. Table 3.1 below shows the total number per case study site and according to gender.

**Table 3.1: Total Number of Study Respondents**

Case Study	Municipal Officials		Total	Public		Total	Total Across Sites
	Male	Female		Male	Female		
Overstrand	3	1	4	20	17	37	41
eThekweni <sup>21</sup>	7	2	9	6	15	21	30
Beaufort West <sup>22</sup>	3	-	3	12	2	14	17
<b>Total</b>	13	3	16	38	34	72	88

### 3.5.2 Instruments for Data Collection

Semi-structured Interview schedules I, II and III (Appendix D) were designed and interviews were conducted face-to-face. A number of Participatory Action Research (PAR) methods were deployed as well as telephonic interviews. Each method is described below:

#### a) Semi-structured Interview Schedule

Semi-structured interview schedules are guided conversations where broad questions are asked and do not constrain the discussion and where new questions are allowed to arise in the course of the discussion (Drever, 1995 & Cavestro, 2003). This is different from questionnaires and surveys where there are structured questions that are not deviated from. For this study this meant that questions arising from the interview sessions that were not on the semi-structured guide could be discussed. This also meant

<sup>20</sup> A typical case study sample usually involves less than 50 cases (Mouton, 2001). However, because of the multiple (embedded) design type and limited control of the number of participants' attendance, the study sample had to be more.

<sup>21</sup> Data described around gender was representative in all case studies showing no real effect of this skew sample.

<sup>22</sup> *ibid*

that, not all questions were asked in a rigid order and the conversation could flow accordingly. The PAR method was used to supplement data gathering and to ensure that the information gathered was sufficient for the study purpose.

There were three semi-structured interview schedules. Semi-structured interview schedule I targeted municipal officials in the engineering services and the purpose of this instrument was to extract data to ascertain their reasons for opting for reuse, their decision-making processes regarding reclaimed water as well as their perceptions of what the implications of their decisions might be on the public. The questions were also designed to solicit overall background information around reclaimed water and to better understand what the process of implementing a project such as this might entail.

Semi-structured interview schedule II tapped into responses from the public and municipal officials (Field practitioners and technical services). The aim of this instrument was to ascertain what the public knowledge levels were around water concerns in general and reclaimed water specifically. It was also to understand notions of 'embeddedness' and social capital and to gauge linkages between individuals or/and groups from the public and their institutions/municipalities. Schedule II was also designed to capture emotions and perceptions of the public in relation to water scarcity in general and the idea of reclaimed water in particular. The schedule was organised using four main themes: Knowledge, Social capital, Emotions and Perceptions. It also tapped into constructs pertaining to the CA. Questions targeted at management were designed to extract information on public engagement strategies and how these 'experts' perceived public perceptions around the topic of reclaimed water. The data extracted using this interview guide addressed the objectives of this study.

Additional questions, using semi-structured interview schedule III were used to capture 'missing' data relevant to the objectives of the study and this schedule tapped into concerns around water scarcity, public perceptions of reclaimed water and social networks and embeddedness.

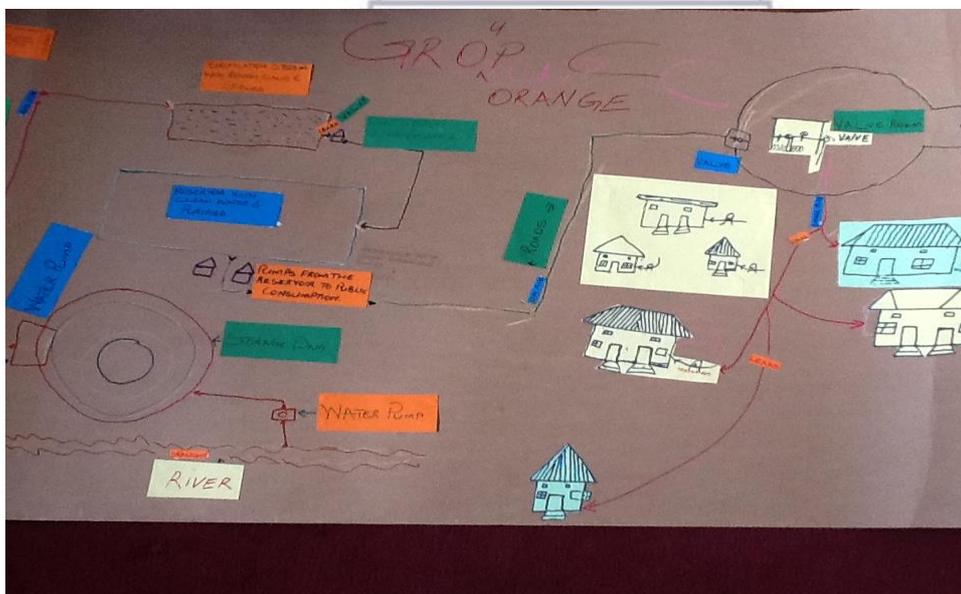
#### **b) Participatory Action Research (PAR) Tools**

PAR is an alternative approach to development projects which are usually implemented in a 'top-down' manner (Babbie & Mouton, 2001). PAR is 'bottom-up' in nature, and

it is more responsive to the needs of local people (Babbie & Mouton, 2001). PAR tools were used to capture data and allowed study objectives to be addressed from several sources. The PAR tools were used to supplement the semi-structured interview schedules and to capture added data in a participatory way, allowing for authentic data production by the respondents themselves. The following participatory methods were used:

*i) Mapping*

Mapping is a participatory technique that draws on local people's knowledge about resources and services in the community (Chambers, 2008). Mapping is one of the techniques used in Participatory Rural Appraisal (PRA), which emerged in the 1980s (Cornwall & Pratt, 2003). However, mapping is identified as having many different sources, from social anthropology to participatory action research (PAR) and popular education (Chambers, 2008). Mapping was used to capture community knowledge on resources that they depend on for their everyday living – including water. It was also used to tap into their knowledge about water issues in their everyday lives. Figure 3.6 below illustrates a community mapping exercise.

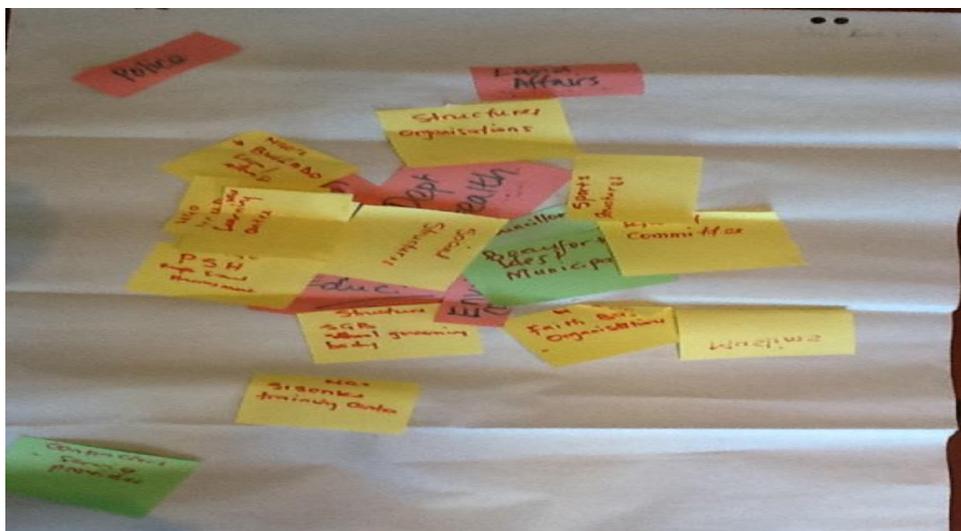


**Figure 3.6: Community mapping exercise in eThekweni Municipality.**

*ii) Venn Diagrams*

Venn diagrams (named after John Venn who created them in the 1880s) allows for the visual presentation of relationships between and among groups of objects that share

something in common. It is a spatial tool that was applied in this study to reflect on the key institutions and individuals in the case studies and their relationships and importance to reclaimed water project. Some questions in semi-structured interview schedule II under the theme social capital were asked again in this exercise. The Venn diagram provided a spatial rendering of the social networks involved in the reuse project in general and provided an understanding of the way in which different groups of people were able – or not as the case might be – to influence decisions around the particular reclaimed water project in question. Figure 3.7 below shows the Venn diagramming exercise.

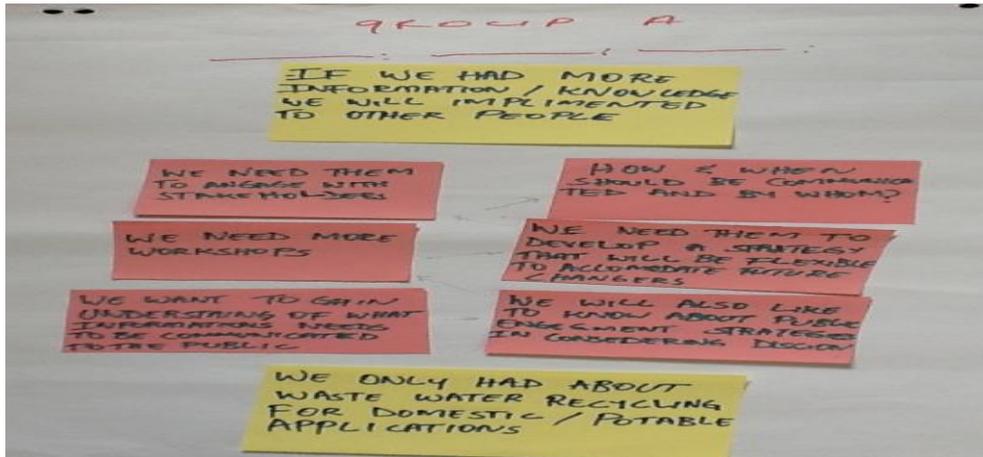


**Figure 3.7: Venn diagram exercise in Beaufort West Municipality.**

iii) *Emoticons*

Emoticon is a construction of the words ‘emotion’ and ‘icon’, which refers to graphic representations of facial expressions (Skovholt *et al.*, 2014). Emoticons can be produced by symbols such as (:-) or by pictograms which are graphic icons (😊) (*ibid*). According to Krohn (2004) cited in Skovholt *et al.* (2014), the emoticon was first used in written text in 1982 by computer scientist Scott E. Fahlman at Carnegie Mellon University in the United States. Emoticons are commonly used in studies such as social media and computer mediated business communication (*ibid*). The Emoticons tool was used in the study to capture feelings that were being experienced by the public with regards to reclaimed water. A total of 17 emoticons were selected from Internet sources to tap into different emotions (positive and negative) around the reclaimed water initiative.

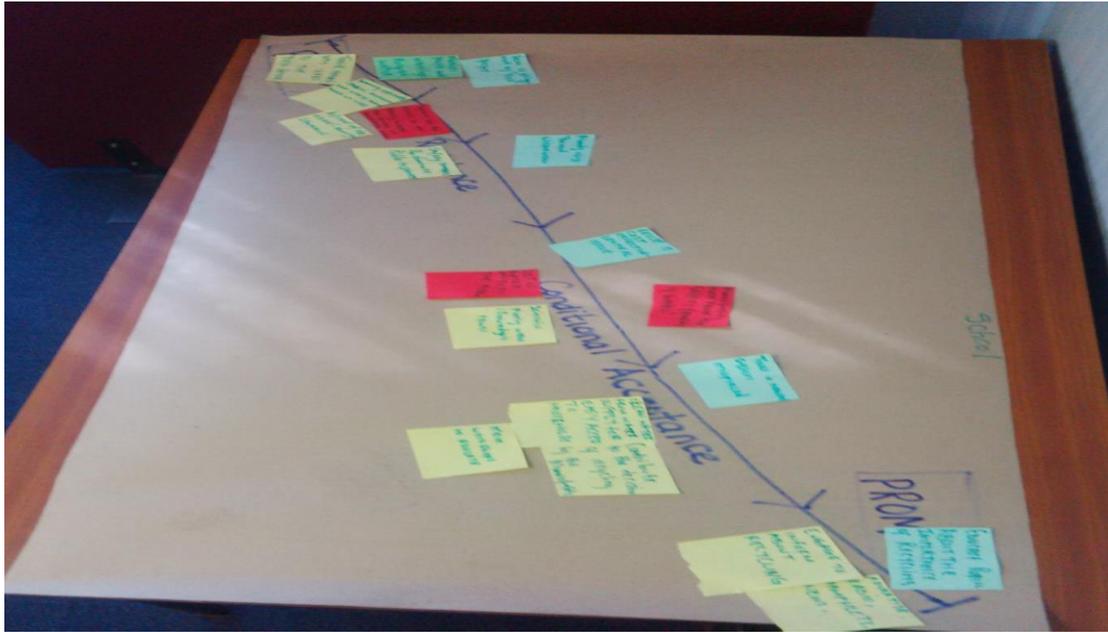




**Figure 3.9: Story with a Gap exercise in eThekweni Municipality.**

v) *The Resistance to Change Continuum*

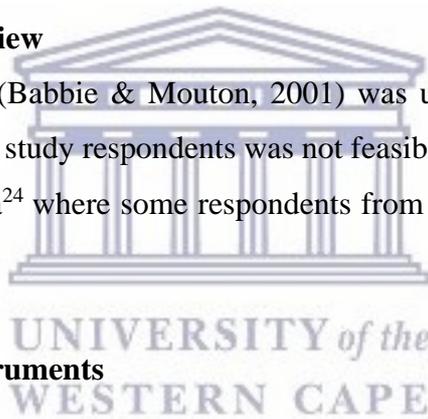
The ‘Resistance to Change Continuum’ tool developed by Srinivasan (1990) is used to demonstrate a simple way of categorising resistances commonly met in the community. It gives inferences to which approaches would be most appropriate when working with people who are either receptive or resistant to change. The process involves the identification of stages of resistance or openness to change. In the context of this study, it was used to capture the implications of different perceptions on public decision in reclaimed water implementation. Different perceptions were attached to different categories along the continuum from rejection to resistance to conditional acceptance then to promotion. The tool was also used to identify actions to be taken to address public perceptions and to shift the public position of resistance to one of promotion for the reuse scheme. Figure 3.10 below shows the resistance to change continuum exercise in one of the study sites.



**Figure 3.10: Resistance to Change Continuum exercise in eThekweni Municipality.**

### c) Telephonic Interview

The telephonic interview (Babbie & Mouton, 2001) was used in an instance where physical interviewing with study respondents was not feasible.<sup>23</sup> This method was also used to fill in missing data<sup>24</sup> where some respondents from the public were contacted via telephone.<sup>25</sup>



### 3.6 Application of Instruments

This section reflects on the way in which the data was collected for the study using the different data collection tools identified in section 3.5. Data collection with municipal officials took place via individual interviews, group interviews using interview schedule I and, in the case of one municipal officer, via the telephone. The semi-structured interview schedule I was used to ask questions during telephonic interviewing. Some additional data were captured via telephonic interviews with the public. Data was recorded by use of a notebook and a tape recorder (in some instances). Digital recording of methods (taking photos) was also helpful in recording the data

<sup>23</sup> Used during first phase of data collection in eThekweni

<sup>24</sup> Some missing data on perceptions and emotions was needed and for convenience, this information was obtained via telephonic interviews.

<sup>25</sup> Four interviews

collection process. The duration of an individual interview was approximately 1 hour whilst group interviews lasted up to 1 hour 15 minutes.

Data was collected from members of the public through focus groups using the participatory tools identified and semi-structured interview schedules II and III. Focus group sessions lasted up to 2 hours 15 minutes. Additional data was captured via telephonic interviews which lasted between 10-15 minutes. Consent forms were issued to public respondents (Appendix E) were signed before the interviews began.

### **3.7 Validation Process**

Babbie and Mouton (2001) calls the validation process, 'member check', where the researcher goes to the source of information and checks both data and interpretation to avoid any errors. A validation process was followed to ensure that the data gathered and interpreted was correct. This process was done via workshops organised at each case study site. This consisted of both study respondents (municipal officials and public) that were already interviewed in previous field visits, and in an instance (eThekweni) other public respondents (teacher and learners from schools) were represented to add to the sample of the case study. The workshop agenda including results of the study was made available to respondents electronically prior to the workshop in order for them to familiarise themselves with the validation process. During the workshop:

- 1) Data was validated and adjustments<sup>26</sup> were made.
- 2) Additional information (Babbie & Mouton, 2001) relevant to the study was captured using the Resistance to Change Continuum tool. The tool was used to show the implications of public perceptions for decisions that were being made by officials in the implementation of the reuse scheme to capture objectives two and three of the study.
- 3) The third part of the validation process involved addressing public perceptions by proposing actions (municipal actions and public actions by both groups. e.g. municipal officials had to suggest both municipal and public actions and vice-versa) that would shift public rejection and resistance towards conditional

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<sup>26</sup> Adjustment was made in Overstrand only

acceptance and promotion of the reuse scheme. This part captured data that informed the approach to address public perceptions as stipulated in objective four of the study.

### 3.8 Data Analysis

Data was analysed concurrently using categorical aggregation analysis (Creswell, 2007). Data collection and data analysis went alongside each other in an iterative manner where the results of the analysis guided the subsequent collection of data. Categorical aggregation analysis involves the establishment of patterns in the data and the search for correspondence between two or more categories. In order to capture factors influencing public perceptions, raw data from the field including narrative texts and texts emerging from the participatory tools ('Story with a gap', 'Emoticons' etc.) were organised under the four main themes namely: Knowledge, Social Capital, Emotions and Perceptions. Questions under these main themes were then reorganised into subthemes. Table 3.2 shows an example of sub-themes.

**Table 3.2: Sub-themes under Social Capital**

Sub-themes
View on public
Trust- <i>between community &amp; municipality</i>
Cooperation - <i>community/ municipality &amp; networks &amp; within community</i>
Participation - reconciliation study
Participation -feasibility study
Participation in reuse
Participation adequacy suggestions

Data captured from semi-structured interview schedule I provided an overview of institutional decision-making for the reuse scheme and public engagement decisions to provide data for objective one and two of the study. Findings informed the next phase of data collection. Public engagement processes were covered in detail in semi-structured interview schedule II under the theme Social Capital and using Venn diagrams to address objective two of the study. Data pertaining to Knowledge was captured as well via semi-structured interview schedule II and the use of the mapping tool. As a cross cutting theme, all emotions expressed under the theme Emotions in semi-structured interview schedules II and III were organised into the emoticons schema which provided data for objectives one, two and three. In order to address

objective three on factors influencing public perceptions, data was drawn from Knowledge, Social Capital, Emotions and Perceptions themes.

This enabled the researcher to reach an in-depth understanding of the reasons for public perceptions and the effects of particular approaches (using the Resistance to Change Continuum tool) on public responses. The approach for addressing public perceptions was developed by clustering data into institutional decision-making stages which was a finding from the first phase, and proposing terms of engagement at each of the stages to address objective four.

The combination of research methods for this study provided for an authentic production of data from the respondents themselves and subsequently triangulated and interpreted to draw conclusions. The interviews and PAR methods provided a unique opportunity to test the usefulness of the theoretical frame – the Capability Approach, as the ideas of opportunity, trust and choice reverberated in the responses of the sampled population.

### **3.9 Limitations and Sources of Error**

One of the limitations with using the case study approach is lack of generalisability of results (Mouton, 2001) as results cannot be assigned to a larger population. However, in-depth findings from this study informs further research and some ‘truths’ can be extrapolated and used to decipher similar situations in diverse locales.

In terms of sources of error (Stake, 1995 & Yin, 1994), the public participation process in eThekweni and Beaufort West was not captured.<sup>27</sup> However, the process captured in Overstrand is representative of public participation processes in South African municipalities. In other instances<sup>28</sup> where there were gaps in information, these were addressed using secondary data. In section 3.5.2, the skew sample, for instance in terms of gender (in eThekweni and Beaufort West) had no real effects on the general findings.

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<sup>27</sup> In Beaufort West, councilors responsible for public engagement were not available for interview.

<sup>28</sup> In eThekweni and Beaufort West, Muslim leaders who could give insights into perceptions on religion, were not available.

### 3.10 Summary

The Capability Approach as the core theoretical framework has been presented and links between this framework and the current study on reclaimed water for domestic applications have been made. The idea of emotions and the way in which this focus links with the Capability Approach has been discussed. Its usefulness and applicability in understanding ‘intangible’ dimensions in water resources management with a particular focus on public perceptions around reclaimed water, has been confirmed.

The research approach used in this study involved qualitative research using a multiple-case (embedded) case study design. Primary and secondary data were used. Secondary data was obtained via desktop literature as well through reference to newspapers and media articles. Ethical procedures were fulfilled at the University of the Western Cape prior to data collection. Primary data was captured via semi-structured interview schedules, the implementation of Participatory Action Research tools such as Emoticons, Story with a Gap, Mapping etc. These instruments were administered in a focus group format. Face to face interviews were conducted to gather a wide range of data to scrutinise emotions and perceptions around reclaimed water for domestic applications and also to solicit proposed approaches that could address negative public perceptions. Telephonic interviews were used for obtaining data when physical contact with respondents was not feasible.

Data was validated to avoid errors. The data analysis used categorical aggregation analysis and involved the process of clustering narrative texts extracted through the semi-structured interview schedules and participatory tools into sub-themes. The four main themes are 1) Knowledge 2) Social Capital 3) Emotions and 4) Perceptions.

The next chapter presents the results and findings collected through the case studies around reasons for the choice of reclaimed water by the municipality, public knowledge on water issues, issues around social capital, emotions and public perceptions.

## CHAPTER FOUR

### **4 FINDINGS ON DECISION-MAKING PROCESSES, PUBLIC ENGAGEMENT, PUBLIC PERCEPTIONS AND ACTIONS TO ADDRESS PERCEPTIONS FOR DIRECT POTABLE REUSE**

#### **4.1 Introduction**

This chapter presents data and analysis drawing on primary data obtained from the interviews and focus group discussions in the Overstrand, Beaufort West and eThekweni municipalities. The interview schedules and participatory methods were designed to capture decision-making processes around DPR and to capture topics according to the broad themes identified in Chapter Three, which tapped into the objectives of the study. A total of 88 respondents were interviewed across the three case study sites. The chapter organises the findings within the broad themes as presented in Chapter Three. It captures respondents' suggestions on how to address negative public perceptions towards DPR.

The chapter addresses the following concerns: 1) reasons for adopting reclaimed water, 2) the decision-making processes, 3) public/community knowledge on water issues, 4) social capital and engagement processes regarding reclaimed water, 5) public perceptions, 6) municipal officials' view on some public perceptions and 7) implications of selected public perceptions on public acceptance/rejection and actions to address negative perceptions.

#### **4.2 Reasons for Direct Potable Reuse and Public Knowledge on Water Issues**

This section covers findings on the reasons, as well as the decision-making processes for direct potable reuse and also considers public knowledge on water issues in general and reclaimed water in particular.

##### **4.2.1 Reasons for Direct Potable Reuse**

The first findings are presented from the Overstrand municipality. Here it was noted by municipal officials that the reasons for choosing DPR as a solution to water scarcity was depletion of surface water and limited volume of groundwater caused by a drought

which took place over a period of about three years. In order to address the water scarcity situation, municipal officials reported that they first and foremost notified the public urging them to reduce their water use because of the decision that had been taken by the Department of Water Affairs regarding water restrictions. Officials concurred that they had informed the public about a ban on irrigation for gardening with a hosepipe and that, raising awareness on water scarcity had reduced water demand up to 25%.

Officials expanded on their reasons for opting for the reuse option, claiming that this option was cheaper than desalination and as such was a more viable solution to water scarcity. Population growth due to tourism was also factored in as one of the reasons. They also affirmed that there were funds availability for construction, operations, maintenance and monitoring of the plant required for DPR.

In eThekweni, municipal officials claimed that the main reason for adopting direct potable reuse was the growing water demand as a result of population and economic growth and that in fact a moratorium was placed on development in order to balance demand versus supply of water. Growing volumes of treated effluent and the need for ecological balance contributed to the decision of choosing DPR. Other reasons include, cost effectiveness when compared to desalination, availability of funds, minimising health and environmental risks, predicted water shortage coupled with the need for water augmentation.

In Beaufort West, municipal officials claimed that the main driver contributing to the adoption of reclaimed water was the severe drought that took place in the area. It was during this period that the Beaufort West DPR project was initiated using funds from Disaster Management. The drought started in the year 2007 and persisted up until the year 2010, which was the year when the worst drought was experienced. As a result of this drought, there was limited groundwater and surface water which left the area with no reliable and sustainable sources of water. During this time there was intermittent water supply and a water restriction was imposed by DWA in order to reduce water usage. This is as reflected in the extract below:

“People were without water for thirty-six hours in a week. 10 litres of water was supplied to the people, buckets were used and this caused a massive inconvenience. If people were found using 12 litres of water, they had a fine” (Beaufort West Engineering services, 2014).

Aquifers were considered as an alternative source of water but these were situated about 20-25 km from the town and water from the aquifers was very poor quality which meant that desalination measures would be necessary. Furthermore there were fears that the aquifers might dry up during drought periods. For these reasons reclaimed water was the only alternative because it was cost effective, reliable and sustainable.

Reasons contributing to direct potable reuse across case study sites are summarised in Table 4.1 below.

**Table 4.1: Reasons Contributing to Direct Potable Reuse**

Beaufort West Municipality	Overstrand Municipality	eThekweni Municipality
<ul style="list-style-type: none"> <li>- Drought</li> <li>- Limited groundwater</li> <li>- Lack of reliable water resources; no rivers</li> <li>- High cost of alternative options (desalination of groundwater)</li> <li>- Cost effectiveness of reclaimed water</li> <li>- Reclaimed water as a reliable and sustainable water source</li> <li>- Availability of funds</li> </ul>	<ul style="list-style-type: none"> <li>- Drought</li> <li>- Depletion of surface water</li> <li>- Limited ground water</li> <li>- High cost of alternative options (referring to desalination)</li> <li>- Population increase due to tourism influx</li> <li>- Availability of funds</li> </ul>	<ul style="list-style-type: none"> <li>- Population growth</li> <li>- Predicted water shortage</li> <li>- Economic growth</li> <li>- Growing discharge of wastewater effluent</li> <li>- Limited volume of bulk water as a result of growing pressure on the dam</li> <li>- Ecological balance</li> <li>- Minimising health &amp; environmental risks</li> <li>- Augment water availability</li> <li>- Cost effectiveness of DPR compared to desalination</li> <li>- Availability of funds</li> </ul>

#### 4.2.2 Decision-Making Processes for Direct Potable Reuse

In all three case studies there were different stages of decision-making leading to the choice of reclaimed water for domestic applications. First of all a Reconciliation study was undertaken by DWA to determine future water availability against the growing water demand. The findings from the Reconciliation study provided the baseline that

informed decision-making and the outcome was that the reuse option was considered as an alternative to address water scarcity.

In Beaufort West, the only site where DPR technology has already been implemented, severe and prolonged droughts led to disaster management. Municipal officials agreed that there was a general acceptance within the municipality that DPR was needed and that there was also consensus from the highest levels at DWA, through to political appointees and municipal officials that this was the way to go. The bullet points below reflect the logical step-by-step approach adopted by Beaufort West - starting with the decision-making stage through to implementation:

- A feasibility study was undertaken to identify the reuse option and technology type;
- The outcomes and proposals were submitted to the council;
- The outcomes were also presented and registered with disaster management for funding and support purposes;
- Municipal council approved;
- A report including financial requirements was submitted to DWA;
- Project initiation via a tender process;
- Final council decision and incorporation of the proposal/project into the Infrastructure Development Plan (IDP); and
- Plant operational – 15<sup>th</sup> January 2011 and first test in early February 2011.

In Overstrand, DPR has not yet been implemented although it is likely that it will be implemented in the not too distant future. Within the municipality of the Overstrand the following decision-making processes around the possibility of DPR implementation are pertinent:

- Feasibility study on preliminary design (abstraction and treatment technologies);
- Presentation and discussion at mayoral committee level;
- Public information through ward councilors and public representative;
- Media release; and

- Mayoral decision (based on technical feasibility report and public acceptance).

In eThekweni, the DPR project has not been implemented. According to municipal officials, engaging with the decision-making processes at the highest level in the institution was challenging and there has not been agreement on implementation amongst some stakeholders. These stakeholders include on the one hand the Muslim segment of the population and on the other hand political representatives. The project has been halted because of a lack of consensus around the adoption of DPR.

### **4.2.3 Public Knowledge on Water Issues and Reclaimed Water**

As is clear from the discussion in chapter one and two, knowledge is a critical component of acceptance. This sub-section covers results from public respondents organised under the broad rubric of knowledge. The following aspects of knowledge are relevant: knowledge of water scarcity, knowledge of the impacts of this scarcity on the public, knowledge of water studies and basic knowledge of water sources. Other components of knowledge acquisition by the public include: specific knowledge on reclaimed water, knowledge on steps leading up to the adoption of DPR and knowledge about water treatment and reuse technology. The section that follows examines the different aspects of knowledge.

#### **4.2.3.1 Knowledge on Water Sources and Water Scarcity**

Across the case study sites, public respondents had some knowledge on their water sources but knowledge about water scarcity varied. In the Overstrand, the public identified rain, boreholes, dams, the Onrus River and water from the municipality as their water sources. It was apparent that in general the public is unaware of the water sources in the area:

“The general public doesn’t know where water comes from; generally they will say that water comes out of taps, electricity comes out of socket – no good understanding of sources of water” (Whale Coast Environmental NGO, June 2014)

The data reflected some awareness by the public of the 2011 drought as well as the 2013 drought. The issue of water scarcity and water restrictions placed by the

municipality had been circulated to the public via monthly water bills. Some respondents observed that their taps were dry for long periods and that water usage for gardens was restricted. It was also reported that the ensuing water restrictions made people fearful and the effects of the drought, such as the dry dam, uncertainty of rains, diseases, crop failures and subsequent increase in food prices, was scary.<sup>29</sup> The extracts below reflect public awareness of water scarcity and water restrictions:

“Yes, water shortage because the dam level decreased. Dam was down about 13% and water usage reduced” (Whale Coast Environmental NGO, 2014)

“Yes, water restriction as municipality told the public that water will be shut off if daily limit is exceeded. Information was written on the monthly water bill” (Focus group Qhayiya Secondary school, June 2014)

On the other hand there was also evidence that the public had been unaware of water scarcity issues until such a time that water restrictions had been imposed by DWA:

“I don’t think communities experienced shortage. People don’t believe there is shortage, they switch on and there is water! Reduced water usage was one of the signs that made the public aware of the situation” (Whale Coast Environmental NGO, June 2014)

Most of the public, including representatives from an environmental NGO, had no knowledge of the reconciliation study. Only one respondent (the principal of a special needs school) was aware of the Reconciliation study “through meeting by BOCMA, correspondences”<sup>30</sup> and reflected on the way in which the public was involved in the Reconciliation study via the public meeting.

In eThekweni, the public was aware of rain, dams, the Umgeni River and other rivers and standpipes as water sources in their community.<sup>31</sup> Respondents indicated that they do not experience water scarcity but that they knew the value of water.

Despite the fact that public respondents had not themselves experienced water scarcity, they identified causes of water scarcity as droughts, reliance on power supply, burst

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<sup>29</sup> Zwelile community focus group, December 2015

<sup>30</sup> Principal Camphill Special Needs school, June 2014

<sup>31</sup> See Appendix on knowledge mapping

pipes, contamination in river, leaking and water theft. The public did not know about the Reconciliation study.

In Beaufort West, the public has a general knowledge of water sources in the community. Public respondents from the Mandlenkosi community identified dams and the River Gamka as the main sources of water in Beaufort West.<sup>32</sup> There was also awareness of water scarcity issues that had been caused by the drought of 2009. Respondents posited that they had been affected by the droughts – some members of the public even had to bathe with bottled water and they had to wait on trucks to supply water to their homes. There was a general awareness that the watering of crops had been banned and as a result crops were dying. For some, this meant buying rather than growing vegetables. A typical experience of the drought follows:

“The 2009 drought and restrictions were a severe problem for everyone. The radio played a very significant role, broadcasting and telling people not to waste water. It was very bad, our dam was empty” (Gamkaland radio, August 2014)

Respondents supported the water restrictions placed on irrigation and car washing and said that, as the municipality had to save water, these restrictions were fair. During the drought there had been no outburst of diseases in their own community and neighboring communities and there was enough water supplied for cooking and drinking. Because they had received support from the government, which alleviated the situation, people were more hopeful than sad. They were also hopeful that the drought would cease. However, although the public seems to be aware of water scarcity in general and the 2009 drought predicament in particular, there was no knowledge of the Reconciliation study.

#### **4.2.3.2 Knowledge on Reclaimed Water and Reuse Decision**

The data showed that there was more knowledge of reclaimed water and decisions about implementation processes in Beaufort West than in the other two sites. In the Overstrand, most public respondents did not know the meaning of reclaimed water

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<sup>32</sup> See Appendix on knowledge mapping

despite the fact that they had been made aware of the idea of reclaimed water through the television. This research – probing and asking questions about reclaimed water, also provided an opportunity to gain knowledge about reuse. The few people who knew what reclaimed water entailed viewed it as water that has been treated and used again, for irrigation or to a potable state. The two extracts below are pertinent:

“I grew up with it, used for irrigation in Free State, Welkom. Reclaimed water refers to water that is cleaned and put back in the system - cleaning water and pumping back” (Campus manager Curro Hermanus High school, June 2014)

“Yes. Water that has been used before, for bathing, kitchen and laundry and used again for other purposes like toilet flushing or irrigation of lawn” (Principal Camphill Special Needs school, June 2014)

Public respondents who had no knowledge of reclaimed water, were unaware of implementation plans in their town and they were also not aware of who opted for reclaimed water and which stakeholders were involved in debates about this issue. A few respondents, although not knowing anything themselves about reclaimed water said that they were aware that the municipality had opted for reclaimed water. They had learnt about reclaimed water whilst listening to discussions about bottled water and other water concerns during public meetings. Those citizens who were interviewed thought that possible reasons for deciding on reclaimed water for potable applications could be water shortage, population growth, droughts, tourism, limited water abstraction as per DWA restrictions, limited available options that could supplement water farming activities and also industry demand. One of the respondents said that the decision to use reclaimed water was a decision that gave a strong message to the public that water needed to be used economically:

“It is economic in the way we save water. Government has focused at a distance to economise, a way of communicating to the public to make people realise the importance of water” (Muslim Leader, June 2014)

In eThekweni there were respondents from the public sample who had not heard about reclaimed water prior to this research project. There were respondents who had been made aware of the option of reclaimed water for potable applications through training

sessions run by the municipal water department, via User platform meetings, community meetings and also from the AA Focus Group.<sup>33</sup> Nonetheless, the majority of the public who were interviewed showed very little knowledge about the reasons for using reclaimed water for domestic applications. They suggested that engagement between the municipality and the public via the print media and the radio as well as public meetings would most likely raise better public awareness about recycling of wastewater.

In Beaufort West, more respondents from the public were aware of reclaimed water for domestic applications. They recognised reclaimed water as being water that came from the toilet and that the municipality did not have many alternatives because of the “drought, less rain and the dam was dry”<sup>34</sup>

Respondents showed some support regarding the decision for implementing reclaimed water because they were aware that there was no other alternative, because obtaining water from boreholes would be an expensive option. There would also be high costs for desalination. Some respondents said that they had learnt about the decision to use reclaimed water via the print media but there was agreement that the public had not been adequately informed about the reuse implementation plan.

#### **4.2.3.3 Knowledge on Water Treatment and the Reuse Technology**

There were varying views across the case study sites when it came to knowledge of water treatment and reuse technology. However, it was evident that most respondents did not know about the full processes involved in their water treatment (case of Overstrand and eThekweni), and on the whole, respondents in all three sites did not know about the type of reuse technology although they claimed to have some idea of what it could entail. Almost all of the respondents were unaware of the feasibility study that had taken place in their towns.

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<sup>33</sup> The AA focus group is a group from section AA in the Claremont Umlazi informal settlement, which was formed to represent water issues in that community.

<sup>34</sup> Focus group Mandlenkosi community, October 2015)

In the Overstrand, although some public respondents did have knowledge on their present water treatment technology, many did not. Public respondents from the Qhayiya secondary school focus group for instance, did not know about the water treatment technology that the town had adopted. At the same time though, whilst recognising that some members of the public might be concerned about the water quality, they themselves felt satisfied that the water had been purified and tested. The extracts below about technology are pertinent:

“Yes, I visited a plant to see the treatment process and how the system works” (Campus manager Curro Hermanus High school, June 2014)

“Yes, I do understand that because I visited several treatment plants. If plant is under good maintenance, no problem” (Whale Coast Environmental NGO, June 2014)

“Yes, water is treated to remove impurities and make it clean /fit for human consumption” (Muslim Leader, June 2014)

Public respondents did not know about the feasibility study and expressed concerns about the quality of reclaimed water. What also emerged from the primary data on issues of water quality was the idea of equity. This is well reflected in the extract below:

“The whites are using good quality water and blacks are using different water. That’s why we are sick” (Focus group Qhayiya Secondary school, June 2014)

Respondents affirmed that knowledge on reuse technology is very important and concurred that there should be access to information about the treatment process to raise awareness for everyone about the safety, which would in turn reduce doubts build confidence and trust – reflected in the extracts below:

“Technology is very important to know, believe is to see. Everyone should be aware of the treatment technology because knowledge will provide confidence and trust.” (Muslim Leader, June 2014)

“Yes, because it will provide confidence and trust on the quality of water and ensure the public that water treated using such process is fit for human consumption. Everyone must know and understand water treatment

process, parents of children and staff” (Principal Camphill school, June 2014)

In eThekweni, the public was unaware of the feasibility study and they had only heard about it for the first time through this research. Respondents claimed that they did not understand the technology around water and wastewater treatment but that they were interested to find out more, particularly about the safety and quality of reclaimed water.

In Beaufort West, most respondents from the public did not know about the feasibility study and on the whole showed little or no knowledge about the technology. And while most respondents were interested in acquiring more knowledge of the treatment process, it was not important for some who felt that this was a matter that was the domain of technicians:

“We don’t know about treatment process but we know they use chemicals. We don’t know where the water comes from, the public should be explained the process, how it works from source to drain then taps. Is it safe to drink?” (Gamkaland radio, August 2014)

“I don’t know where the pipes are, that is the job of the technicians. The labourers should know” (Legal Advice NGO, August 2014)

Some of the public had knowledge on the treatment process as they had been taken to the plant where they had the opportunity to learn about the technology:

“I visited the plant and the process was explained. There are V-sections, water is drained to those sections then flows out” (Principal St. Matthews Primary school, August 2014)

“I have visited the plant with learners so that they can learn about the treatment technology” (Teacher Beaufort West Secondary school, August 2014)

### **4.3 Public Engagement Processes in Water Studies and DPR Scheme**

This section presents data gathered from interviews with the public as well as from municipal officials around engagement on the broad topic of water and on engagement on the topic of reclaimed water in particular. It also reflects on opportunities for co-

operation between the municipality and the public and amongst the public themselves. The narratives that follow reflect levels of trust between the municipality and the public and amongst the public themselves and show whether and in what ways the public considers themselves to be important in determining whether or not there should be a reclaimed water scheme. This section also scrutinises social networks and considers their level of influence around the DPR scheme as well as suggestions made by respondents on how the municipality could better engage with them regarding DPR.

#### **4.3.1 Public Engagement in Water Studies**

In the Overstrand, most public respondents were not involved in the Reconciliation and Feasibility studies and they were concerned about transparency. The extract below is selected to reveal these concerns – concerns around public engagement.

“We were not involved. People must be involved in the beginning. We are paying for water, using water; there are businesses about 700-900 guesthouses in the area. They should go to community structures and they will send representatives. There should be transparency and be accountable, maybe they are hiding something” (Focus group Qhayiya Secondary school, June 2014)

One respondent who had been involved in the Reconciliation study claimed that although the public had been involved (see section 4.2) in some aspects, on the whole the public was not adequately involved in the Reconciliation study itself as there had been a low turnout in public meetings held to discuss the Reconciliation study.

Municipal officials at the engineering services claimed that DWA had involved the municipality, water boards, bulk water users like agriculture and some stakeholders in the Reconciliation study. Nonetheless, according to these officials, the report on the Feasibility study involving technology selection for reclaimed water was not made available to the public. They said there were no public meetings and no Ward committee meetings regarding this study. In their opinion this was justified as they felt that the information was too technical for the public to understand.

In eThekweni public respondents were not involved in the Reconciliation and Feasibility studies because the process did not have a public participation and feedback

component to it. In Beaufort West, most public respondents had not been involved in the Reconciliation and Feasibility studies and they felt that public engagement process in the studies was not adequate. Some respondents who were consulted highlighted the need for information sharing and proposed that the research should be shared so that there could be an opportunity to learn.<sup>35</sup>

### **4.3.2 Public Engagement Process in Reclaimed Water**

In the Overstrand, municipal officials from the technical services said that there were no public meetings held regarding the decision for reclaimed water. They claimed that the public had been informed via the media (newsletters, newspapers and web articles). According to these officials only three individuals from the public had given telephonic feedback about safety issues. The municipal officials that were interviewed felt that their steps to engage the public were justified because according to them, the project is at its very early stage and is not yet been implemented. They also felt that all segments of the population did have the same opportunities to be involved in decisions around water issues as they have all been invited to meetings where they had the right to raise concerns and issues around water in general. However, they ascertained that they did have future plans to engage the public more actively during the implementation phase and that this would be within the context of an Environmental Impact Assessment.

Councilors, who are municipal officials responsible for public engagement, clarified that reclaimed water plan was part of the municipality's Integrated Development Plan (IDP) and Water Services Development Plan (WSDP) and that these plans were made available to the general public through the municipal website. The councilors agreed that although the public participation process (PPP) within the municipality is in place, it encounters challenges in its application due to low levels of literacy amongst the general public and because people were caught up in a poverty trap:

“Poverty, leading people to focus on livelihood related activities rather than being involved in municipal issues. People participate often when issues discussed are directly related to their lives such as access to housing and jobs” (Councilors, June 2014)

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<sup>35</sup> Interview respondents Gamkaland radio, August 2014

Councilors advised that public meetings would not be called regarding reclaimed water specifically but that this issue would be raised as part of a broader agenda around service delivery. They described the public participation process (PPP) and organisational structure as follows:

➤ ***Public Participation Process***

- The process starts firstly with those involved in the ward committee – and these are the councilors who are public representatives and belong to organisations involved in public services. There is a monthly council meeting (including a Portfolio meeting and Ward meeting) and public meetings, including committee meetings, held every second month.
- The ward councilor calls the meeting with the street committee and briefs this committee about any issue that is to be discussed.
- The public is invited to the public meeting through the street committee.
- Street committee meetings are held to disseminate information to the public.

The Councilors indicated that the process is difficult and requires regular monitoring to understand whether the message given to street committee members has been disseminated adequately and to assess their ability to convey the message appropriately.

The communication strategy used by councilors involves: talking to community leaders and getting their buy-in, requesting community leaders to convey the message to the public directly or via a street committee and only then, once the public has been briefed, a meeting is called.

➤ ***Organisational Structure***

- In some areas, Wards 5 and 6 for example, a street committee was established representing residents from each street who were then invited to disseminate information to the public.
- The residents of the street call for a street committee meeting during which their representatives are selected and recommended to the councilor to be formally appointed. The committee has a total of 10 members including a chair, deputy chair, secretary and deputy secretary, organiser and general members.

- The role of the street committee is to mobilise communities, inform the communities about particular meetings (circulate an agenda/purpose of the meeting, time and location, speaker etc.).
- Due to high levels of illiteracy, street committees convey to the public their message about a meeting in the vernacular using loud speakers.
- Street committee members are selected by people living in the same street and these individuals are then recommended to the councilor so that they can be formally appointed onto the street committee.
- Street committees are federated in a so called Neighborhood Watch (which is an assembly of street committees for a given area). Their role is mainly to draft the public issues (from each street) and draft the recommendations for the entire area, call meetings for the entire area etc.
- On top of the Neighbourhood Watch, there is a community policing forum that is made up of members from the street committee, municipal officials and members from the policeforce. Their role is mainly to discuss issues related to the well-being of the community, ranging from security and safety, social issues and service provision which includes water and sanitation.
- Ward committees are comprised of members of the community (residents of the ward) who were selected by their fellows to represent them through the different structures described above. A Ward Committee is comprised of 10 members and their roles are mainly to: represent the community, assist the councilor including monitoring the community needs and concerns, organising meetings and flagging issues pertaining to the well-being of the community. The committee is represented by the ward councilor during public meetings and events.

The councilors suggested that the public should be engaged at all stages of the decision-making process, starting from the reconciliation and feasibility studies, through to implementation and post-implementation so that they could "... inform the public, get their opinions and views and importantly get buy-in."<sup>36</sup>

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<sup>36</sup> Overstrand municipality Councilors, June 2014

In a focus group discussion, quite a few public respondents said that information on reclaimed water was available on websites and on water bills. There was consensus that there were indeed public meetings but the overall opinion was that public meetings are not well attended in general.

Reuse plans were communicated by the municipality via public meetings; including meetings held with DWA, Breede Gouritz Catchment Management Agency (BGCMA), the Advisory Forum and Users' Forum, via newsletters that were circulated with the municipal accounts as well as through the radio and newspapers. Draft reuse plans were included in the IDP and there was a call for comments by the public, but only a small segment of the population had access to the plans and was able to make any input. The two extracts below reflecting municipal engagement with the public are pertinent:

“Yes, we know about it through radio, newspaper, during meeting with DWA and BGCMA (Principal Camphill Special Needs school, June 2014)

“Yes, during the public meeting that was organised by the municipality. Municipality communicated during the public meeting that was organised. I took part in the meetings; the Overstrand Advisory Forum, plenary for Ward Committee system. Also, newsletters, those with municipal accounts it was called strategy for the future and in the newspaper, it was called future water management” (Whale Coast Environmental NGO, June 2014)

The public was given the opportunity to participate by asking questions, presenting ideas and sharing experiences but in fact very few members of the public were able to on these opportunities. There seem to be differing views about communication of reuse plans.

As indicated above, the view was that municipal officials had not engaged with the public, but some respondents felt that the public had in fact been involved. It is therefore likely that there were some networks representing the public that were involved in meetings but that overall the public had not been involved during these early stages. An Advisory forum had been formed at the time to deal with the water crises, and there were members from the public represented on this forum.

The public on the whole is not satisfied with the manner in which decision makers engage with them and they feel that there is room for improvement, with suggestions<sup>37</sup> for improvement such as; use of physical announcement (going around to make it known via public talks to all public), informing the public via newsletter, newspapers, municipality working together with schools via sms, plant tours and more public meetings and campaigns to get feedback from the public on the safety of DPR. It was more likely that DPR would be accepted after these steps had been taken.

In eThekweni, municipal officials were aware that communication to the public was mainly through the media, including radio slots, newspaper articles on health and safety as well as articles on the treatment process itself. Despite this claim, the majority of the public remained unaware of reuse plans and felt that they should be informed because “knowledge is power and a well informed nation is a powerful nation.”<sup>38</sup>

In Beaufort West, municipal officials ascertained that there had been an attempt to introduce the idea of reuse in public meetings. According to these respondents, flyers and local newspapers also communicated information to the public about water scarcity and the option of reclaimed water. Municipal officials explained that they had engaged with the public through councilors and that they had contracted an expert consultant to respond to questions asked by the public – especially questions around the risks of reclaimed water. Municipal officials explained that this meeting had specifically targeted community members of Mandlenkosi (and other interested parties) where the most negative perceptions arose. However, Mandlenkosi community members claimed that they were not aware of these meetings:

“No we were not aware. I saw pipes and asked if it was communicated to the public. No recall of any meetings, maybe it was a private meeting – politically influenced. They can’t claim community was aware. They should provide minutes, agenda and attendance register” (Focus group Mandlenkosi community, October, 2015)

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<sup>37</sup> Suggestions from interviews and ‘story with a gap’ tool

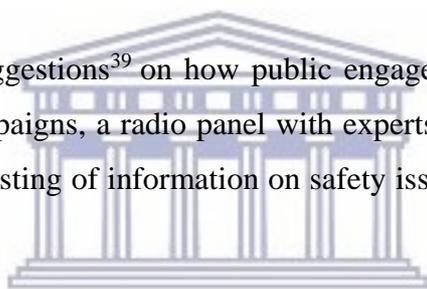
<sup>38</sup> Extracted from ‘story with a gap’, focus group workshop, July 2014

Some respondents confirmed that a public meeting had taken place between the municipal officials and school learners from the Matric class around the issue of DPR. However, the public felt that they had not been adequately informed and that the municipality should not rely on newspapers because many did not have access to them:

“I read in newspaper. Radio station was approached. Newspapers and library are not used by majority of people. Not all people buy newspapers. There wasn’t much talk about the reuse issue” (Gamkaland radio, August 2014)

“What does it take to get to know? Information should have been given by local government. Unfortunately they didn’t inform the public enough. They should have invited people to meetings; school meetings, parent meetings – they didn’t share that with us” (Principal St. Mathews Primary school, August 2014)

The public gave some suggestions<sup>39</sup> on how public engagement could be enhanced, such as; door to door campaigns, a radio panel with experts, two way engagement in educational workshops, posting of information on safety issues and raising awareness via schools and churches.



Municipal officials defended their position saying that decisions had to be taken in a fairly adhoc way because the drought situation was serious. They felt that there was an ongoing opportunity for the public to gain more knowledge about the treatment process – for instance through the tours that are organised to the treatment plant. They also agreed that schools would be a good place to start in raising awareness around DPR concerns.

According to municipal officials, information on post implementation, in particular water quality results, has been published and that there was available information via print media and the DWA website where much of this information is also available in the section about the Blue Drop Certification. Furthermore, officials told the research team that a consultant visits the plant about twice a month to monitor it so as to ensure

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<sup>39</sup> Suggestions from interviews and ‘story with a gap’ tool

safety but added that public is unaware of these visits. Municipal officials planned to engage more with the public during this current post-implementation phase.

### 4.3.3 Trust

As the theoretical chapter has emphasised, trust is a critical asset that is brokered between municipal officials and the public. As trust is the ‘glue’ that lubricates relationships, it was important to understand better how trust was brokered or broken. In the Overstrand, most respondents from the public affirmed that they trusted their municipality to provide good services including water services and that they are also aware that the municipality is working in their interest to address water scarcity in their communities:

“Yes. There is genuine attempt to provide services. They are working hard” (Environmental NGO, June 2014)

“Yes. We pay, they are the government, we vote for them” (Campus manager Curro Hermanus, June 2014)

“Yes, because the mayor supports the community, one of the best in the country. They are aware of water shortage and scarcity and work in addressing the situation by involving the public” (Principal Camphill Special Needs school, June 2014)

Although some respondents from the public sample do trust the municipality, many are concerned about the cost implications of services including water provision. As one respondent echoed, there might be a general expression of trust in municipal services and yet a total distrust when it came to water reuse:

“Yes, but not regarding water reuse issues. I don’t think so because use of reclaimed water is not safe for human health” (Muslim leader, June 2014)

The public is likely to trust in the competencies of their officials for providing good quality water:

“Yes, I think so. They trust in the competencies. They first of all trust the water quality from wastewater treatment in general” (Municipality Technical services, June 2014)

There appears to be high levels of trust amongst the public themselves who feel united around concerns of service delivery, including housing and water. Trust could be eroded by politics. There is also a manifestation of distrust amongst the public:

“There is no trust because people have different agenda and views”  
(Whale Coast Environmental NGO, June 2014)

“People, in terms of services will stand together but everything depends on the political party that has the majority of people. Political affiliation has polarised the public – trust is dependent on this” (Focus group Qhayiya Secondary school, June 2014)

In eThekweni, the public confirmed that they did trust their municipality but at the same time they wanted the municipality to do better. On the whole trust between members of the public seemed lower in eThekweni although there are still pockets of trust and the “community trusts one another here and there.”<sup>40</sup> Municipal officials in this site felt that there was a lack of trust in representational structures of Ward Councilors due to political agendas. There were different degrees of trust between Councilors who engage with the community and Civic Society Organisations (CSOs). The Rate Payers Association reportedly had extremely low levels of trust in all organisations and network structures.

In Beaufort West the municipality stated that they had a constitutional mandate to provide water to the public and that equity is a major concern that informs decisions. Officials reported on their efforts to build a pipeline that went through the river to the border of the Mandlenkosi Township and that this decision needed to be seen as one where reclaimed water was equitably distributed to different segments of the population. Overall, from the public perspective, trust in the municipality was low because “...everyday funny things in the municipality are happening...and councilors express themselves politically,”<sup>41</sup> Only a few members trusted that the municipality would deliver good quality water. A respondent shared the importance of having trust and noted that “if distrust in municipalities, then chaos.”<sup>42</sup> Whatever trust might exist

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<sup>40</sup> Focus group workshop, July 2014

<sup>41</sup> Respondents Gamkaland radio, August 2014

<sup>42</sup> BADISA NGO (Social welfare), August 2014

between the municipality and the public could be eroded during elections when distrust is more likely to emerge.<sup>43</sup>

#### 4.3.4 Co-operation and Agency

This section now looks at the idea of co-operation between the municipality and the public and amongst the public themselves. It also looks at the idea of agency and how the public themselves could promote reuse within their communities. In all three case studies, there was a general sense that the level of co-operation between the municipality and the public was minimal.

In the Overstrand, officials believe that there is a good relationship between the municipality and the public because "... the ward committee reports regularly the situation happening in the field"<sup>44</sup> and that, "if they were unhappy, they would have voiced their concerns."<sup>45</sup> However, the public is not of the same opinion because most believe that "municipal officials present their report to the public and just a discussion is ensued but not a debate,"<sup>46</sup> as portrayed by one of the respondents:

"Public participation is ticked boxes and our views are not really taken but they want to take our views especially on EIA<sup>47</sup> stage" (Environmental NGO, June 2014).

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The empirical evidence reflects on whether and in what ways communities co-operate with one another. Co-operation within communities is mainly around issues of common interests, for instance access to water, drought and water scarcity. Co-operation is also said to be shaped by political allegiances. There seemed to be a belief amongst the public that they could have agency when it came to promoting the idea of reclaimed water in their community but that their sense of agency was stifled because municipalities were not engaging with them adequately.

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<sup>43</sup> Municipal official, August 2014

<sup>44</sup> Municipality, Technical services, June 2014

<sup>45</sup> *ibid*

<sup>46</sup> Respondents Whale Coast Environmental NGO, June 2014 and including other respondents who felt same way.

<sup>47</sup> Environmental Impact Assessment

In eThekweni, data from field practitioners responsible for public engagement showed that there is a certain level of co-operation between the municipality and the public. In particular, within the municipality itself, Water Services co-operated with the AA Focus Group on strategic issues. Communities also co-operate around water issues and the AA Focus Group was formed to discuss water issues in their communities. The municipal Education Centre in the Northern Waste Water Treatment Plant (NWWTP) is seen as a vehicle for promoting the voice of citizens. However, despite these efforts, the consultant in charge of the reuse plans felt that there was not enough space for constructive engagement between the public and the municipality regarding the particular issue of reuse and the Education Centre should reinforce its efforts to promote opportunities for more constructive engagement.

In Beaufort West, municipal officials concurred that there is a problem with public participation but their concern was that the majority of the public show little interest in water issues in meetings because they are more focussed on other issues such as sanitation and electricity. Officials agreed that water scarcity as a result of the droughts had brought people together and that in general a common concern around drought prompted community members to co-operate with one another. The public also concurred that community cohesion during droughts and water shortages was a source of strength to the communities. Despite these efforts of co-operation, there were public activists who felt that the reuse scheme benefits the private company only and not the public. They also believed that there was a lack of skills development to build municipal capacity on issues of reuse. On the whole, public respondents were adamant that the community did help each other out and that there was evidence of them working together to combat certain issues, for instance crime.

Within the Mandlenkosi Township there seemed to be very little discussion on issues related to reclaimed water. However, the fact that there was no evidence of protesting meant that the community was being co-operative with the municipality on the issue of reuse. It was also felt that residents were not being influenced negatively regarding reclaimed water and that this showed a level of co-operation with the municipality. One respondent spoke about the way in which some members from the community promoted reclaimed water in children outreach programs but they themselves are buying bottled water rather than drinking reclaimed water.

### 4.3.5 Networks in Relation to Reclaimed Water– Structural Social Capital

In the Overstrand, there was an idea that “all” inhabitants of Overstrand would be affected by the reuse scheme– and the public was therefore considered to be everybody living in that place. Certain segments of the population, in particular the skilled and the retired were deemed to have more knowledge on the issue of reclaimed water and therefore this segment of the population could speak on behalf of the public. The environmental NGO also identified particular pockets of their community who were more informed about reclaimed water and these were the Eco Schools, the Municipality (Ward Committee), Rate Payers Associations, SANBI, Department of Education, DWA, DEA and Friends of Qhayiya.

In eThekweni, networks and their influence regarding DPR from different sources is shown in Table 4.2 below.

**Table 4.2: eThekweni Networks and Affiliations with Impacts on DPR**

Theme: SOCIAL CAPITAL			
Perspective Impacts	Municipal officials at decision-making	Municipal officials between INSTITUTION & PUBLIC	PUBLIC view on networks
<i>Most important with greatest impact</i>	<ul style="list-style-type: none"> <li>Councilors, National DWA, print Media, Users –North of uMngeni River (800,000 uninformed – large impact), Department of Water &amp; Sanitation</li> </ul>	<ul style="list-style-type: none"> <li>Municipal Water &amp; Sanitation, End users, Department Health (legislation, standards, regulation), Civic organisations</li> <li>Education program outreach: Schools, Nursing Colleges, Industries</li> </ul>	<ul style="list-style-type: none"> <li>Vulnerable people in civil society: physically challenged, infants, elderly people, children at schools, the sick, NGOs, CSOs.</li> </ul>
<i>Medium importance with medium impact</i>	<ul style="list-style-type: none"> <li>uMngeni Water, Officials - Skilled staff, Minister DWA, Consumers, NGO activists, Islamic groups (voice), Politicians.</li> </ul>	<ul style="list-style-type: none"> <li>Rate Payers Association, Ward Councilors, Focus Groups (strategic issues),</li> </ul>	<ul style="list-style-type: none"> <li>User Platforms, Churches, Ward Councilors and Committees, Chiefs, Health carers.</li> </ul>
<i>Least impact</i>	<ul style="list-style-type: none"> <li>Press, Industry. Environmental Health, Environmental dept., uMngeni River Union Group, Muslim and Community groups.</li> <li>Premier KZN, Other media, Focus Groups,</li> </ul>	<ul style="list-style-type: none"> <li>Clean, Green &amp; Healthy, Municipality (Environmental Health), Department Health, DWA (legislation, regulation) Religious organisations.</li> <li>Abahlali - residents Informal Settlements, Health Related</li> </ul>	<ul style="list-style-type: none"> <li>Political parties, Muslims and Indians are a minority.</li> </ul>

	User Platforms - about 100 pp.  Agriculture, WESSA, Academics, Provincial groups – COGTA.	NGO's, Schools, National & Local Industries, Academia, DEA	
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In Beaufort West, influential networks are also reflected in a table (see table 4.3 below). There were also some interesting interconnections between different organisations. For instance:

- Beaufort West Municipality, Ward Committee, sports structures and Councilors have an influence on each other
- Most NGO's have a relationship with one another
- DEADP and Beaufort West Municipality are interconnected
- The Department of Education, the School Governing Body and DEADP have an influence on each other
- Social Services Grants and Department of Health influence each other
- The immediate users and their Councilors influence one another
- The Department of Water Affairs and Sanitation, Donors (external) and Engineers (outside the town itself) influence each other
- Engineers (internal) and the Department of Waste Management influence each other
- Schools, churches, local business, direct adverts, the local newspaper (Local Courier), the Radio Gamka (Local Radio station) all impact on one another

Table 4.3 below draws on data extracted during interviews with the public and presents a schema which shows where there are greater – or lesser – influences amongst different bodies/networks in Beaufort West.

**Table 4.3: Beaufort West Networks and Affiliations with Impacts on DPR**

Structure impacting on reuse	Level of impact on reuse		
	Greatest	Medium	Least
Social structures	X		
Department of Health	X		
Social Service grants	X		
Department of Education	X		
Councilor	X		
Beaufort West Municipality,	X		
Environment (DEADP)	X		
Immediate users	X		
Rural development	X		
Funders (external),	X		
Engineers (external)	X		
DWA	X		
Structures organisations		X	
NGO's (BWLADO, Learning centre, NPOs, Muslims, FBO		X	
Waste management,		X	
Engineers (internal)		X	
Schools		X	
Church		X	
Local business,		X	
Direct adverts		X	
News Papers		X	
Radio Gamka		X	
Land Affairs			X
Police			X
Contractors			X
Mayor			X

#### 4.4 Factors Influencing Public Perceptions and Emotional Responses

The discussion that follows below examines the way in which public respondents in all three sites perceive reclaimed water for domestic applications and how 'intangible' goods such as emotions and trust/mistrust, for instance, are expressed. Emotional responses to the way in which the public have been approached on the topic of reclaimed water in particular and around the topic of water in general, were captured. A chart of seventeen emoticons was presented to respondents and thirteen of emoticons resonated with the respondents.<sup>48</sup> Typical emotions, both negative and positive expressed were: anger, fear, shame, sad, despair, doubt, confused, anger, clarity, gladness, hope, confidence and calm.

Perceptions were organised under the following topics: safety of reclaimed water, specific uses of reclaimed water, trust in municipal competencies, choice, equity, cost

<sup>48</sup> These emotions were not always captured in all three sites

implications, source of reclaimed water, benefits and necessity, media and socio-demographic and religion. This section presents both perceptions of the public and municipal officials' responses on these perceptions.

#### *a) Safety of Reclaimed Water*

Data from across all the case study sites shows that the public has concerns around the safety of reclaimed water but also, for most respondents, knowledge – or lack thereof – around the safety of reclaimed water was crucial in shaping their perceptions. In Overstrand, data emerging from the interviews and focus group discussions with the public indicates that issues of safety are influenced by success stories in reuse where, for instance, users learn that other towns have adopted reuse and have never experienced any problem as “everything is about knowledge”<sup>49</sup> Some of the public were not certain of the water quality because of its source and thought that reclaimed water was detrimental to their health whilst others said they would prefer borehole water if they had an option. There were however those who indicated that they will drink reclaimed water provided that the quality complies with standards. With these respondents in particular, they felt confident about the quality of water although such confidence was dependent on regular tests being done and regular reporting on water quality results. Most respondents were hopeful that reclaimed water would meet water quality standards.

However, despite the expression of these positive emotions, there were mixed feelings when it came to using reclaimed water. The public still expressed negative emotions about the water. Feelings of fear, doubt and confusion were at the fore. Fear and confusion about reclaimed water was rife amongst the community focus group members because they were scared and confused about possible waterborne diseases, and they needed a great deal more clarity on the processes involved with DPR.<sup>50</sup> Respondents doubted the water quality because they worried about the chemical content and potential risks and they wanted to know more about the quality of the water before they would accept DPR as a solution. The extracts below are significant:

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<sup>49</sup> Qhayiya Secondary school, June 2014

<sup>50</sup> Zwelile community focus group, December 2015

“I wouldn’t feel comfortable unless it is proven drinkable. They should just prove that it is safe and that it will be a different one. I have bad feeling because of the potential risks. I can use it unless proven that the system works as intended” (Campus manager Curro High school, June 2014)

“Skeptical, wouldn’t say it is completely wrong...would like to see background findings like quality before I accept” (Environmental NGO, June 2014)

In eThekweni, data from the public focus group held there showed that even though there might be trust that the municipality would supply good quality water in general, the safety of the treatment process and water quality is an issue when it comes to reclaimed water in particular. Participants indicated that they “want to know about recycling, the safety of recycled water and be taken to practicality where these things exist on purification sites.”<sup>51</sup> Sadness was expressed because of possible side effects and as a result of concerns about reclaimed water whilst some public respondents also experienced confusion, doubt and fear around the unreliability of the treatment process, and health concerns due to the uncertainty of the water quality:

“We are confused little bit, what if the machines not work properly? What if something goes wrong? There are doubts of impurities and germs” (Focus group workshop, July 2014)

“Afraid of diseases. What if we had running stomach after this?” (Focus group workshop, July 2014)

According to one respondent from St Matthews Primary school in Beaufort West, after having acquired some knowledge about safety measures at the plant, the water was perceived to be safe and there was reassurance that there was no danger in using the water although there were concerns that the budget for operational and maintenance costs was unrealistic.

Most of the respondents interviewed in Beaufort West mistrusted the water quality. The colour of the water perturbed respondents who felt that this was an indication that the water was not safe for human consumption. Because of the strange colour, some people either boiled the water before drinking it or made a choice to buy purified water in

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<sup>51</sup> Focus group workshop, July 2014

bottles. Evidence gathered during the community focus group also showed that concerns around safety were at the fore and that these concerns were mainly because of the lack of knowledge of the purification process. Ironically, in some cases it seems that it was not ‘dirty’ water that concerned the public but in fact, in the words of a teacher from Beaufort West Secondary school, the “water is too clean and is a problem because our bodies need the bacteria and minerals.”<sup>52</sup>

There are also doubts amongst residents about the quality of the water and uncertainty about the whole process in general. Some residents felt anger as a result of poor water quality and because it tasted bad. Not everyone was distrustful but they “want regular test results.”<sup>53</sup>

Municipal officials in the Overstrand said that they would inform the public if the plant did not meet up to the safety requirements and they were reassured that the plant would switch off automatically if there was a problem with quality as it is designed with a seven-barrier treatment system to ensure safety in the water quality. Municipal officials in Beaufort West affirmed that there were adequate safety measures in place. They also claimed that the results of water quality are published in the local newspaper and as was the case in the Overstrand, they said that the public is assured that if something goes wrong the plant would shut down automatically. Officials stated that the current water quality is much better and it was thoroughly tested for endocrine disruptors. Officials also felt that the public no longer had any concerns about the water because they had not heard any concerns voiced by residents regarding water quality. Municipal officials in eThekweni were aware that the public did have concerns around safety but they claimed that they had put in place measures to assure the public of the water quality.

#### ***b) Trust in Municipal Competencies***

Trust in municipal competencies influence the ways in which the public perceives reclaimed water. Issues of trust and distrust in the municipality – and around the safety of reclaimed water in particular, emerged across all case studies. In Overstrand, feelings of trust emerged alongside feelings of distrust. For instance, there was trust in the

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<sup>52</sup> August 2014

<sup>53</sup> Teacher Beaufort West Secondary school, August 2014

municipality once they had given proof that reuse water was a sustainable alternative, that the current water resources are insufficient and that all other options had been exhausted. At the same time there was complete distrust that the municipality would be providing safe reclaimed water and in the words of the leader from the Muslim community, “I’ve been negative from the beginning and less trust. Reclaimed water is not a good thing for the public”<sup>54</sup> In eThekweni, the public generally trusts the municipality for water provision but this trust is not extended to other services:

“You have to trust the municipality, in terms of water, yes. What do we do about scarcity? We trust the municipality for water provision not others like housing” (Focus group workshop, July 2014)

But then again, same focus group respondents expressed distrust as they were confused about recycling and thinking of health related issues – “because it’s something new which was never tried before in our (*their*) community – thinking of health hazards.”<sup>55</sup>

In Beaufort West, trust in the municipality is uneven. While some respondents noted there was some trust in the municipality for planning in advance before another crisis and trust in their technical services, others noted that there was distrust amongst some members of the general public who rather bought bottled water. And during the community focus group, despair was apparent as “We have lost hope and trust from authorities.”<sup>56</sup> One of the respondents expressed anger at the municipality for their inadequacy in not planning ahead before the drought crisis to make provision for the growing population:

“They didn’t make provision to support the growing population. They should have planned earlier ahead before the droughts. And during droughts we were desperate and couldn’t use any ablution facilities” (Principal (*former*) St. Mathews Primary school, October 2016)

### ***c) Specific Uses of Reclaimed Water***

The specific uses of reclaimed water were seen to influence the way in which respondents perceive and feel around reclaimed water – as some uses do not necessarily

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<sup>54</sup> Overstrand, June 2014.

<sup>55</sup> Focus group workshop, July 2014.

<sup>56</sup> Mandlenkosi community focus group, October 2015

provoke the same feelings as others. In the Overstrand, it seemed that respondents were unwilling to consider reclaimed water for drinking, cooking, bathing and even for laundry use. The only uses that they would accept were for flushing the toilet or/and for gardening. There was some flexibility around the use of reclaimed water for bathing. However, the Muslim view was that, reclaimed water would never be considered acceptable for drinking and cooking.<sup>57</sup> In Beaufort West, users did not mind using reclaimed water for irrigation and other uses like car washing as long as it was not for drinking. It was only in eThekweni where public respondents said they did not mind drinking the water and using it for other purposes as well, as long as the water had been tested.

#### *d) Choice*

The issue of choice was relevant in considering the ways in which the public responded to reclaimed water. In Overstrand, some segments of the public considered desalination, treated rainwater, buying bottled water and a water transfer scheme more appealing than the idea of reclaimed water for drinking even though they expressed concerns that these other options could be more pricey and were unsure whether this would be affordable. The extract below is taken from an interview with a Muslim leader in Overstrand about their preference around bottled water:

“Health, you can’t share it with anyone, prevention is better than cure, why take a risk, gamble with my health? I will rather buy bottled water than drinking reclaimed water regardless of the treatment process and quality”  
(June 2014)

Other respondents felt there was a strong ‘no choice’<sup>58</sup> element because decisions around reclaimed water were made only at the municipal level. And for others, they despaired because there was simply no other choice other than reclaimed water. The issue of choice resonated with the public as they found value in deciding for themselves what solution there should be to the problem of scarcity as reflected in the extracts below:

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<sup>57</sup> Overstrand Interview Muslim leader, June 2014

<sup>58</sup> Respondents from Whale Coast Environmental NGO, June 2014

“Yes, to decide for oneself is good, but it is limited in certain circumstances. We exercise our freedom through votes” (Focus group Qhayiya Secondary school, June 2014)

“Yes, I believe that I must have choice and right to choose, right to knowledge and decide for myself and take accountability” (Principal Camphill school, June 2014)

In eThekweni, where water scarcity is not visible to the public (*see section 4.2 on Knowledge*), there was preference for a windmill system as an alternative choice, as it offers natural rather than reclaimed water. And in this instance, respondents expressed anger because this system (technology) was not considered. On the other hand, in Beaufort West where water scarcity was a reality because of the drought, there was still a preference for options such as a water transfer scheme and desalination of boreholes although the associated costs were a deterrent. As already noted in the discussion above, bottled water or purified water purchased at petrol stations was preferred. But large sections of the population could not afford to buy bottled or purified water and, as the two extracts below show, they were faced with a ‘no choice’ situation:

“There is no choice...there is no other source of water. They are compelled to use it. It is a disadvantaged community, no means to buy bottled water everyday” (Principal St. Mathews Primary school, June 2014)

“Some had to live with it, no choice in the families, the people had to accept. You accept and make peace with the new water” (BADISA NGO, August 2014)

Residents were neither happy nor sad because of lack of choice and said that “a beggar can’t be a chooser.”<sup>59</sup>

#### ***e) Equity***

Concerns around equity and fairness also influence public perceptions. The perceptions around equity cover two aspects. Firstly, data that looks at issues around the distribution of water services in general and reclaimed water in particular is presented. Secondly,

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<sup>59</sup> Mandlenkosi community focus group, October 2015

there is the issue of the ‘intangibles’ around issues of public engagement with regards to reclaimed water scheme.

In Overstrand, although DPR has not been implemented, the public perception is that there are certain communities that have been better serviced in general, than others:

“Communities are not treated fairly because the service level is not the same amongst the public – certain areas are well serviced compared to others. The whites are using good quality water and blacks are using different water, that’s why we are sick” (Focus group Qhayiya Secondary school, June 2014)

In eThekweni, similar to the case of Overstrand, there are already concerns around more general equity issues in the black communities. For this reason, concerns of fairness are at the fore when it comes to reclaimed water. It was noted that there are stereotypes on equity issues caused by The Group Areas Act where the ‘black’ communities perceive that their drinking water is different from that of the ‘white’ communities:

“We stay in townships not by choice. We are about 30-35 minutes walk from cities. The whites walk for 5 minutes. That itself makes us believe we might be getting water from different dams. The Group Areas Act still exists. Our dams might not be as good as the whites. Not quality water as the whites” (Umlazi community member, October 2016)

In Beaufort West, there were acute concerns around equity in the distribution of reclaimed water at the implementation phase and this was expressed vividly during interviews with respondents from the Gamkaland radio station as follows: “in Victoria West, there was perception whites want to kill the black, why put near the location?”<sup>60</sup> Although the public was aware that DPR had been implemented evenly throughout the town, some respondents still had issues around equity post-implementation, and felt that certain privileged water users within the municipality do not use the water themselves.

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<sup>60</sup> Beaufort West, August 2014

Municipal officials were well aware of the equity factor and in all three case studies they were adamant that equity concerns were crucial when it comes to public perceptions around reclaimed water and that it was really important to be 'fair.' This meant adhering to the principal of 20% blending to both affluent and poorer households in the case of eThekweni. Officials in Beaufort West said that they had made an effort to build a pipeline that went through the river to the border of the Mandlenkosi Township to gain trust from the public and to be seen to be distributing reclaimed water equitably.

Importantly, public engagement processes regarding the DPR scheme were seen to be unfair by the public across all case study sites. The public felt that they had been unfairly treated by the municipality because they were not adequately consulted before decisions were made on the choice of reuse. It was only in the Overstrand that there was anecdotal evidence that the process was fair because the actions of the municipality to address water scarcity were clearly spelt out. However, the following extracts expressing unfairness and anger around engagement issues are pertinent in Overstrand:

“It was unfair because we as members of the public, primary beneficiary were not informed about the reuse plan. We have right to address our concerns and issues during meetings and municipality has obligations to listen to us and address our issues” (Focus group Qhayiya secondary school, June 2014)

“Not fair, because the public should be consulted and all other options exhausted before deciding on reuse. Real reasons for switching to reuse are not convincing” (Muslim, June 2014)

“It’s not fair, just unfortunate it does things this way – doesn’t hold to its heart public consultation. It was a statement of fact” (Whale Coast Environmental NGO, June 2014)

“Angry because of the services of the municipality and their manner of communication” (Zwelile community focus group, December 2015)

In eThekweni, public respondents felt shame because they were not involved in the planning of the project which they felt they should have been part of:

“We feel shame. We are not cool because they don’t involve us in planning of this” (Focus group workshop, July 2014)

“Information sharing is not done with us the locals. No capacity to come back to the community. Yes, I feel the shame. I’m part of the community and I feel affected” (Umlazi community member, October 2016)

It was suggested that the decision-makers should create awareness of the problem before considering decision-making. Below is an extract highlighting concerns around public consultation:<sup>61</sup>

“We will also like to know about public engagement strategies in considering decision. We need to be well informed. Consultation not done, we add least value. People must be consulted – open dialogue, allow new and creative method that is inclusive” (Focus group workshop, July 2014)

In Beaufort West, some members of the public felt the implementation process was not fairly explained to them and some were angry because they were not well informed. Once again feelings of shame emerged because the public here too had not been engaged in the decision-making process:

“Some councilors said they made provision, but we felt that we were not involved in the whole process. We felt shame as they took decisions without making use of our knowledge” (Principal (former) St. Mathews Primary school, October 2016)

Residents are afraid and worried about a crisis in water supply and the main cause for this fear is as a result of lack of knowledge about the implementation process and as reported by one respondent, “some people don’t know which I feel it’s a danger”<sup>62</sup>

#### *f) Cost Implications*

Concerns around cost also contribute to the way users feel about DPR. Views around cost implications varied amongst the public across all case study sites. In Overstrand, respondents during the school focus group<sup>63</sup> were clear about the cost effectiveness of reclaimed water over desalination, but expected the tariffs to increase because of the

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<sup>61</sup> Extracted from section 4.3

<sup>62</sup> Legal Advice NGO, August 2014

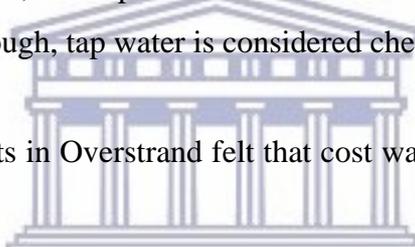
<sup>63</sup> Qhayiya Secondary school, June 2014

treatment and operating costs which DPR entails. But they also were confident that tariffs would reduce in the longrun. They agreed that there could be more clarity, however, if there was better education around the idea of reuse.

In eThekweni, respondents of the focus group were aware that the DPR initiative could be cost effective and were quite glad regarding the cost implications because they claimed that “money and time would be saved. It will conserve water wastage”,<sup>64</sup> but they also needed more clarity about the scheme.

In Beaufort West, doubts from some members of the public around related costs emerged because there was concern that the municipality hired outside consultants because they thought that this could compromise water quality. Another perception amongst the users in this site is that water tariffs have not changed and that the water is still expensive – and here, a respondent was sad because “water is extremely expensive.”<sup>65</sup> For some though, tap water is considered cheaper than buying water.

However, some respondents in Overstrand felt that cost was not as important an issue as safety:



“It costs my health. If water cost is lower or higher, the health implications will be much higher in terms of consultation and medication. Hence, such water should not be for domestic use” (Muslim leader, June 2014)

“I don’t mind paying more. I am more interested in the quality – as long the quality is good I will go for it” (Campus manager Curro High school, June 2014)

“Yes, if it will save me money, then it will make a difference. But the perception is often around the quality of water; the public can change their perception if the quality is maintained and complies with standards” (Principal Camphill Special Needs school, June 2014)

According to the municipal officials’ views on costs in Overstrand, tariffs would increase if DPR were implemented. In eThekweni, municipal officials considered that

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<sup>64</sup> July 2014

<sup>65</sup> Teacher Beaufort West Secondary school, August 2014

even if tariffs were to rise because of reclaimed water this was still a cheaper option than other options such as desalination. Officials in eThekweni agreed that DPR costs are an important concern and something that should be made very clear to the public. An official in Beaufort West claimed that because maintenance of the plant is expensive, tariffs should be made very expensive to encourage people to use less water.

*g) Source of Reclaimed Water*

Concerns around the source of reclaimed water influence perceptions and differ across case studies. In Overstrand and Beaufort West, disgust or ‘yuck’ as an emotional response was noticeable. In an interview with respondents from the Environmental NGO in the Overstrand, the sentiment of disgust at the idea of DPR was pronounced. There was also a feeling of disgust because of the source and according to the campus manager at an affluent High school, some potential consumers might not drink the water because of its smell.<sup>66</sup> Amongst the Zwelile community members in Overstrand, there was a strong link with sewage water and urine. The extract below depicts an example of the emotional response regarding reclaimed water:

“My mind went to the part of dirty water similar to the biogas production from human excreta. I had negative perception and will never drink reclaimed water” (Muslim leader, June 2014)

In Beaufort West, there were also feelings of disgust for the same reasons as Overstrand; responses from the public showed that people still believe that the water has an unfavourable taste and smell and they report on an unpleasant smell from the reclamation plant. Respondents from the Mandlenkosi community focus group said they were disgusted and angry after hearing that they were using water from the toilet. Meanwhile in eThekweni, public respondents did not show the same feelings of discomfort and/or disgust, as residents believed that scientists would purify the water to quality standards. Nonetheless, the public view remained one where discomfort would be mitigated if there was knowledge sharing on the water quality.

With regards to the area where wastewater originates, the view was the same across the case study sites as people felt that it does not matter from which neighbourhood

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<sup>66</sup> Campus manager Curro Hermanus High school, June 2014

wastewater originates because safety concerns were at the fore. The extracts below are pertinent:

“We don’t care about the area. We care that the water is treated” (Zwelile community members, October 2016)

“Wastewater is wastewater, it doesn’t matter where it comes from” (Telephonic interview, October 2016)

Municipal officials, for example in eThekweni, felt that this ‘disgust’ emotion is linked to the fear that the public has of the water quality. Officials felt that the public experienced emotional discomfort associated with drinking reclaimed water. And in Beaufort West, one of the officials operating at the top level of decision-making felt that the public would continue to resist using reclaimed water despite having knowledge about the safety of the water quality. Municipal officials also felt that people were quite irrational when it came to thinking of using reclaimed water and that they would reject this idea despite having knowledge on quality standards. Importantly, officials concurred that the public would make up their own minds and that they should not be coerced into accepting DPR.

#### *h) Benefits and Necessity*

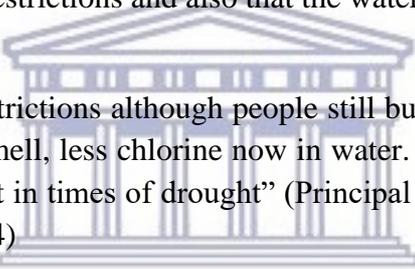
In both the Overstrand and Beaufort West, residents had some understanding of the benefits and necessities of reclaimed water as a solution to water shortages. It was only in one instance in Overstrand that reclaimed water was deemed to be unnecessary and it was thought that it offered no benefits for human consumption because of health implications:

“It is not necessary; the effects on human health will come gradually. Human body will be affected in a longer term. If I feel it is not good for me, then it is not good for the next person. There is no benefit as such, water is not good for domestic consumption” (Muslim leader, June 2014)

However, other respondents in Overstrand were in agreement that the DPR scheme was necessary as a solution to water shortages. Some even thought that the water quality could be better than their current tap water and they also indicated the benefits for sanitation. Respondents who took part in the Qhayiya Secondary school focus group

highlighted the benefits of reclaimed water in that there would be no water restrictions and also that water tariffs will be cheaper. The issue of knowledge transfers was critical as respondents felt strongly that their perception around the benefits and necessities of this water was dependant on knowledge around its safety and that there should be “sufficient water quality assurance and availability of adequately trained personnel.”<sup>67</sup> The benefits of reclaimed water were not always known because the general public has not been informed of the processes involved around DPR.

The public in Beaufort West was clear about the benefits and expressed gladness and was calm when thinking through reclaimed water as a solution to water scarcity caused by the droughts. They were also hopeful (and grateful and thankful) that water would be made available as a result of the reuse scheme. The scheme was seen to be necessary because it is “planning in advance before another crisis.”<sup>68</sup> Other benefits were that there were no more water restrictions and also that the water quality had improved:



“No more water restrictions although people still buy water. There is less mud/soil, no foul smell, less chlorine now in water. It is an augmentation option – supplement in times of drought” (Principal St. Mathews Primary school, August 2014)

However, as was the case in the Overstrand, respondents in Beaufort West felt that information about the reclaimed water scheme was crucial and that, they “would like to know more.”<sup>69</sup> Moreover, in eThekweni where water scarcity is not visible, participants in the focus group workshop saw the benefits of reclaimed water as “creating jobs, healthy lives, clean water from water supply and easy access to households.”<sup>70</sup>

### *i) Media*

Narrative texts collected from Beaufort West and eThekweni showed that the public considers the media (radio and print) as being an apt way to inform them on issues around reclaimed water. Respondents from the Gamkaland radio in Beaufort West

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<sup>67</sup> Respondents Whale Coast Environmental NGO, June 2014

<sup>68</sup> BADISA NGO, August 2014

<sup>69</sup> Respondents Gamkaland radio, August 2014

<sup>70</sup> Focus group workshop, July 2014

affirmed the significant role of the radio in “broadcasting and telling people not to waste water during the drought.”<sup>71</sup> A typical quote showing the benefits of media in informing the public about reclaimed water follows:

“Use media more. Why don’t they use the radio station to inform the public? Still they don’t use the community station. There have been problems in the past but let’s get past this. Invite councilors, let people call and ask questions, so that it goes out to more people” (Gamkaland radio, August 2014)

It was only in Overstrand where the negative effects of media was expressed by some respondents:

“Media sensations influences perceptions also, if not explained, there will be war” (Whale Coast Environmental NGO, June 2014)

“Media has influence. We put articles in newspapers to convey message but may not guarantee a positive response” (Hermanus Times print media, December 2015)

The reason why the public in Beaufort West did not report on the negative effects of media could be attributed to the fact that the “Toilet to tap language was never used.”<sup>72</sup> It was reported that during the drought and water restrictions, officials held a meeting with the media reporters to assist and not create problems “but rather honest and not wrong sensation.”<sup>73</sup> However, according to another official, there was a biased article from the City of Cape Town on ‘shit’ water and the unequal distribution of reclaimed water, but at the same time there had been no media sensation months after the plant was built.

In eThekweni, one of the officials reported that the media influenced the public negatively because of the ‘toilet to tap’ language. The extract below depicts the influence of media in reclaimed water:

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<sup>71</sup> August 2014

<sup>72</sup> Municipal official at top decision-making level, August 2014

<sup>73</sup> *ibid*

“The environmental guy writes about ‘toilet to tap’ – totally irresponsible, he won’t write up balanced stories. Media is not always true. The public out there has been fed by media on the one hand and politicians also respond to the media. The ‘toilet to tap’ stuff – presenting it as true. It is about balanced, informative versus sensational – it’s about trust in the safety. There is a history with Durban with the press because of independent newspapers” (Municipal official, technical services, July 2014)

It was surprising to find that when the public was consulted they did not report on this but that they saw the media in a positive light, suggesting the use of media as an information-sharing tool.

*j) Socio-Demographic and Religion*

When considering socio-economic and religious factors, there was evidence that the community is not homogenous and that not all segments of the population felt the same about DPR. There were different views depending on age, gender, race, level of education and religion. With regards to age, data gathered across all three case study sites showed that youth are more likely to accept reclaimed water than the older generation. The reasons given were that youth are more likely to accept reclaimed water because they are more understanding and that they have a tendency to adapt more readily to change (case of Overstrand), they are better informed because they are more likely to attend meetings than the older people (case of eThekweni) and that they are less worried about diseases than the older people who are more prone to health risks like cancer and diabetes (case of Beaufort West).

The view about gender across all case study sites was that women are more likely to reject reclaimed water than their male counterparts. During focus group discussions in Overstrand, it became clear that women are more likely to resist reclaimed water and according to men, the reason was because women easily get disgusted. The women explained that the reason for being sensitive to reclaimed water is because their daily life revolves around water, not only for household needs but also for their personal hygiene and that “because of monthlies, we are more sensitive.”<sup>74</sup> In eThekweni and

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<sup>74</sup> Zwelile community focus group, December 2015

Beaufort West, it was reported that women were more fussy than men and more hygienically stressed out than men, respectively.

Race is another socio-demographic aspect that is relevant when considering whether or not DPR will be accepted. The perception in Overstrand and Beaufort West is that the black population is still disadvantaged and will more easily reject DPR than their colored or/and whites counterparts who tend to be more informed than blacks. The extract below describes this view:

“Majority are black and still suffering. So will easily reject. Colored, White, they know than blacks and will understand reuse better than blacks”  
(Zwelile community focus group, December 2015)

There was however a contradiction from eThekweni where the view is that blacks are more likely to accept DPR simply because, unlike Coloureds or Whites who can afford other alternatives like buying of bottled water, they felt that they did not have any other choice.

Religion is another factor that shapes perceptions around DPR. In an interview with the Muslim leader in Overstrand, there is opposition to the use of DPR for ‘spiritual ablution’ amongst the Muslim community, because water which has not passed through conventional treatment (IPR) is considered to be unfit for drinking. The Muslim leader noted that there is trust in the conventional process where water undergoes natural purification compared to DPR technology.<sup>75</sup> Municipal officials in eThekweni noted that a minority Muslim group would not accept the use of reclaimed water for potable applications which contributed to the stalling of the reuse scheme. According to an official, the reasons for rejection was that the Muslims perceive such water to mean ‘*haram*’ which means ill-luck.

On the other hand, Christian leaders in all case study sites recognised the importance of reclaimed water as a solution to water scarcity and felt that there should be no problem as long as the water has been treated. The common understanding here is that biblically it does not matter what goes into the mouth of a person but rather what comes

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<sup>75</sup> Interview Muslim leader, June 2014

out of the person's mouth. The leader in Overstrand recognised also the importance of being better informed on the topic so that a message could be conveyed to the congregation with more confidence. The extract below from Beaufort West presents the Christian view:

“The Bible doesn't restrict anything even food, because it doesn't defile you, but what comes out of your mouth. Water is life according to the scriptures” (Christian leader, Focus group, October 2015)

Another factor to consider when scrutinising socio-demographics in a given site is level of education. The public in all sites felt that the education level of the user influences perceptions and can result in acceptance or rejection of reclaimed water. The general perception is that those with a poor level of education will take time to adapt to change whereas, those who are educated have the ability to do their own research and are more likely to understand the complexities around a decision to use DPR. There was a general feeling that the onus was on the municipality itself to engage with the public and educate. Teachers also need to acquire knowledge about DPR because it is not enough for learners to be educated without the teachers themselves learning about DPR. The extract below from eThekweni reflects on issues around education:

“Yes, education plays a part. Those with poor level of education can take time to adapt. Those with good level of education, they can do their own research, they have the know-how. But the municipality should alert people to avoid resistance” (eThekweni Community member, telephonic interview, October, 2015)

The public in all sites noted that it would be useful that the municipality take responsibility for a 'practical' learning experience; taking members of the public to the treatment plants and demonstrating what the process entails.

#### **4.5 Suggestions to Address Public Perceptions**

This section presents the implications of selected public perceptions on decisions around DPR and suggested actions or strategies to address them – from both public and municipal officials. Data was captured using the 'Resistance to change continuum tool'.

#### **4.5.1 Impacts of Public Perceptions on DPR and Actions to Address Public Perceptions**

Across all three sites, data revealed that the public would reject or have resistance in the DPR scheme due to the following perceptions:

- The emotional discomfort, disgust associated with the thought of using dirty water from the toilet;
- Doubts in the safety of reclaimed water; doubts in the water quality, fear of water-borne diseases and mistrust in the purification process;
- Lack of knowledge of water scarcity;
- Preference to other alternatives such as desalination;
- Equity concerns around the use of reclaimed water and lack of public consultation;
- Inappropriate language or terminology for the water;
- Religious concerns to the Muslims;
- High costs associated with hiring of consultants;
- Increased water tariffs; and
- Mistrust in the municipality due to inequity around political concerns.

Respondents made suggestions of factors that could shift negative perceptions to conditional acceptance and promotion of reclaimed water. It emerged that the public would only have conditional acceptance and promote reclaimed water when they have acquired adequate knowledge on issues around the DPR scheme and have been adequately consulted. A number of actions<sup>76</sup> emerged that are necessary to address those negative perceptions which the public felt were necessary, pointing to a two-way responsibility of actions to be undertaken by both municipal officials and the public themselves. Strategic actions to address perceptions emerging from all case studies are presented in table 4.4 below.

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<sup>76</sup> Municipal actions were suggested by the municipality and the public, and same applied for public actions

**Table 4.4: Municipal and Public Actions to Address Negative Perceptions**

Public perceptions	Municipal actions	Public actions
<b>Disgust in the source</b>	<ol style="list-style-type: none"> <li>1. Bottled water - Municipality must brand water and use it in all municipal offices and meetings</li> <li>2. To bring proof to people that the water is well treated and is safe to drink</li> <li>3. Issue out some form of training to individuals who are influential societal figures (leaders) to help communicate with the community on individual as well as groups – to explain and teach the entire water cleansing</li> </ol>	<p>Educate yourself – attend meetings</p>
<b>Doubts, fears and mistrust in the safety</b>	<ol style="list-style-type: none"> <li>1. Public relation campaign</li> <li>2. Daily test results made public</li> <li>3. Elaboration/clarification of the effect of chemicals involved, to the human metabolism in health</li> <li>4. Engage with health institutions to introduce a periodic health check-up as a back up health care</li> <li>5. Show public benefits of DPR</li> <li>6. Municipality should drink it in public to show that it is safe for community</li> <li>7. Ongoing regular monitoring of the water supply and keeping the public informed of the results</li> <li>8. Communicating the results to the community in the official languages</li> <li>9. Use existing examples of places where this (reclaimed water) is already being done</li> </ol>	<ol style="list-style-type: none"> <li>1. Distribute pamphlets – information supplied by the municipality at schools and churches</li> <li>2. Play on the role in helping others to understand the water recycling</li> <li>3. Visit the plant</li> <li>4. Drink it because people will know that by drinking, it won't harm anyone and it won't cause illnesses</li> </ol>
<b>Equity concerns/lack of public consultation</b>	<ol style="list-style-type: none"> <li>1. Inform public that the water is not only for one sector of the community but for all</li> <li>2. Utilising media to communicate with public; local newspapers, local radio</li> <li>3. Show how the public will benefit</li> <li>4. Set up team of experts: Government, chiefs, councilors, religious leaders to be champions</li> <li>5. Use public forums and campaigns to ease the fears</li> <li>6. Financial benefits as opposed to other methods such as desalination</li> <li>7. Educate the children at school, through debates, stories, poetry and stage plays</li> </ol>	<ol style="list-style-type: none"> <li>1. Convey information that water is supplied from one source and there is no discrimination via meetings, schools, churches and other Government departments</li> <li>2. Attend meetings to have opportunity to raise questions and various stakeholders and contribute towards decision-making</li> <li>3. Attend road shows</li> <li>4. Access media (radio, television and newspapers)</li> <li>5. Changing mindsets</li> <li>6. Community co-operation and have water activists</li> <li>7. Undertake own research</li> <li>8. Get as much information as possible by engage themselves into learning more about re-using water</li> </ol>
<b>Mistrust in the municipality</b>	<ol style="list-style-type: none"> <li>1. Taking photos of Mayor, and other Local Government officials and politicians drinking and publish it in local newspaper</li> </ol>	

	2. Municipal Officials should prove that they consume the water as well, by putting water in jugs when they hold public meetings and not bottled water
<b>Media sensation - language</b>	<b>Media as a conveyor belt to promote</b> 1. Involvement of the media to communicate the idea to the public e.g. emotion picture, diagrammatic illustration with easy explanations and picture forms on a daily and weekly basis 2. To broadcast it to the television so that everyone will notice that it is safe to drink it

As shown in the table 4.4 above, there is more likelihood that the public accepts and promotes reclaimed water for domestic applications once municipal and public actions have been implemented. The table identifies the various networks and institutions that should be engaged and involved for the successful implementation of DPR. Respondents noted that politics, lack of transparency and financial constraints can impede the effective implementation of the strategy.

#### 4.6 Summary

This chapter has provided empirical evidence from respondents in the three case study sites about 1) the reasons contributing to decision-making on DPR, 2) public knowledge on water sources and issues around scarcity, 3) the ways in which the public has been engaged in water studies in general and DPR in particular, 4) trust and co-operation, 5) the factors that influence public perceptions and contribute to the ways that people feel about DPR as well as, 6) suggestions to address selected negative perceptions.

There were several reasons which influenced the decision taken by different municipalities to use DPR as a solution to water scarcity. In Beaufort West and Overstrand the main driver was acute water shortage as a result of a natural factor – drought – and the fact that there were no other sustainable water augmentation options from boreholes or/and surface water. In eThekweni, the main reason for choosing DPR was water scarcity due to the high economic and population growth and also due to the need for reduction of wastewater effluent into the sea so as to achieve a ‘green environment.’

The study questions were organised around the themes of knowledge, social capital and agency, emotions and perceptions. Data shows that the public in all case studies have some knowledge of their water sources and the reasons for the choice of reclaimed water. The public has very limited knowledge on the safety of reclaimed water because

seemingly their municipalities have not engaged with them adequately around this issue. The EIA engagement process was used in eThekweni and officials in Overstrand plan to use this process prior to the implementation phase. In Beaufort West, decisions were taken on an urgent basis and officials had limited engagement with the public via public meetings. Trust and co-operation varied in that the public sample showed some trust in the municipality for their competencies but in terms of co-operation, they felt they have not been consulted adequately.

There are a number of topics to consider which influence perceptions and emotional responses towards DPR and include: 1) source of reclaimed water, 2) safety of reclaimed water, 3) specific uses of reclaimed water, 4) trust in municipal competencies, 5) choice, 6) equity, 7) cost implications, 8) benefits and necessity, 9) media and, 10) socio-demographics and religion. There were both varying and similar views in the case study sites regarding how people perceive and feel about the DPR scheme. It is evident that the way the public feels informs their perceptions around DPR. Data showed that the public in general had some understanding of the benefits and necessity of DPR and that they were calm, hopeful and glad that this could offer a solution to water shortage. But knowledge about safety measures was critical for them. Negative feelings such as anger, despair, fear, shame and sadness also emerged around the issue of safety and around public consultation/engagement. Negative perceptions revolved around the fact that the public was not adequately consulted and that it was unfair that they were denied the opportunity to gain knowledge about the DPR process.

Overall, there is empirical evidence that there had been inadequate engagement, which meant that the public was denied the opportunity for the public to learn about DPR. This denial activated feelings such as fear as well as doubt that DPR was safe. There were also feelings of shame that they had been left out when it came to taking decisions around DPR. This resulted in mistrust in the municipalities that serve them. In Beaufort West where reclaimed water has already been implemented, the public still has doubts on the water quality and they feel that they should know more about the water quality results. Empirical evidence from all three case study sites showed that negative perceptions could be alleviated once the public feels that they are being involved in decision-making processes regarding reclaimed water for domestic applications. The public identified different avenues where knowledge transfers could take place and the

most obvious should be via meetings where they could learn about the safety and the benefits of reclaimed water. Data gathered also emphasised the necessity of engaging various networks and institutions such as health care on the one hand or/and the entertainment industry on the other and that this engagement would help the successful implementation of DPR. It was felt that politics, a lack of transparency coupled with financial constraints could impede effective engagement.

The focus of the next chapter, chapter five is on public perceptions and the impact these have on decisions around reclaimed water. The chapter also makes recommendations on how to engage with the public so as to facilitate public acceptance of direct potable reuse in South African municipalities, in so doing to promote more positive feelings for DPR.



## CHAPTER FIVE

### **5 DISCUSSION ON IMPLICATIONS OF REASONS INFLUENCING DPR ON PUBLIC DECISIONS, IMPACTS OF PUBLIC PERCEPTIONS AND ADDRESSING NEGATIVE PERCEPTIONS IN DPR**

#### **5.1 Introduction**

This chapter presents a discussion on the results presented in chapters four. It discusses whether and in what ways reasons influencing the choice of DPR in the three case study sites, impact on public decisions towards reclaimed water for domestic applications. It considers ways in which public perceptions and emotional responses impact on the implementation of DPR. The discussions on the impacts of public perceptions on the DPR scheme reflect on concerns around the engagement processes adopted by the municipalities and implications on public decisions. This chapter elaborates on how public emotions and perceptions could be addressed. It does so by proposing specific terms of engagement at each stage of the institutional decision-making processes.

The Capability Approach grounds the discussions further as it engages with the notion of opportunity, in particular with ways in which reclaimed water in South Africa promotes opportunities for citizens and considers whether and in which ways the decision to augment water supply through DPR is – or is not – able to advance social justice for citizens. Within the context of this study, and drawing on the work of Goldin (2010), the discussion will show how unequal access to knowledge around concerns of reclaimed water restricts agency, jeopardises the building of trust in water service providers (municipalities) and also how it perpetuates negative feelings such as shame and sadness. By lodging the study within the framework of the CA, it becomes clearer how a project on reclaimed water is able to promote social justice and to foster positive emotions or feelings such as pride, self-esteem and dignity amongst citizens.

#### **5.2 Impacts of Reasons Influencing DPR on Public Decision**

Results have shown that although there are multiple reasons collectively leading to the choice of DPR in each site, there were main drivers for this choice. In Beaufort West and Overstrand municipalities, the main driver was drought, which caused depletion of

water resources and in this case DPR was seen as the best option for augmenting limited water sources. In eThekweni one of the main reasons was water scarcity due to rising populations and economic growth as well as the need to reduce the discharge of wastewater effluents into the environment. These reasons all reverberate with international literature from the United States, Australia and Namibia where there are a number of reasons given for turning to DPR as solution to water scarcity including population growth, economic growth, natural disasters such as droughts as well as the reduction in wastewater effluent into seas, (Pithey, 2007; Cain, 2011; Bahri, 2012; DWA, 2013; Tchobanoglous *et al.*, 2011 etc.).

However, when one turns to the public, despite them having some understanding that DPR is a cost effective solution to water scarcity, it seems that the reasons leading to the adoption of DPR in these municipalities have not been clearly understood and the public still believe that there could be other ways of augmenting water supplies. Respondents in Beaufort West felt the impact of droughts, yet this did not mean that they automatically accepted reclaimed water for domestic applications. According to some respondents in Beaufort West, it is the lack of choice of other options or/and poverty that has been the main reason why the majority of residents are using reclaimed water. There are some residents who, if they can afford to, still prefer to buy bottled or purified water.



In Overstrand, despite the fact that residents are aware that water is scarce, they are still not convinced about the reasons for implementing DPR. In eThekweni water scarcity is even less visible than in the other two sites and it makes it even harder to convince citizens that there is a legitimate reason to opt for DPR. Acceptance of reclaimed water has not been obvious either because in this instance, there have been doubts arising from ‘invisible’ and unfounded reasons for implementing DPR. This lack of conviction that DPR is the way to go causes doubt and mistrust amongst the public who feel that the municipality is not necessarily making the right choice in opting for DPR. There is therefore a strong argument that knowledge deficits are at the core of these uncertainties.

Results have shown that in all three case study sites, the public was not adequately involved in decision-making processes around the reuse concern; in the case of

Beaufort West this was from planning through to implementation and post-implementation whilst in Overstrand and eThekweni municipalities this was mainly during the planning phase. Decisions were made on an adhoc basis in Beaufort West whilst in the Overstrand the idea was that the public would be consulted later, during the implementation phase. In the case of eThekweni, public consultation is even more precarious because the decision to go along with DPR has been halted because of cultural/religious issues due to biased reporting of media as well as other issues that are in the political realm.

Overall – as is evident from the discussion above, there has been inadequate engagement right at the inception of the project. This means that at the stage when municipal officers begin to consider DPR as a possible solution to water scarcity, the public are not given the opportunity to learn about DPR and why this might be a good solution to problems of water scarcity. As a result, citizens reject the choice that the municipality has made and it becomes much more difficult for the municipality to get buy-in from their constituents for DPR at a later stage.

### **5.3 Public Perceptions and Impacts on Acceptance of DPR Scheme**

The topics on public perceptions include: source of reclaimed water, safety of reclaimed water, specific uses of reclaimed water, trust in municipal competencies, choice, equity, cost implications, source of reclaimed water, benefits and necessity, media and socio-demographic and religion. The discussion below includes an analysis of their effects on the acceptance and implementation of DPR.

#### ***a) Source of Reclaimed Water***

Data collected in the three sites reveals that a realisation of where reclaimed water comes from activates certain emotions such as disgust, which in turn causes the public to reject or resist the water. Residents particularly in Overstrand and Beaufort West municipalities feel disgust because they find it difficult to delink the idea of drinking water from urine and excreta. In Beaufort West residents indicated that there is a smell in the water in the reclamation plant and that this pushes the public to buy bottled water. In eThekweni, the public was aware that there was a plan to purify the water and for this reason the effects of the ‘yuck’ factor were minimal. Nonetheless, they identified

the ‘yuck’ factor as being significant and it was selected on the ‘resistance to change continuum’ participatory tool showing that this was a factor that could lead to public rejection of or resistance to the DPR scheme. This was also the case in Beaufort West and Overstrand where respondents claimed that the ‘yuck’ factor could lead to rejection of and resistance to the DPR scheme. A study by Wilson and Pfaff (2008) and the Basic Assessment Report by Golder Associates Africa (2012) also showed that the emotional response of ‘yuck’ was one of the key concerns that emerged around the introduction of the DPR scheme in eThekweni. In some instances, as was the case in Zwelile (Overstrand), residents chose ‘not to know’ too much about where the water came from so as to ward off the ‘yuck’ factor.

According to an Australian study by Hamilton and Greenfield (1991) cited in Po *et al.* (2003), the psychological rejection of reclaimed water as filthy and unclean was the reason that the majority of respondents totally rejected the reuse scheme. According to this study, respondents preferred to stay away from using reclaimed water in order to prevent illness and disease. In a focus group conducted by Melbourne Water (1998) cited in Po *et al.* (2003), participants who claimed that they accepted the use of reclaimed water nonetheless admitted that there was a psychological barrier around using the water. These participants claimed a preference for the use of bottled water or for a way of passing their household drinking water through a filter. According to Po *et al.* (2003), the ‘yuck’ factor emerges through what Rozin and Fallon (1987) call the law of contagion discussed in the psychological literature where “the law suggests that a neutral object may acquire disgusting properties from another object through brief contact (e.g. hair in the soup)” (Rozin & Fallon, 1987 cited in Po *et al.*, 2003, pp. 16)

This association means that even though water is treated to the highest possible standards, people may still perceive it to be disgusting because of contact with disgusting stimuli such as human waste (Po *et al.*, 2003). This view is shared by Hartley (2003) cited in AWR (2013) who posits that the degree of human contact should be minimal as it is one of the several points that is likely to trigger users’ non acceptance of reclaimed water.

Municipal officials in all three sites support the view that the ‘yuck’ factor influences public perceptions and that it can lead to rejection of and resistance to the DPR scheme.

The 'yuck' perception affects the way in which the public perceives reclaimed water and there is a strong possibility that if not adequately addressed, this perception could result in rejection of or resistance to DPR schemes in South Africa.

The source of wastewater in terms of the area where it originates plays a role in determining public acceptance or rejection of the DPR scheme (Po *et al.*, 2002; Jeffrey, 2002; Nancarrow *et al.*, 2002 & Kaercher *et al.*, 2003). According to Po *et al.* (2003) citing studies by Jeffrey (2002) and Nancarrow *et al.* (2002), the reuse of wastewater from one's own household was more acceptable than from other sources. The author points out that this view can be associated with the 'yuck' factor and that people might regard their own waste as being less 'disgusting' than other people's. On the other hand, the study by Kaercher *et al.* (2003) contrasts this view as the ARCWIS focus group conducted within the context of their study showed that participants preferred a public source rather than their own household waste. From the South African case studies, the source or area where wastewater originates makes no difference in terms of public acceptance and rejection of reclaimed water. Rather, safety was of greater concern.

#### ***b) Safety of Reclaimed Water***

The issue of safety came up because the public felt that there were high levels of uncertainty when it came to the quality of reclaimed water. Because there was so much uncertainty about safety issues, respondents doubted the DPR scheme and expressed fear, sadness, confusion, worry and anger that there could be chemicals and even potential diseases associated with drinking poor quality water. Moreover, there was a general sense of confusion about the recycling process as a whole. There was also a feeling that something was missing in terms of background information and that once this information had been provided to the public, they would feel more at ease about water quality issues. Overall, the public, were keen to know more about the treatment process as a whole and they emphasised the role of knowledge in mitigating for fear about safety concerns.

Focus group respondents in the Melbourne Water (1998) and Sydney Water (2002) studies as well as in the work of Kaercher *et al.* (2003) cited in Po *et al.* (2003) also reflect on the safety of reclaimed water because of unknown impacts of chemicals used to treat the water and they linked the idea of health and safety when it came to reclaimed

water. In a study by Jeffery and Jefferson (2002) in the United Kingdom, also cited in Po *et al.* (2003), 89% of respondents indicated no objection in using reclaimed water as long as safety was guaranteed.

The idea of gaining knowledge about safety reverberated in the South African case study material. In some instances public respondents had acquired some knowledge and in these instances they felt confident about the safety of reclaimed water. Nonetheless, they still stressed the need for regular tests and regular data reporting on the quality of reclaimed water. Some respondents who were interviewed in Beaufort West emphasised that the lack of knowledge generated fear about reclaimed water. The theme of knowledge reverberated throughout the study and in the words of a respondent from the Overstrand: *'it is all about knowledge'* and from another respondent in eThekweni *'knowledge is power and a well informed nation is a powerful nation.'* Knowledge was central when it came to safety.

Municipal officials in Beaufort West and eThekweni indicated their expert role in informing the public about the safety and reliability of the reclamation project in producing good quality water. eThekweni officials confirmed that the public has been informed about 'fail-safes.' Beaufort West officials confirmed that the results of water quality tests are published in the local newspaper and they feel that the public was not voicing safety concerns. In the Overstrand, municipal officials need to communicate to the wider public about 'fail-safes.' What becomes clear from the narrative texts that were gathered in all three sites is that there are varying experiences around issues of safety by officials and by the public. Po *et al.* (2003) draw on risk literature that confirms this evidence – showing that risks perceptions are different between the experts and lay people. According to Slovic (1998), the public tends to express a broader range of risks that capture uncertainty, dread and equity concerns. Issues around equity and the relationship of equity to safety are discussed below in the section on perceptions around equity.

Data gathered from the public in all three sites drew attention to lost opportunities and lack of knowledge about the safety of reclaimed water. The consequences of not addressing public concerns around safety mean that the public is rejecting and/or resisting the implementation of DPR schemes in South Africa.

### ***c) Specific Uses of Reclaimed Water***

Public respondents in all three case studies indicated preference in using reclaimed water for flushing, gardening, car washing rather than for drinking, cooking, and bathing. The effects of the source of reclaimed water and safety concerns drive these preferences. According to Po *et al.* (2003), the disgust emotion and perceptions that there is a risk involved in adopting DPR shapes people's perceptions and determines their acceptance of DPR. The closer reclaimed water is to human contact or ingestion, the more people are opposed to using the water.

Studies in the USA (Bruvold *et al.*, 1981; Kasperson *et al.*, 1974 & Bruvold, 1972 cited in Bruvold, 1988) and Australia (Sydney Water, 1999 & ARCWIS, 2002) have revealed more acceptance of reclaimed water for non-potable uses such as irrigated agriculture. D'Angelo's Report (1998) cited in Po *et al.* (2003) points out that reclaimed water has been generally accepted especially for food crops that are to be washed or peeled prior to human consumption. Nonetheless, these studies all show that in comparison to other uses, the use of reclaimed for domestic applications is the least preferred. And these studies show that the public has been most adamant about not using DPR for drinking or for cooking purposes (*ibid*). Another study by Alhumoud and Madzikanda (2010) about people's attitude towards water use in Kuwait revealed that only a small proportion (5.26%) of respondents were prepared to accept reclaimed water for domestic applications. The majority of respondents identify agriculture, car wash, housing washing, laundry, showering as being the appropriate and preferred uses and only 8.33% consider that this water could be used for cooking. The highest percentage (69%) resisted the use of reclaimed water because of health reasons as well as the psychological barrier (54%) that was in the hearts and heads of people who were thinking about DPR.

### ***d) Trust in Municipal Competencies***

Trust that the authorities would provide water that is safe could play a critical role in determining public acceptance of reclaimed water (Po *et al.*, 2003 & Hartley, 2003). The majority of people interviewed in all three case studies have some trust that their municipal authorities would provide good services and were aware that the municipality is working hard to address water scarcity. In some instances trust in the municipality fluctuated because although there was a general sense of trust in the

authorities that provided water, there was distrust more specifically that these same authorities would be able to provide safe reclaimed water. The South African case study results back up findings from the literature and show that the public has concerns around health and they have doubts and fear that something may go wrong in the treatment process. This is even more tangible in Beaufort West where although public respondents also expressed trust in the municipality they show doubts in the safety of reclaimed water because of the unfavourable smell and taste of the water, which they currently experience.

The issue of trust is a complex one because there is evidence from international studies that the more general trust that authorities would provide safe reclaimed water meant that they would be willing to use recycled water (Kaercher *et al.*, 2003 cited in Po *et al.*, 2003). The South African case studies have shown that despite high levels of trust in municipal officials, there is still resistance when it comes to accepting reclaimed water. Empirical evidence gathered at three sites confirms that inadequate engagement during the preliminary phases of the DPR project is a driver for mistrust in the technical services of the municipality around reclaimed water. Therefore, where there is lack of trust there is simultaneously despair by the public that the municipality would get it right and acceptance of reclaimed water becomes arduous.

#### *e) Choice*

According to Po *et al.* (2003), choice is an important determinant of public acceptance of reclaimed water. According to Dishman *et al.* (1989), the public was more ready to accept reclaimed water in places with reported water shortages because of the need to conserve water. However, in Beaufort West and Overstrand where there have been experiences of severe and prolonged droughts and with water shortages caused by drought, this has not resulted in ready acceptance of reclaimed water. In these sites the public still prefer other water augmentation options, despite being aware of high costs associated with water transfer schemes and with the desalination of borehole water. As noted by Po *et al.* (2003), the fact that there is a need for other water sources (such as DPR) does not guarantee that the public will accept reclaimed water. In eThekweni where the public is not aware of water scarcity, the acceptance of reclaimed water becomes more difficult and in this instance public respondents were angry because of the choice of reclaimed water over other options such as the windmill system.

The Melbourne Water focus group participants (1998) agreed that there had to be a genuine need for using reclaimed water, and that the adoption of DPR could only be considered when other options were impractical and economically unfeasible. The South African study finds that despite being aware of high costs in desalination and water transfer schemes, the public remains skeptical of reclaimed water for domestic applications. Some public respondents showed preference for bottled water because they could afford it but mostly respondents in Beaufort West felt that the public as a whole would have to drink reclaimed water because they could not afford to buy water.

Majority of the public in the South African case studies felt that they had been sidelined and denied the opportunity to take part in decision-making about the choice of recycling wastewater for domestic applications. This generated feelings not only of anger but also of sadness because people felt that they were not given an opportunity to make up their own minds because decisions were taken without consulting them.

#### *f) Equity*

The term 'equity' has been chosen over and above the term coined by Po *et al* (2003) which is 'environmental justice' because it fits best in the context of South Africa's past era of the apartheid regime. Perceptions of racial inequality in South Africa persist and equity is an important concern in all three case studies. The 'black' community in Beaufort West was reported to be the most concerned about equity. Municipal officials took photographs of themselves drinking reclaimed water at the reclamation plant and this gesture helped generate trust in them. However, despite efforts by the municipal officials to show that they themselves would drink the water, the wider public claims that the 'white' officials do not drink reclaimed water in their homes. Although there was a clear message that reclaimed water would be used by all inhabitants of Beaufort West, the public needed more reassurance that this was the case and they asked for reclaimed water to be served during municipal meetings or functions to promote reclaimed water in a practical way.

The issue of equity resonated in Overstrand where some respondents felt that 'white' communities are better serviced with good quality water than 'blacks' and that waterborne diseases were more prevalent amongst the black population. Equity concerns are deeply rooted within the historically disadvantaged groups. Concerns

around equity were not only expressed by the historically disadvantaged segments of society but also by ‘white’ respondents who were equally concerned with the quality of reclaimed water. In eThekweni, equity concerns were so serious that they could lead to an outright rejection of the reuse scheme. The study by Wilson and Pfaff (2008) in Durban was amongst groups with specific religious and philosophical inclinations and these authors showed that racial equity of treated water distribution was one of the key concerns surrounding DPR. Issues of fairness in the South African case studies are elaborated on in the discussion around public consultation.

Beyond the South African borders, the issue of fairness resonates with environmental justice. These findings were evident within the Maroochy and Caloundra councils in Australia where reclaimed water could not be introduced because public respondents were not consulted and involved at the beginning of the project (Po *et al.*, 2003). According to Po *et al.* (2003), the literature is sparse when it comes to considerations of location. The authors argue that this aspect should be considered seriously because of its potential negative impact on community sense of place (expressed by the Sydney Water (2002) and ARCWIS (Kaercher *et al.*, 2003) focus group participants).

In the case of Beaufort West - and in particular with the Mandlenkosi Township located closer to the treatment and reclamation plants – the issue of where the plant is located is important. Residents were concerned that the plant was located close to their residence and objected to the pipeline that passed through their community. Equity is linked into location as residents felt that they had been treated unequally because the plant was located close to their homes.

Public consultation plays a crucial role in influencing public acceptance or rejection of the DPR scheme. Most of respondents in all three case study sites said they were inadequately involved in the decision-making processes of reclaimed water. They expressed emotions of sadness, anger and shame because they were not involved at all or otherwise inadequately involved in the decision-making processes and they felt that this was unfair. A number of scholars have pointed out the importance of involving the public in decision-making around water issues. For example, according to Hartley (2006), the quality and degree of public involvement in decision-making are

determinants of acceptance of reclaimed water. Russell and Hampton (2005) also note the importance of public consultation as the public expects to be involved.

Inadequate public engagement or the lack of public involvement limits opportunities (capabilities) for public respondents to acquire knowledge about reclaimed water as a solution to water scarcity. It is through engaging with others around the topic of reclaimed water that the public is able to raise their concerns and to make informed choices. When people are consulted they are more likely to feel good about themselves and to foster a sense of pride that they are being consulted and also in being part of the solution to the serious problem of water scarcity. When they are excluded they are more likely to have negative feelings – such as shame that their opinions do not matter. McKay (2005) draws attention to the value of community participation during the planning and implementation phases of new water resource options. According to Kraft and Clary (1991), a number of projects fail due to the lack of community support and that communities have been excluded because of the perception that they could interfere in the decisions of the authorities and that including them would end up being counterproductive. As the study (South African three case studies) results have shown, it is imperative to involve the public during the initial planning phase of a DPR scheme and not only once the scheme is being implemented.

Public consultation that is deemed to be fair influences the acceptance of reclaimed water as knowledge deficits around reclaimed water concerns are more likely to be redressed. On the other hand the lack of fair public consultation is likely to lead to public rejection of the DPR scheme because opportunities to gain knowledge and address concerns are thwarted because decisions that have not been informed through public consultation are then taken from the top and imposed on the public.

#### ***g) Cost Implications***

Cost and perceptions of tariffs influence public decisions around DPR (Po *et al.* 2003). In the Overstrand, respondents thought that the cost of reclaimed water would mean that they pay more initially – although they were aware that in the long run this might not be the case. In eThekweni, the public believed that the implementation of reclaimed water would save money but here tariff implications had not yet been communicated to the public although municipal officials had the intention of circulating tariff leaflets. In

Beaufort West, there was some confusion around the issue of cost as some of the public believed that water tariffs for reclaimed water use are more expensive whilst others realised that reclaimed water is cheaper than buying water from a vendor.

In a study by Marks *et al.* (2002), the authors found that majority of people expected to pay less both because of perceived low water quality and of restrictions on their use of the resource. The authors found that some residents believed that the lower price was a necessary incentive to encourage acceptance of reclaimed water. Gagliardo (2003) cited in Po *et al.* (2003) asserts that there is a need to show potential users the economic advantages of recycled water.

Increased or reduced tariffs did not impact on public acceptance of reclaimed water in the three South African case studies. Even though lower tariffs were considered to be an advantage by the public in the Overstrand (with the exception of the Muslim leader case) and Beaufort West, they were more concerned with quality than with cost. Here, most respondents said that they would be prepared to buy water even if it cost more as long as the quality was not compromised. One of the reasons that the public is prepared to pay more for bottled water in Beaufort West, for instance, is because they can vouch for the quality. Even in eThekweni where the public is glad that there are lower costs involved with DPR, data showed that they needed clarity about the processes involved in DPR – proving again that concerns around safety are at the fore rather than costs. For these reasons, it is evident that cost is not a major consideration and is certainly not the driver for acceptance or rejection of the DPR scheme in South Africa.

#### ***h) Benefits and Necessity***

Public respondents in all three sites posited that reclaimed water was beneficial and that it was a viable solution to water scarcity. In the ideal, reclaimed water should come with reduced costs, would mean that there would be no water restrictions, job creation would be stimulated, water would be of good quality and there would be benefits for sanitation as well as the reduction of wastewater into the environment. However, from the Muslim perspective reclaimed water was not justified and was considered to be of no benefit because it was a risk to public health. In general, the benefits of reclaimed water were not always obvious as some public respondents felt that they did not know enough about the process to make an informed opinion about the benefits.

Attitudes towards the environment are likely to influence acceptance of the DPR scheme (Po *et al.*, 2003; Hurlimann & McKay, 2002; Marks *et al.*, 2002 & Hartley, 2003). Interviews with the environmental NGO who had better knowledge on environmental benefits of using reclaimed water, showed skepticism around reclaimed water. The NGO also raised concerns regarding the quality of the water. According to Tchobanoglous *et al.* (2011), acceptance of reclaimed water is intricately linked into the fact that DPR would not raise concerns about water quality. However, because of lack of knowledge around the process of reclaiming water, there is very little understanding of the benefits of reclaimed water when it comes to quality. Even though some public respondents indicated good quality water as one of the benefits, results have shown that the public is unsure about the safety of reclaimed water in general. Overall, the benefits and necessities of reclaimed water were often clouded by fears about water quality or health risks associated with this option.

#### *i) Media*

Studies, reports and articles (for instance Chen *et al.*, 2015 & Po *et al.*, 2003) have shown that the media, both print as well as the radio, has an influence in shaping public perceptions and that in terms of water reuse, it plays a crucial role in determining public acceptance or rejection of reclaimed water. Articles published about reclaimed water in eThekweni as 'toilet-to-tap' were a catalyst for an emotional response of disgust or the 'yuck' perception amongst the general public. Municipal officials were critical of the effects of unbalanced media reports in shaping public perceptions. According to officials, unbalanced media reporting stimulated negative emotions of disgust and fuelled public fears around safety. However, the public sample that was interviewed had no idea that there had been negative media reports and they viewed the media as a convenient vehicle that could convey information about reclaimed water. Similarly, in Beaufort West there were not any negative effects from the media who were considered to be a suitable vehicle to inform people about water conservation during the drought period and the media was considered as a platform for information sharing on issues around reclaimed water. There was some evidence that the public in the Overstrand had noted the seriousness of unbalanced media saying, for instance, that "*if not explained there will be war.*" In the Overstrand, the public also considered the media to be a suitable vehicle for raising concerns around the DPR scheme.

Balanced media reporting is likely to influence acceptance of the DPR scheme. Importantly, whatever role the media is to play regarding dissemination of information around the DPR scheme, their role should not replace consultation processes where the public's fears around the scheme would be addressed by meaningful engagement with experts who are able to build confidence in reclaimed water as a viable option.

***j) Socio-Demographic and Religion***

The socio-demographic aspects of this study were age, gender, education, race and religion. Studies on reuse have shown that demographics can be influential in public perceptions of reclaimed water (Po *et al.*, 2003; Hartley, 2003 etc.). Public respondents in all case studies are in agreement that in terms of age, the older generation are more resistant to reclaimed water than the younger generation who are, overall, more accepting of change. This is in line with the study by McKay and Hurlimann (2003) cited in Po *et al.* (2003) who predicted that those aged fifty and above were the most resistant. Interestingly, this view is contrary to a study by Bungu (2014) in South Africa<sup>77</sup>, where younger people were seen to be more negative of reclaimed water than the older people, because the youth had little or no knowledge of water scarcity and reclaimed water. In terms of gender, men are more accepting to reclaimed water than women who were more concerned with the health and water quality issues. This is in line with Hamilton and Greenfield (1991) also cited in Po *et al.* (2003) who suggested that it was more likely for an educated male with no aversion to change and without prior exposure to negative perceptions to accept reclaimed water than his female counterpart.

Education was seen to be an important factor influencing public perceptions and from the findings, the general perception is that those with lower levels of education will take time to adapt to change whereas, those who are more educated are better able to do their own research and are more likely to understand the complexities around a decision to use DPR. Dolnicar and Schafer (2006) proposed the introduction of reclaimed water in high status communities first. In their study, it was those who were more educated that showed an interest in the reuse process. Overall, it is evident from the South African

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<sup>77</sup> Assessing the perceptions of consumers in the Vaal Triangle on wastewater reuse. Administered 700 questionnaires, with a 74% response rate of 515 questionnaires.

data that the public in general – both those who are educated and those who are not – need targeted education around the issue of reclaimed water. The point here is that the level of education is not considered to be a determinant for acceptance of the DPR scheme.

There was also some differentiation in perceptions along racial lines. According to Hartley (2003), race has a more dominant influence on public perceptions than any other demographic factor. Respondents felt that it was more likely that acceptance would be higher amongst the white population and colored populations in South Africa because they are likely to be better informed than the black population who were the historically disadvantaged group during the apartheid era. Furthermore, there is a likelihood that the black population will reject reclaimed water because of equity concerns. However, this view was quite different in eThekweni where the black population were more likely to accept reclaimed water because they were poorer than other races and because they had no choice of an alternative such as buying bottled water. The study by Bungu (2014) however differed on this issue and for Bungu it was the white respondents who were seen to be more negative and distrustful of the authorities than the black respondents. While noting that racial views are worth considering, data from black and white respondents across the three case studies showed that concerns around inadequate public engagement proved dominant. Racial inequities is one concern but it is clear that the topic of reclaimed water is a sensitive one and that there are negative perceptions amongst many segments of the population, irrespective of age, gender and race.

Perceptions around religion, in particular Islam and Christianity were taken into account so as to better understand whether and in what ways religion might shape public decisions in reclaimed water. According to the Muslim leader consulted in the Overstrand, direct potable reuse technology was outrightly rejected but indirect potable reuse was acceptable. According to this respondent, reclaimed water, via the DPR technology, is not fit for spiritual ablution because the water has not undergone natural purification. The perception from a Christian perspective in all three case studies is that, what is consumed and goes into the human body does not have a spiritual effect on a person. Those practicing Christianity are therefore more likely to accept reclaimed water than those practicing Islam.

In eThekweni, the religious perspective played a big part and one of the main reasons that the DPR scheme was not implemented was because of rejection by Muslim activists. However, the study conducted by Wilson and Pfaff (2008) amongst religious and philosophical groups and leaders in Durban, found that there was no fundamental religious or philosophical objections to using reclaimed water for domestic applications, either locally or internationally. This is contrary to the findings from the validation workshop conducted in eThekweni which indicate that those practicing the Islam are more likely to reject and resist reclaimed water than those practicing Christianity.

#### **5.4 Approach to Address Public Perceptions around Reclaimed Water for Domestic Application in South Africa**

This section discusses the reasons for public perceptions and makes suggestions on how to address these perceptions with regards to DPR. This study proposes an approach to address public perceptions in the three case studies, which can be taken up by the case study municipalities as well as other municipalities in the country envisaging the implementation of DPR.

Data across all three case studies shows that there is a knowledge deficit and inadequate public engagement and that this drives negative public perceptions. It does not suffice that there is a municipal understanding of the risks of water scarcity and their need to supply potable water for a growing demand, because it is imperative to take into consideration people's values, beliefs, norms and preferences through public consultation before taking a decision on the choice of any water augmentation scheme – such as reclaimed water for domestic application. The empirical evidence drawn from the three sites of investigation shows that public engagement has been inadequate and that the public has many questions to ask around DPR. An institutional attitude of 'decide-announce-defend' (Beck, 2009) does not encourage public debate and deliberation. Engaging the public through mutual understanding and building of trust through constructive consultation is thus crucial in addressing public perceptions and this is a process that needs to be iterative and not just a 'once-off.'

Frustration is manifest from both the public and the municipality when knowledge is not shared. The municipality become frustrated because they meet with opposition to their scheme from the public and the public is frustrated because they feel that solutions to water scarcity are being imposed on them from the top-down. The introduction of a new scheme such as DPR presents, in the ideal, an opportunity for people to learn ‘what works’ and ‘what does not work’ and for the municipality to become more familiar with their constituents. Public perceptions might not change instantly once they have knowledge about the scheme but at least the public will feel that they have been given opportunity to make an informed choice about reclaimed water. The emphasis is therefore on choice and opportunity as having intrinsic value – and not only instrumental value. In other words, as Robeyns (2003) notes, it is the right thing to do to give people the opportunity to choose when it comes to decisions that impact on their everyday lives.

It is evident from this study that a range of negative emotions have been aroused simply because the municipality did not engage constructively with the public. As already mentioned above, it is possible that knowledge sharing might not change perceptions around reclaimed water but what it would do is to instill trust in the municipality and to boost knowledge around the matter of water scarcity. Public respondents were asked whether and if so in what ways they would prefer to be consulted. Public suggestions however become crucial, as it is them that have the negative perceptions around reclaimed water and these ought to be addressed. However, municipal officials’ views on improving public engagement in order to achieve successful results become increasingly crucial since they are the ones who have to put processes in place to ensure more positive outcomes.

From the empirical data, it is clear that different emotions emerge at different stages of decision-making. It would be helpful to address negative perceptions when and if they arrive at earlier stages of decision-making as perceptions about reuse are shaped very early on in the life cycle of a project. There is a wide range of different feelings that were expressed during the various phases such as the planning, implementation and post implementation phases. The study posits that the public should be involved at the very beginning of decision-making, setting the scene for active public engagement right at the onset of water scarcity and risk management through to the reconciliation study

and then to the final stages of the project. In this way the public would know why the reuse decision is envisaged as a water augmentation choice in the first place and they would be more likely to accommodate the idea rather than being ‘shocked’ about it.

The quality and degree of public involvement in decision-making are determinants of acceptance of recycled water (Hartley, 2006). Importance has been placed on public participation to achieve optimal social outcomes in decision-making (Lockie & Rockloff, 2005). A number of projects have failed due to the lack of community support and this happened because those who implement recycled water projects were often of the opinion that the community would interfere in the decisions of authorities and that their involvement would be counterproductive (Kraft & Clary, 1991). However, as already indicated above, Po *et al.* (2003) claim that approaches such as ‘decide announce defend’ (DAD) and other methods of persuasion have resulted in many failed reuse projects (for instance the San Diego Water Repurification project).

Major decisions made without involving local communities and those affected by the decisions are more likely to fail (Lundqvist & Gleick, 1997). In order to increase community acceptance of recycled water use, the development of more effective methods of public participation is required (Hartley, 2001). Key factors for public participation and perception of recycled water use include: information and context, communication and dialogue, trust and trust building, perception of fairness, and motivation and commitment to participate in decision-making (*ibid*).

Goldin (2013, 2015) and Wutich and Ragsdale (2008) suggest that people are connected to issues of water in an emotional way. Public acceptance of reuse is also linked into attitudes and emotions that people have around the topic of water. These attitudes and emotions play an important part in determining whether or not new technologies such as potable reuse of reclaimed water, will or will not be accepted. Attitudes and emotions are embedded within social structures and subjective beliefs, norms and values that are the product of interaction between people who engage – and influence – one another.

The Capability Approach applied in this study makes the links between public emotions and perceptions and the implementation of reclaimed water for domestic applications explicit. As Goldin *et al.* (2013) propose, the application of a new approach in dealing

with people's perceptions around reclaimed water might offer new answers because it will have as its central focus on people rather than technology or scientific 'facts' which tend to dominate the realm of water management discourse. As these authors note, it will also shine the torch on people's perceptions and feelings – how they feel about reclaimed water for domestic applications. Emotions (fear, anger, hope etc.) are a function of social relations and processes and as Goldin's (2003, 2010) work on shame has shown, some water users feel helpless – and this might be how they feel in the face of extreme climatic events such as droughts and this might result in emotions such as fear, anger, hope, shame etc. These feelings determine action and the way in which people act – or do not act – when it comes to environmental concerns and their relationship with the environment, for instance climatic occurrences such as droughts and floods.

Nussbaum (2011) identifies emotions as the fifth in her list of well-being. According to Nussbaum emotions are: 'being able to have attachments to things and people outside ourselves; to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to experience longing, gratitude, and justified anger. It is important not to have one's emotional development blighted by fear and anxiety.'

Hartley (2006) proposes public consultation, as key to addressing public perceptions. The South African case studies propose steps that bring the institutions closer to the public within the context of reclaimed water. At each stage that the institution is involved in decision-making, public respondents have expressed different emotions. Suggestions on how to address these perceptions were made by the public themselves as well as by the municipalities. Respondents in all three case studies assisted in suggesting what types of approaches would be best to adopt during the different phases of the project.

Opportunities to build on existing social capital, to build trust in municipal capacity and to allow for choice, appears to be limited and there has been an over-reliance on print media to disseminate information on this sensitive topic. Information may be misrepresented by the media for sensationalist purposes or might be manipulated by politically motivated activists, even within the context of a legitimate EIA and Interested and Affected Persons (I&AP) stakeholder engagement procedure that is

followed through by municipalities. In the Overstrand municipality where the introduction of reclaimed water is envisaged, municipal officials plan to engage more with the public via the EIA and I&AP procedure. The opportunity for opening up meaningful debate through a two-way communication process prior to taking a decision may constructively shape the form and scope of public engagement. This idea of opportunity is the cornerstone of the theoretical frame, the Capability Approach that informs this study.

Sub-section 5.4.1 discusses the perceptions and emotional responses that emerge at each stage of the project. Sub-section 5.4.2 then proposes terms of engagement around the concern of public engagement by information sharing and engagement and considers appropriate tools for each of the stages that would be helpful in shaping more positive perceptions around DPR.

#### **5.4.1 Public Perceptions and Emotional Responses at Decision-Making Stages**

There are six different decision-making stages around reuse; the first of which is the acknowledgement of water scarcity and the need to manage risks associated with this scarcity. Once this is acknowledged, the municipality carries out a reconciliation study which is then followed by a feasibility study. Once these studies have been completed the next stages are the reuse decision, reuse implementation and finally post-implementation.

The study posits that the way the public perceives and feels about DPR is generated by knowledge deficits and inadequate engagement processes about water issues at the earliest stages of decision-making – before the reuse decision stage. The perceptions and emotional responses identified in the study are now presented in context of decision-making stages below.

##### *i) Water Scarcity and Risk Management*

When faced with a water scarcity crisis, whether natural or human-induced, municipalities implement risk management strategies which are guided by the regulatory body, DWA. In the Overstrand, at this early stage, the public noted that they were aware of water scarcity but that the situation only really became apparent once

restrictions around water use were imposed on them as part of the municipal risk management strategy. According to municipal officials, water restrictions were imposed by DWA. The municipality played its role in raising awareness and it was reported that this reduced water demand for up to 25%. The public was concerned and fearful about the looming water crises and had to adapt to the crisis by changing their water use lifestyle. They however, had very limited knowledge about the severity of the situation despite the fact that there were efforts made by the municipality to inform the public about water restrictions. There was not an adequate engagement process to provide the necessary information that could alleviate concerns from the public. Despite the fact that the public was aware through risk management that water restrictions had been imposed to conserve water, they still felt that decisions around risk had been imposed on them. A selected few were invited to sit on the Advisory Committee that was established to deal with the water crisis and this gave them an opportunity to learn more about the water scarcity issues. Despite the public acknowledging the benefits and necessity of reclaimed water as a solution to water shortages, they were not convinced that this was the way to go and wanted to have proof that all other options have been exhausted. The public wants to be involved in decision-making right from the onset and their lack of involvement is seen by them to be unfair.

Water scarcity in eThekweni has been attributed to population and economic growth and in this instance risk management had included a moratorium placed on economic development as a bid to manage and conserve water. Multiple factors contributed to the reason for opting for direct potable reuse for augmenting water supply. However, water scarcity is not apparent to the public who are therefore doubtful as to why the municipality needs to opt for reclaimed water. The municipality claims that they have disseminated the message that there is a water shortage via the media at the same time as embarking on a public education campaign but their message has not gotten through to the public.

Drought was observed in the area of Beaufort West in 2009/2010 resulting in limited and poor quality ground and surface water, including water in the Gamka dam. As a result, in order to manage risk, the municipality implemented water restrictions and imposed fines to any user whose water use exceeded 12 Kl per month. Awareness of the severity of the crises and the need to conserve water was raised by the municipality

especially via the community radio. The public was aware of the drought because of visible signs such as low dam levels, dying crops, water restrictions and dying animals etc. and they felt that the restrictions were fair. Given the severity of the situation, there was a call for prayers in order to appease the divine grace. At this stage, when the signs were so visible of water scarcity, there was confusion, panic and fear amongst the public. These feelings were aggravated when households waited for water to be distributed for hours and sometimes for days.

The effects of the droughts led to the decision to opt for and implement reclaimed water using the DPR technology to ensure water supplies and given a lack of choice of other alternatives. Opting for reclaimed water was done in an adhoc manner with inadequate public engagement and the public felt that this way of going about the job was unfair. Despite visible impacts of the drought coupled with an understanding of the benefits and necessity of reclaimed water, the public was still not fully convinced that reclaimed water was the best option.

*ii) Reconciliation Study*

In 2008, following on with the reconciliation for the metropolitan areas, DWA initiated a nation wide program to develop water reconciliation strategies for all towns, villages and clusters of villages across the country (Hay *et al.*, 2011). The overall objective of the reconciliation study was to address water requirements and reconciliation strategies for all towns and villages in the country over a twenty-five year frame (DWA, 2009 cited in Hay *et al.*, 2011). The study involved mainly bulk users (such as agriculture) and selected stakeholders. The outcome of the study that evaluated water demand versus supply and proposed options for water augmentation was made available via the Department's web site in the Water Services Development Plan (WSDP) and Infrastructure Development Plan (IDP). This study did not involve the general public. This was confirmed by the public who were consulted across all three case studies and who said they had not been involved in the reconciliation study.

Although there is information available on the municipal website, not everyone has access to this information. The public in all three case study sites expressed their concerns regarding the way in which institutions (in this case the municipality) had not involved them in the process and they felt that there should have been transparency and

that they ought to have been involved at the onset. Knowledge about what was going into the reconciliation study would have made it clearer to the public that the reuse scheme is one of the water augmentation options. A feeling of unfairness of not being properly involved and informed was expressed by most public respondents across all three sites.

*iii) Feasibility Study*

The next step after the reconciliation study was to conduct a feasibility study. This study would guide the municipality and assist them in choosing a suitable option for water augmentation, guiding them in the selection of the type of treatment technology and associated costs for reclaimed water. There were different consultants in each municipality who were responsible for this study. In Beaufort West, the outcome of the study was submitted to DWA and the reuse project was approved. Subsequently the council decision to introduce reclaimed water as an alternative option for water supply was published in the municipal IDP. The municipal officials in Beaufort West and the Overstrand admitted that outcomes of the feasibility study were not communicated to the public and public respondents in these two sites also confirmed that they were not involved in this study. In Beaufort West in particular, there were members of the public who felt that the cost implications were not transparent.

In eThekweni however, the consultant that was interviewed said there was a public participation process via the EIA. According to the Basic Assessment Report by Golder Associates Africa (2012), the outcomes of the feasibility study were communicated to the Interested and Affected Parties (I&APs) via the EIA public participation process. Public participation plays a vital role in informing Interested and Affected Persons and in providing an opportunity to comment on the proposed project (*ibid*). Some public respondents had been made aware of the option of reclaimed water for potable applications through training sessions run by the Municipal Water Department, via User platform meetings, community meetings and also through the AA Focus Group. Despite these sessions, most of the public who were interviewed showed very little knowledge about the reasons for using reclaimed water for domestic applications.

The public in all three sites wanted to know more about the choices around water augmentation and also wanted to be involved right through the process. Because this

had not happened they feel that the process has been unfair. There is also a perception that the municipality might be “hiding something”<sup>78</sup> and this generated mistrust in the municipality.

*iv) Reuse Decision*

After the feasibility study, municipalities decided to augment water via reuse across all sites. In the Overstrand, municipal officials were opting for reclaimed water for potable applications and an attempt was made to inform the public about this via newsletters, newspapers, municipal web articles in the WSDP and IDP and municipal water bills. However, most of the public respondents interviewed indicated no knowledge about reuse plans for their town and the few who had any knowledge at all had been part of the public meeting held with DWA and other networks such as the Users’ forum and the Advisory forum. According to municipal officials, only three individuals gave any feedback about safety concerns by telephoning the municipality. The complaint to the municipality was that the engagement processes had been inadequate. As such the municipality planned to rectify this by engaging the public better via the EIA at the time of implementing the project.

By this stage of the project, most of the public felt that they had been unfairly treated because they were not involved in decision-making. They expressed doubt, confusion and fear around the safety of water quality and the operations of the plant and their overall feeling was one of disgust at the idea of reclaimed water. Overall, there was a lack of trust in the municipality and a feeling that they were not being treated justly. As discussed in section 5.3 above, other concerns pivoted around the lack of choice, religion, media and concerns about what the benefits of the project were and whether the project was necessary in the first place.

The decision to recommend reclaimed water as an alternative water augmentation scheme in eThekweni emanated from the feasibility study. According to the Basic Assessment Report by Golder Associates Africa (2012), the public had already been informed that a decision had been taken. Some respondents felt shame because they had been excluded from the decision-making and they felt a wide range of emotions

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<sup>78</sup> Focus group Qhayiya Secondary School, June 2014

such as confusion, sadness, worry, disgust, fear and general mistrust around the safety of reclaimed water. In eThekweni, first of all, water scarcity was not tangible and secondly, the public was aware of other solutions such as the windmill system which they felt had not been considered. This made them angry as they felt that there were other options but that they had not been given a choice. The 'yuck' factor was further exploited through the media's 'toilet to tap' ethos.

In Beaufort West, the outcomes of the feasibility study were registered with the Disaster Management Department in a quest for potential funding to implement the scheme. Upon the approval by the municipality, a complete report covering design and financial requirements was submitted to the Department of Water Affairs. The project went through a tender process after which the council made a final decision to go for this option and the project was incorporated into the municipal IDP. There was an attempt at this stage to communicate with the public via flyers and through the newspaper about the reuse decision. However, public engagement was not adequate because the circulation of information was limited only to those having access to the flyers or/and newspapers. The go-ahead was given by DWA and the construction of the plant was authorised. The municipality had however taken decisions to implement the project in haste and a whole range of emotions which are discussed in the section on implementation below, were generated.

v) *Implementation*

The implementation stage is the stage where the decision taken on reuse becomes effective. This stage involves both technical and social components; 1) the construction process of the plant and 2) understanding and addressing social concerns. In Overstrand, the plan to implement reclaimed water was put on hold when alternative water resources (such as rainwater and ground water) became available. However, although the timeline is not certain, the implementation of reclaimed water for domestic applications has been confirmed by the municipality. Negative perceptions and emotions which are currently in the reuse decision are also likely to be present during the implementation stage.

In eThekweni, the implementation of reclaimed water plans has been put on hold due to the fact that some members of the community have rejected this idea (Bill & Pfaff,

2008). Another reason is that there is a lack of political support. However, reclaimed water is still seen by officials as a suitable alternative to address looming water scarcity in the area. Nonetheless, it could only be implemented if the processes of engagement suggested by respondents are taken into consideration and if the necessary political support is given. According to the public, there is a likelihood that negative emotions and perceptions would still emanate during the implementation phase if proper public engagement has not taken place. Disgust, anger, feelings of unfairness and fear and worry in the safety of the water are likely to be manifest at the implementation phase.

In Beaufort West, a range of emotional responses was manifest. Feelings of unfairness, shame and despair were experienced by the public who felt that they had not been adequately involved in the decision-making processes nor had they been given a choice. Equity concerns and perceptions regarding racial discrimination were triggered at this stage especially from community members at the Mandlenkosi Township which is predominantly 'black.' Respondents also expressed doubt, anger and mistrust around the issue of safety of reclaimed water. Negative perceptions can be attributed to the lack of knowledge around the treatment process. Other concerns were raised including an expression of disgust when contemplating the source of reclaimed water. Concern around cost and tariff implications were also raised.

Clearly, from the public's point of view, they would resist the use of reclaimed water unless there is adequate public consultation. The public wanted to know about the project and also wanted their equity concerns to be addressed. Even though to some extent the public were aware of the benefits of reclaimed water, they still required further clarity on the general processes involved.

vi) *Post-implementation*

The post-implementation stage is the stage where water quality assurance for the plant is monitored. There are plans in place in Overstrand to ensure that drinking water quality, be it reclaimed or from other sources, would be subject to a post-implementation monitoring procedure as is currently the case of Beaufort West. In the Overstrand, water quality results are published in the Blue and Green Drop certificates on the municipal website. A plan is in place to continue publishing these results once

reclaimed water is implemented. Data shows that the public will worry, have doubts and feel fearful about the safety of the water quality if they are not adequately reassured.

In eThekweni, no mechanisms for information sharing or monitoring have been developed yet. Even though the municipality has not reached this stage, negative emotions such as doubt, fear, worry and confusion have been expressed around the quality of reclaimed water and around the engagement processes in general. Public respondents indicated that they would like to know the water quality results so that they could trust the idea of reclaimed water.

In Beaufort West, operation and maintenance (O&M) and monitoring processes are in place and the intention, at least according to municipal officials who were interviewed, is to reassure the public that there are strict control measures in place to guarantee safety at the plant and the water quality coming from it. The idea behind reassuring the public is that this is the right way to foster relations of trust between the public and the municipality. Water quality monitoring results are published in the local newspaper under the Blue Drop certification section. Organised plant visits and explanation campaigns that demonstrate how the plant functions are meant to boost confidence in the monitoring and operation of the project. These visits – and campaigns that accompany them, are intended to redress the inadequate public engagement during the earlier stages of the project. Municipal officials note that the plant is operated and monitored twenty-four hours non-stop but the public is not aware of the operation and maintenance requirements of the plant nor do they know about monitoring mechanisms that have been put in place to ensure that the water produced complies with standards.

Some respondents have indicated that the quality of the water has improved yet others expressed anger because the water does not have a good taste and according to them, it has not been adequately treated. This stirs up emotions such as ‘yuck’ and doubts about the safety of reclaimed water. Despite attempts to address public concerns via information on quality standards in the newspapers, public participants want more direct engagement from the officials. Another emotion that emerged was sadness that the water is expensive. Overall, there is a lack of trust in municipal services because of the perception that municipal officials do not drink such water themselves.

Table 5.1 below summarises the discussion above by selecting relevant negative emotional responses and other ‘intangibles’ that emerge around the issue of DPR. These emotions are organised across sites and according to the different phases that have been identified above.

**Table 5.1: Range of Negative Emotions across Case Studies**

Stages of decision-making process	Emotions/ ‘intangibles’			Emerging emotions for DPR
	Beaufort West	Overstrand	eThekwini	
Water Scarcity & Risk Management	- Unfairness - Lack of choice	- Lack of choice - Unfairness - Doubt in DPR choice	- Denial <sup>79</sup> - Doubt in DPR choice	- Unfairness - Denial - Doubt - Lack of choice
Reconciliation Study	- Unfairness - Doubt	- Unfairness - Doubt	- Unfairness - Doubt	- Unfairness - Doubt
Feasibility Study	- Unfairness	- Unfairness	- Unfairness - Doubt	- Unfairness - Doubt
Reuse Decision	- Doubt - Anger - Disgust - Mistrust - Unfairness - Racial inequity - Lack of choice - Shame	- Doubt - Fear - Confusion - Worry - Mistrust - Disgust - Lack of choice - Unfairness – consultation & racial inequity	- Anger - Fear - Disgust - Worry - Confusion - Shame - Doubt - Mistrust - Sadness - Lack of choice - Unfairness – consultation & racial inequity	- Anger - Fear - Disgust - Worry - Confusion - Shame - Doubt - Mistrust - Sadness - Lack of choice - Unfairness – consultation & racial inequity
Implementation	- Doubt - Anger			- Doubt - Anger

<sup>79</sup> The discussion above has not spoken about denial but it is a relevant ‘intangible’ where water scarcity has not been apparent.

	<ul style="list-style-type: none"> <li>- Disgust</li> <li>- Mistrust</li> <li>- Unfairness – consultation &amp; Racial inequity</li> <li>- Lack of choice</li> <li>- Shame</li> </ul>			<ul style="list-style-type: none"> <li>- Disgust</li> <li>- Mistrust</li> <li>- Unfairness – consultation &amp; racial inequity</li> <li>- Lack of choice</li> <li>- Shame</li> </ul>
Post-implementation	<ul style="list-style-type: none"> <li>- Mistrust</li> <li>- Unfairness – consultation</li> <li>- Doubt</li> <li>- Anger</li> <li>- Disgust</li> <li>- Sadness</li> </ul>			<ul style="list-style-type: none"> <li>- Mistrust</li> <li>- Unfairness – consultation</li> <li>- Doubt</li> <li>- Anger</li> <li>- Disgust</li> <li>- sadness</li> </ul>

The negative emotional responses in Beaufort West’s implementation and post-implementation stages are typical responses at these stages and some of these emotions have also been expressed by the Overstrand and eThekweni respondents. It is evident from the discussion in this chapter that the lack of knowledge about the different stages together with the lack of public engagement at the various stages to learn ‘what works’ and ‘what does not’ has generated negative feelings around the DPR scheme. This study proposes that there are important steps to be taken that are over and above the standard ‘modus operandi’ where the public is consulted via the EIA for instance. It suggests a more extensive mode of engagement where there is an opportunity for the affected persons to be part of the decision-making process leading up to the implementation of DPR. Despite this lacuna, the study acknowledges the genuine efforts made by the three municipalities to raise awareness of the water crisis via the media using posters, flyers, newspapers, radio etc. This does not, however, suffice, and there is a need for more inclusive direct engagement where information flows are from the municipality to the public and vice versa.

#### 5.4.2 Approach to public engagement at institutional decision-making stages

Negative perceptions and negative emotional responses around reclaimed water have been exacerbated due to knowledge deficits and inadequate public engagement at the

very early stages of the water reuse project. As already discussed, addressing these perceptions should begin at the very early stages when there is awareness of water scarcity and risk management, through to the reconciliation study and then the reuse decision itself and the final implementation and post implementation stages of the project. The process of engagement requires iterative and continuous reassurance where concerns around the scheme are acknowledged and addressed.

The idea is not to develop three different approaches to address public perceptions for each of the sites, but rather to adopt an approach where it is clear, exactly what kind of information the public needs and how best to impart this information. The terms of engagement proposed in this study – and presented below – are not ‘fixed in stone’ as they serve as a guide that can be adjusted as and when needed.

*i) Water Scarcity and Risk Management*

At this stage, the public needs to know about water scarcity and the severity of its impacts. Information about water scarcity and risk management should generally be communicated to the public before a crisis arises. Officials should provide the public with tangible and visual evidence of water scarcity (e.g. dryness, constant decrease of dam level etc. – see figure 5.1).



**Figure 5.1: Dried Gamka Dam (Courtesy: Beaufort West municipality 2010 water crisis).**

Information pertaining to water scarcity should be broadcasted on the radio, explained on water bills and posted on billboards. Opportunities for information flows exist when

the public is called to meetings or/and through school programs where users can share their concerns and learn more about water scarcity and how to redress it. The public would also be made aware through these meetings or/and programs that there are water restrictions that they need to heed. The municipality can use these opportunities to make presentations and display posters where the facts are made quite clear. The public would also be able to find out about institutional structures – for instance an Advisory Forum, that deals with water scarcity. An Advisory Forum was for instance, created in Overstrand. There are also other structures, such as the AA focus group that exists in one of the communities of eThekweni. This is also an opportunity to suggest whether and in what ways new forums or structures could be established.

*ii) Reconciliation Study*

Even though the Reconciliation study does not have to involve the general public, the purpose and outcomes of the study should be communicated to the public. Information that comes from the Reconciliation study needs to be readily accessible to the public. Information about the Reconciliation study is available on the DWA website, but this does not suffice because not everyone has access to the Internet. Education programs and/or public meetings are essential as these are vehicles for information sharing and these need to be put into place at the very early stages so that the public becomes aware of water augmentation options.

*iii) Feasibility Study*

The Reconciliation study informs the feasibility study. Detailed information of everything that goes into a feasibility study is not required but the basic information that concerns the public should be shared with them. Before a feasibility study takes place, the public needs to be told about it and then once the study has been completed, the results need to be communicated to the public. The public requires a space where they would be able to put their questions and their expectations to the officials and where they could get a better understanding of what the feasibility study entails. This is essential as it allows the public to understand how the choice of different water augmentation options is made. The public wants to know about the safety of DPR technology as well as the implications of tariffs. It is essential that the public can eliminate their doubts and fears that the municipality is with-holding information from them.

iv) *Reuse Decision*

Once the feasibility study is complete, the municipality takes a decision based on the study findings. Here too, it is critical that the public fully understands what has informed the decision and to be fully aware of the reasons for and the consequences of the decision. Experts within the municipality need to understand the technology around reclaimed water but this is not something that the public need to know. What they do need to know is whether or not the technology can be efficient enough to produce water that meets water quality standards. The implication of the reuse decision on tariffs should also be clearly communicated to the public. The public also needs to be reassured that the end users are not simply one small segment of the population – based on racial reasoning – but that the population as a whole is considered. The financial benefits of DPR in comparison to other options should be explained to them.

As is the case with previous stages, the reuse decision should be communicated to the public during public meetings where information can be disseminated to the public. The general public should be given the opportunity to express their views in response to the information provided to them. A discussion forum including mainly public representatives such as community and religious leaders and the municipality, should be created to discuss the decision-making process. Such a forum would also be helpful in determining what types of information there should be and how and when this information should be communicated to the public. Municipalities would need to make it clear that this technology is already being used and they should give clear examples of this as a way of building confidence around the health and safety concerns.

v) *Implementation*

Once the reuse decision has been adopted, the next stage is the implementation itself. Beaufort West is the one site where the scheme has been implemented. Once the project is implemented it means that the public would be expected to drink and use this water for domestic application. This is a particularly sensitive stage and it entails ongoing measures to address social concerns that may arise once the plant is being constructed. The public needs to know 1) why a particular spot has been selected for the reclamation plant, 2) how the plant will be operated (continuously or intermittently), 3) what monitoring programs and other measures are in place to ensure that the plant is fully controlled and risks are reduced to its minimum.

Public meetings are ideal to convey information to the public and these provide spaces where questions can be asked and concerns raised. During these meetings the municipality can make presentations, show posters and call on water and medical experts to speak to the public.

vi) *Post-implementation*

The Post-implementation stage starts once DPR has been launched. The post-implementation means that the reclaimed water scheme is operational. The public at this stage expects to know more how the plant is monitored and what measures are in place to ensure that the quality of water is safe and meets standards, and whether the monitoring program is in fact being implemented. The public needs to be informed around water quality results and needs to know how often and where these results will be published. The public also needs to feel reassured that once the results are made public, they will have access to experts who can explain what the results mean. It is also important for the results to be communicated in a manner that is easily accessible. Guided visits to the plant, information campaigns, school visits, roadshows, and information sharing sessions all help to disseminate information and address concerns. An Advisory Board selected from the public could play a major role in advising officials on the types of information that needs to be communicated to the public.

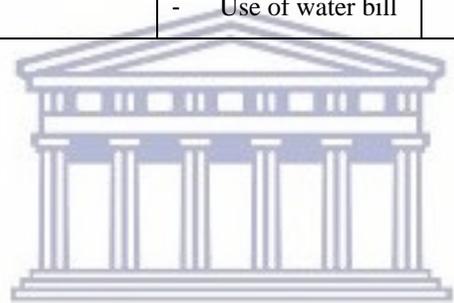
Although the Overstrand and eThekweni municipalities have not reached the implementation phase yet, the public expressed the need for ongoing monitoring and reporting of results to allay fears, worry and doubts in the water. At this stage, trust in the municipality to provide safe drinking water is crucial. Table 5.2 below is organised into four columns; 1) the different decision-making stages 2) perceptions and emotional responses 3) strategies for engagement, and 4) the proposed positive outcomes.

**Table 5.2: Approach to Address Negative Public Perceptions in South Africa**

Stages	Emotions/Perceptions	Strategies				Emotions/ 'intangibles' outcomes
		Information sharing for awareness	Tools	Engagement for knowledge acquisition	Tools	
<b>Water scarcity and risk management</b>	<ul style="list-style-type: none"> <li>- Unfairness</li> <li>- Denial/Doubt</li> <li>- Lack of choice</li> </ul>	<ul style="list-style-type: none"> <li>- Inform about water scarcity</li> <li>- Provide tangible evidence of water scarcity</li> <li>- Communicate risk management plans</li> </ul>	<ul style="list-style-type: none"> <li>- Use of bill boards</li> <li>- Use media – radio and newspapers</li> <li>- Water bills</li> </ul>	<ul style="list-style-type: none"> <li>- Public awareness</li> <li>- Participate in meetings</li> <li>- Address issues and concerns</li> <li>- Public advisory board</li> <li>- Explain risk management plans</li> </ul>	<ul style="list-style-type: none"> <li>- Public relation campaign</li> <li>- Presentation (using facts)</li> <li>- Posters (with facts)</li> <li>- School program</li> </ul>	<ul style="list-style-type: none"> <li>- Fairness</li> <li>- Informed choices</li> <li>- Clarity</li> <li>- Confidence</li> </ul>
<b>Reconciliation &amp; Feasibility studies</b>	<ul style="list-style-type: none"> <li>- Unfairness</li> <li>- Doubt</li> </ul>	<ul style="list-style-type: none"> <li>- Inform public about purposes, outcomes and impacts (before and after)</li> </ul>	<ul style="list-style-type: none"> <li>- Information centre</li> <li>- Leaflet</li> <li>- Use of water bill</li> <li>- Use of media</li> </ul>	<ul style="list-style-type: none"> <li>- Discussion forum</li> <li>- Public meetings/dialogue</li> <li>- Public advisory board</li> </ul>	<ul style="list-style-type: none"> <li>- Presentations</li> <li>- Posters</li> </ul>	<ul style="list-style-type: none"> <li>- Fairness</li> <li>- Confidence</li> </ul>
<b>Reuse decision</b>	<ul style="list-style-type: none"> <li>- Anger</li> <li>- Fear</li> <li>- Disgust</li> <li>- Worry</li> <li>- Confusion</li> </ul>	<ul style="list-style-type: none"> <li>- Basis for decision</li> <li>- Decision making process</li> </ul>	<ul style="list-style-type: none"> <li>- Information centre</li> <li>- Use of media</li> </ul>	<ul style="list-style-type: none"> <li>- Public advisory board</li> <li>- Public meetings</li> </ul>	<ul style="list-style-type: none"> <li>- Use of councilors to inform</li> </ul>	<ul style="list-style-type: none"> <li>- Gladness</li> <li>- Pride</li> <li>- Clarity</li> <li>- Self-esteem</li> <li>- Trust</li> </ul>

	<ul style="list-style-type: none"> <li>- Shame</li> <li>- Doubt</li> <li>- Mistrust</li> <li>- Sadness</li> <li>- Lack of choice</li> <li>- Unfairness – consultation &amp; racial inequity</li> </ul>	<ul style="list-style-type: none"> <li>- Technology selection criteria and effectiveness</li> <li>- Treatment process - Demonstration (lab scale model)</li> </ul>	<ul style="list-style-type: none"> <li>- Use municipal notice board and website</li> <li>- Use of water bill</li> </ul>	<ul style="list-style-type: none"> <li>- Discussion forums with public representatives</li> <li>- Share previous experiences</li> </ul>	<ul style="list-style-type: none"> <li>- Use of community and religious leaders</li> <li>- Presentations</li> <li>- Agenda and themes for discussion</li> </ul>	<ul style="list-style-type: none"> <li>- Informed choices</li> <li>- Confidence</li> <li>- Calm, etc.</li> </ul>
<b>Implementation</b>	<ul style="list-style-type: none"> <li>- Doubt</li> <li>- Anger</li> <li>- Disgust</li> <li>- Mistrust</li> <li>- Unfairness – consultation</li> <li>- Lack of choice</li> <li>- Shame</li> </ul>	<ul style="list-style-type: none"> <li>- Implementation process</li> <li>- Demonstration process to show safety measures</li> <li>- Technical information</li> <li>- Qualifications of plant workers and management staffs</li> </ul>	<ul style="list-style-type: none"> <li>- Information centre</li> <li>- Use of media</li> <li>- Advertise using high profile people/celebrity</li> </ul>	<ul style="list-style-type: none"> <li>- Public advisory board</li> <li>- Public meetings with religious and community leaders</li> <li>- Public guided plant visits</li> <li>- Medical experts feedback</li> </ul>	<ul style="list-style-type: none"> <li>- Presentations</li> <li>- Posters</li> <li>- Road shows</li> </ul>	<ul style="list-style-type: none"> <li>- Gladness</li> <li>- Pride</li> <li>- Clarity</li> <li>- Self-esteem</li> <li>- Trust</li> <li>- Informed choices</li> <li>- Confidence</li> <li>- Calm, etc.</li> </ul>
<b>Post-implementation</b>	<ul style="list-style-type: none"> <li>- Mistrust</li> <li>- Unfairness – consultation</li> <li>- Doubt</li> <li>- Anger</li> <li>- Disgust</li> </ul>	<ul style="list-style-type: none"> <li>- Monitoring program/schedule</li> <li>- Water quality monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- Information centre</li> <li>- Use of media</li> </ul>	<ul style="list-style-type: none"> <li>- Guided plant visits</li> <li>- Information campaign</li> <li>- School visits</li> <li>- Roadshow</li> </ul>	<ul style="list-style-type: none"> <li>- Plant visit program</li> <li>- Posters &amp; leaflets</li> <li>- Banners</li> </ul>	<ul style="list-style-type: none"> <li>- Trust</li> <li>- Confidence</li> <li>- Gladness</li> <li>- Pride</li> </ul>

	<ul style="list-style-type: none"> <li>- Sadness</li> </ul>	<ul style="list-style-type: none"> <li>parameters and frequency/process</li> <li>- Water quality results (Blue Drop and Green Drop)</li> <li>- Safety measures</li> <li>- Risk management plan</li> </ul>	<ul style="list-style-type: none"> <li>- Use of municipal notice board and website</li> <li>- Report on periodic check up by health officials</li> <li>- Use of water bill</li> </ul>	<ul style="list-style-type: none"> <li>- Information sharing sessions</li> </ul>	<ul style="list-style-type: none"> <li>- Booklets</li> <li>- Themes for discussion</li> <li>- Use of medical experts to report on safety</li> </ul>	<ul style="list-style-type: none"> <li>- Self-esteem, etc.</li> </ul>
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If the proposed steps presented in table 5.2 above were taken, there is likelihood that public emotions of anger, sad, fear, unfairness, despair and disgust would be shifted to positive feelings of pride, self-esteem, encouragement, happiness and hope about reclaimed water.

Whilst addressing public perceptions goes a long way in securing positive results in terms of public acceptance, the political climate is also a factor that can impede implementation. Political support is essential for the successful implementation of the reuse scheme in South Africa. Although the study emphasises the critical role that politics plays in providing an enabling environment for the implementation of DPR, the complexities linked with politics is beyond the scope of this study. It is evident from the study that there are other aspects, such as availability of funds and technical capacity, that also influence the implementation of DPR. However, the proposed strategies presented in this chapter would go a long way in promoting acceptance – and the ensuing implementation of direct potable reuse in South Africa. Although there are other factors that influence DPR, public acceptance remains crucial.

## 5.5 Summary

It is evident that, despite public acknowledgement of the benefits and necessity of reclaimed water, they do not find the reasons of the choice of DPR adequately convincing and have showed preference for other options. Some perceptions have been more significant than others in impacting on the implementation of DPR. Fear and doubts in the safety, disgust from the source of reclaimed water, mistrust in municipality competences and inequities arising from inadequate public engagement together with racial concerns of inequality, have shown to impact negatively on the implementation of reclaimed water. The study has claimed that a knowledge deficit caused by at best inadequate engagement and at worst lack of any engagement, has been the driver of perceptions and negative emotional responses around DPR.

The EIA and other so-called engagement processes involving the public have been limited. Overall, the public needs to be much more engaged in reuse debates. In order to address these negative ‘intangible goods’ (emotions and perceptions), the study considers that concerted efforts need to be made to engage directly with the public so

as to mitigate for knowledge deficits, which are the main triggers for negative perceptions. Negative perceptions need to be addressed at the various stages beginning with the acceptance that there is water scarcity and a need for risk management, through to the Reconciliation and feasibility studies, the reuse decision, and the implementation and post-implementation stages. The kind of information to be disseminated to the public and the tools used for meaningful participation provide the foundation from which negative emotions and perceptions can be redressed so as to maximise the opportunity for implementing reclaimed water for domestic applications in South Africa.

The study proposes transparent processes where the public should know the purpose and outcome of each stage, the reasons for choosing reclaimed water, the safety measures in place and the monitoring and feedback on results. Information would be disseminated through the use of well targeted tools including, radio, newspapers, flyers, posters as well as venues where the public is given presentations or talks through poster information with the municipal officials and other experts. School programs or tours to the plant also provide opportunities for real knowledge transfers. Elders, community and religious leaders are also crucial in influencing public perceptions. Addressing public perceptions through the proposed strategies is likely to provide the desired opportunity for the public to make informed choices and in so doing, to boost positive emotions such as pride, self-esteem, happiness, which are core to human well-being and of central importance in the theoretical frame, the Capability Approach.

The next chapter – chapter 6 presents the concluding remarks of the study and provides recommendations to be taken up for further research.

## CHAPTER SIX

### 6 CONCLUSION

#### 6.1 Background to Study

The option of DPR as a water augmentation scheme has been preferred globally as a solution to water scarcity crisis. Global water scarcity has been attributed to a host of reasons including; population growth, economic growth, increasing discharge of effluents into the sea, urbanisation, and climate change impacts such as droughts, urban floods and reduced run-off, and this has led to increasing water demands (Cain, 2011; Morrison *et al.*, 2009, Piao *et al.*, 2010 & UNWWAP, 2015). Rapid population growth (Aravinthan, 2006 & Vigneswaran & Sundaravadivel, 2004) and recurrent droughts (de Ronde *et al.*, 1999 & Rouault & Richard, 2003) contribute to the reasons of increasing water demand in South Africa. The country's growing economic and social development is giving rise to increasing water demands and the sustainability of fresh water resources has reached a critical point (DWA, 2013).

The Department of Water Affairs set out a number of development projects to ensure sufficient water of good quality for the socio-economic needs of the country. Out of these proposals, water reuse has been chosen because of its feasibility and improved purification technology and decreasing treatment costs. Importantly, within the context of this study, recurrent droughts in South Africa have also led to the decision of recycling municipal wastewater for domestic applications (de Ronde *et al.*, 1999 & Rouault & Richard, 2003).

Public perceptions however impede the implementation of RW for domestic applications because people are repelled by the thought of water that has been in toilets going to taps (Lemonick, 2013). This is perceived to be the disgust or 'yuck' factor (Po *et al.*, 2003). As with any water project, the success or failure of a proposed reuse project depends on public perceptions of how the project relates to public health, public finance, taste and aesthetics, land use, environmental protection, and economic growth (National Academy of Sciences, 2012). Discussions in the literature have shown that few countries like Australia, Namibia and United States of America (in particular states

such as California, Texas, Kansas, Colorado and New Mexico) are already drinking recycled water, demonstrating that reclaimed water can be safe and clean, and that it helps ease water shortages (Asano & Bahri, 2008 & Crook, 2010). Apart from the disgust factor, the reasons for negative public perceptions are lack of knowledge of the benefits as well as lack of awareness of why the project has been chosen in the first place (Boucher *et al.*, 2011). The ‘decide announce defend’ (DAD) approach (Beck, 2009) tends to dominate, aggravating public mistrust of water institutions because decisions are taken without consultation despite public opposition to this way of doing things.

The role of public participation in natural resource management, development projects and processes is becoming more important as new policies are approved and adopted (Naidoo, 2008). It is evident that water management is the responsibility of different decision-makers in the public and private sectors (UNWWAP, 2015; Owen & Goldin, 2015 & Goldin, 2010). However, there is a challenge to convey a message that this is a shared concern and that the problem of water scarcity can be dealt with constructively by promoting a platform where various stakeholders can gather and participate collectively to make informed decisions (UNWWAP, 2015).

The quality and degree of public involvement in decision-making are determinants of acceptance of recycled water (Hartley, 2006). Importance has been placed on public participation to achieve optimal social outcomes in decision-making (Lockie & Rockloff, 2005). A number of development projects have failed due to lack of community support. Regarding the adoption of new technologies, implementers of recycled water projects thought that the community would interfere in the decisions of authorities and that involvement of the public would be counterproductive (Kraft & Clary, 1991).

Hartley (2003) cited in Po *et al.* (2003) established a framework consisting of five principles to assist water agencies in the USA to engage the public constructively on reuse issues. The main aim of the principles was to build and maintain public trust and confidence. These five principles are: 1) manage information for all, 2) maintain individual motivation and demonstrate organisational commitment, 3) promote communication and public dialogue, 4) ensure fair and sound decision-making and

decisions, and 5) build and maintain trust. The author emphasises that these principles should not be viewed as a standard checklist to establish public trust but that the application of these principles has to be context specific of a reuse decision using diagnostic questions and analytical techniques. The role of institutions in water reuse can vary significantly across and within countries. The formulation of any approach should be context specific as reasons for implementing reclaimed water for domestic applications vary from one site to another and from one community to another.

In most cases, the central government plays an important role in funding the project and in acting as the regulator. Other roles involving the technical aspects of water treatment and quality monitoring and the social aspect of public liaison are consigned to local government, municipalities and community organisations. Different institutions involved in reclaimed water reuse play different roles and these roles are defined according to their level of influence or mandate. In general, government departments, local governments or municipalities have different roles to play. It is evident from the available literature that central and local governments have played varied roles (ranging from feasibility studies pre-implementation, implementation, monitoring and public awareness) in ensuring that additional water resources are made available, whilst at the same time monitoring existing ones and ensuring that the quality of water produced meets the agreed standards.

In addressing public perceptions, a number of approaches have been suggested in the literature to foster trust between government and the public – amongst which are social marketing, community meetings, educational programs, schools programs and media programs. Through these approaches, institutions are better able to gain an understanding of community values and concerns and to establish relationships with key stakeholders, which are critical to the success of any reuse project. Approaches that are framed within notions of social justice are helpful in ensuring that relationships are meaningful and that the playing field is levelled. From within the Capability Approach framework, it is seen that human well-being is critical and this means providing opportunities where citizens can choose for themselves what works best and where they are part of decision-making processes that impact on their everyday living.

Sen's (2002) work differentiates between intrinsic and instrumental value arguing that there is an intrinsic value in having choice and freedom and that it is not simply 'good' because it is instrumental for achieving a better life but because it is the right thing to do to enhance democracy by providing opportunities for public reasoning. The empowerment of citizens through public reasoning and public debate is a recurring theme in the CA discourse. The CA is quite apart from other development approaches that hold that the right thing is for government (or others) to make people lead healthy lives, do activities (that governments decide on), take on technologies – and so on – and as long as they deliver the goods they do not need to consult the public. With this focus, the emphasis is on top-down decision-making and ideas of freedom, choice and agency are seriously compromised.

For Cleaver (2007), people act collectively to negotiate norms, challenge existing inequalities and to defend their rights. The generation of a notion of collective capabilities demonstrates how individuals can act together as agents of change, rather than each one of them pursuing their choices alone. Capability analysis therefore needs to account for the instrumental (and intrinsic) role that collective capabilities can play in promoting the individual's ability to achieve the life that she/he values. Sen asserts that no individual can think, choose, or act without being influenced by the nature and working of the society around them (Sen, 2002) and thus emphasises the importance of collective processes, such as public reasoning. The generation of collective capabilities needs to be through the *free and voluntary* participation of the members, rather than through force or coercion. Ibrahim (2011) also emphasises the importance of collective capabilities and uses the notion of self-help analysis to show how the poor can act together to develop and exercise new collective capabilities. The author underlines the intrinsic and instrumental value of social structures and explores the concepts of collective freedoms and collective agency and makes the links between social capital and the CA.

This study has argued and provided evidence that it is at the interface between the institutions (municipality as service providers) and the public that positive and negative perceptions are shaped and that there are ways in which these spaces can open up public dialogue where RW is no longer a threat but a solution to water scarcity. This study therefore proposes an approach that is likely to enable institutions to address negative

public perceptions by addressing inadequate public engagement, which hinders the implementation of reclaimed water in municipal contexts. As there is a lack of a documented approach on how to engage the public, this study fills a gap and proposes a way of engaging for those who consider the implementation of a DPR scheme.

In order to achieve the study objectives, the research team deployed a qualitative methods approach and used a number of participatory methods and tools to address the study objectives. Methods involved face-to-face interviews as well as focus group discussions. The tools included; semi-structured interview schedules, Emoticons, Mapping, Venn Diagrams, Story with a Gap and Resistance to Change Continuum. The CA forms the theoretical framework in which this study is lodged. In the context of this study, examining the way decisions around reclaimed water are taken through the lens of the CA in site specific case studies, helps to understand whether and in what ways decision-making around reclaimed water is offering new opportunities for learning and for making people feel good about themselves.

The flexibility of the CA, reflected in the use of a term proposed by Robeyns (2011) as ‘capabiltarianism’, opens up a space in which a wide range of aspects of human well-being can be considered and this study has focused on ‘emotions.’ Emotions have been used to reflect on concerns of social justice and the way in which emotions and social justice come together to guide and inform an approach to water augmentation. Emotions (fear, anger, hope etc.) are a function of social relations and processes and as Goldin’s (2003, 2010) work on shame has shown, some water users feel helpless – for instance in the face of extreme climatic events such as droughts and this might result in emotions such as fear, anger, hope, shame etc. These feelings in turn are determinants of human action and the way in which people act – or do not act – when it comes to environmental concerns and their relationship with the environment.

Goldin (2013, 2015) and Wutich and Ragsdale (2008) suggest that people are connected to water in an emotional way. Public acceptance of reuse is also linked into attitudes and emotions that people have around the topic of water. These attitudes and emotions play an important part in determining whether or not new technologies, such as direct potable reuse will or will not be accepted. Attitudes and emotions are embedded within social structures. Subjective beliefs, norms and values that are the product of interaction

between people who engage – and influence – one another are drivers for particular emotional responses.

## **6.2 Reasons for Choosing DPR and Impacts on Public Decisions**

Chapter four showed that there were various reasons, which led to the decision to opt for DPR in the three case study sites. The main driver for Beaufort West and Overstrand was drought due to climate change impact, causing depletion of water resources. The main reason for eThekweni was high population and economic growth and the need to reduce excessive discharge of wastewater effluents into the environment.

The public in Beaufort West and Overstrand are aware that the reason for the choice of DPR in their town is as a result of the visible signs presented by the drought situation. Data has shown that this knowledge did not warrant automatic and complete acceptance of the DPR choice as a water augmentation option – even in Beaufort West where the most effects of drought occurred and where DPR has been implemented. In eThekweni, the public claims there is no water scarcity and acceptance of reclaimed water has not been obvious either due to doubts arising from ‘invisible’ and unfounded reasons for DPR.

The Beaufort West municipality affirms that decisions regarding the choice of DPR were taken in an adhoc manner. In Overstrand, there are plans to engage with the public at the implementation stage. In eThekweni, public consultation is precarious because the decision to implement DPR has been interrupted. In all three case studies, there has been lack of public consultation at the inception of the DPR scheme where the municipality begin to consider DPR as a possible solution to water scarcity. The public have not had the opportunity to gain knowledge about DPR and why this might be a good solution to problems of water scarcity. Citizens are thus rejecting the choice that the municipality has made and when the public have not been consulted and informed right at the inception of the project, it becomes much more difficult for the municipality to get buy-in from their constituents for DPR at a later stage in the project cycle.

The evidence from the study leads to the conclusion that the lack of public consultation at the inception of the DPR scheme has raised doubts amongst the public regarding this

choice as a solution to water shortages. Despite visible signs of water scarcity, acceptance of reclaimed water becomes difficult, and even more difficult in cases where there are no visible signs of water scarcity.

Chapter four has shown how the municipality has attempted to introduce the idea of reclaimed water via different methods such as newsletters, newspapers, web articles, water bills and public meetings. In eThekweni, the public were involved via an EIA study where the feasibility of the DPR scheme was explored. In Overstrand, the municipality plans to engage the public more at the implementation stage, also via the EIA. In the case of Beaufort West, the emergency around the intensified drought forced adhoc decision-making around the implementation of the DPR scheme. There has been an over-reliance on print media to disseminate information and this is unhelpful as the topic is a very sensitive one where misrepresentation of the facts by the media for sensational purposes is problematic. The ‘facts’ have also been distorted or manipulated by politically motivated activists, despite the fact that there is a legitimate EIA and I&AP stakeholder engagement driven by municipalities.

In Overstrand, there were no public meetings regarding reclaimed water for domestic applications in particular, but rather this would be raised as part of a broader agenda around service delivery. This means that any opportunities to build on existing social capital and to build trust in municipal capacity is limited. As a result citizens felt that they had been treated unfairly and that because they were not consulted they had negative feelings about reclaimed water.

The way in which the municipalities have engaged the public around the topic of reclaimed water have been inadequate. The plans to engage the public via the normal EIA and I&APs stakeholder engagement are limited on the one hand due to media sensation and on the other hand due to the fact that large segments of the population do not have access to media reports in the first place. It is not enough to say – as is the case in Overstrand, that the public will be consulted at a later stage, because by this stage there are negative feelings that have been festering. This means that there is not adequate knowledge to inform the public and they therefore make their own judgement – often erroneously – around the topic and it is very difficult to counter these negative feelings at a later stage.

### **6.3 Public Perceptions and Impacts on DPR Implementation**

Public perceptions and impacts on the implementation of the DPR scheme are as follows:

#### ***a) Source of reclaimed water***

The source of reclaimed water causes the disgust emotion amongst the public because of the difficulty of delinking the water from urine and excreta. This leads to rejection or resistance towards the water. The area where the wastewater is coming from does not seem to matter as much to the public in the three case studies as the idea that this water originates from disgusting stimuli such as excreta.

#### ***b) Safety of reclaimed water***

Doubts, fear, worry and anger around the safety of reclaimed water are all feelings that have been churned up because of a lack of knowledge around the safety measures in place regarding DPR scheme. Once again, the lack of knowledge has been as a result of inadequate engagement with the public to acquire knowledge around the safety of this water, which in turn causes the public to resist or reject this water.

#### ***c) Specific Uses of Reclaimed Water***

The study confirms that people are opposed to the use of reclaimed water for drinking, cooking and bathing, whilst they are more likely to tolerate reclaimed water for car washing, toilet flushing and gardening. The closer reclaimed water is to human contact or ingestion, the more people are opposed to using the water.

#### ***d) Trust in Municipal Competencies***

The study also confirms that the public trusts in the municipality for general service delivery but they are distrustful when it comes to reclaimed water. There are fears and doubts about the safety of this water because of health concerns. In Beaufort West where reclaimed water has been implemented, it is evident that the public doubts the municipality because of the unfavourable smell and taste of the water on which they currently rely.

Empirical evidence gathered at all three sites confirms that inadequate engagement at the introduction of the DPR scheme is a strong driver for mistrust in the technical competence of the municipality around reclaimed water. Furthermore, where there is a lack of trust, feelings of despair emerge and persuading the public to accept reclaimed water becomes an arduous task.

*e) Choice*

The study reveals that despite the fact that the public (in particular in Overstrand and Beaufort West) are aware that there is a choice that involves the adoption of reclaimed water as a solution to water scarcity, they prefer other water augmentation options even though there would be much higher costs involved if other options were to be chosen.

The fact that water scarcity is ‘invisible’, in the case of eThekweni makes it more difficult for the public to accept reclaimed water. The idea of choice is linked to poverty because those who cannot afford other options such as bottled water have no choice but to use reclaimed water. Inadequate public consultation has caused the public to feel sidelined as they have been denied the opportunity to take part in decisions involving choosing or not choosing reclaimed water as an option.

*f) Equity*

Perceptions around racial inequities are rooted in the country due to its past apartheid regime. Even though municipal officials are aware of this heritage and the need to put measures in place to show that there are not racial skews in terms of reclaimed water distribution, the public is generally unaware of such measures. Equity is a concern for many and it has been seen to lead to resistance or rejection of the reclaimed water scheme.

Inadequate public engagement has exacerbated equity concerns and provoked feelings of unfairness, anger or/and shame. Fair public consultation has, on the other hand, had a positive influence on the acceptance of reclaimed water because it has resulted in knowledge deficits around reclaimed water concerns being diminished. The discussion has shown that in cases where there has been a lack of fair public consultation, there is public rejection of the DPR scheme because opportunities to gain knowledge and address concerns have been ignored.

### ***g) Cost Implications***

The South African case studies show that although the public perceived a lower tariff as a benefit, their particular concern is not about tariffs but rather about safety. Cost is not a major consideration and it is certainly not the driver for acceptance or rejection of the DPR scheme in South Africa.

### ***h) Benefits and Necessity***

Some members of the public had some knowledge of the benefits and necessities of reclaimed water. But for most, the benefits of reclaimed water were not always obvious and the public felt that they did not know enough about the process to be able to weigh up the benefits. The benefits and necessities of reclaimed water are clouded by fears about water quality or health risks associated with this option. Once again, it is a lack of knowledge about the benefits and about the necessity of this option that has driven resistance to and rejection of the scheme.

### ***i) Media***

The study has shown that media influences acceptance or rejection of reclaimed water and that it is unbalanced reporting that leads to rejection. A balanced media is likely to influence acceptance of the DPR scheme. Nonetheless, whatever role the media is to play regarding dissemination of information around the DPR scheme, their role should not replace consultation processes where the public's fears around the scheme would be addressed by meaningful engagement and where the public could gain confidence in reclaimed water as a viable option.

### ***j) Socio-demographic and Religion***

The study reveals that younger people are more willing to accept reclaimed water because they are more accepting to change than the older people. In terms of gender, the study reveals that women are more resistant to reclaimed water because they are more concerned with health and water quality issues than men. The study showed that the level of education was seen important in influencing acceptance or rejection of the reuse scheme. However, it was also evident that the public needed specific education around the issue of reclaimed water. The level of education attained does not link with acceptance or rejection of the DPR scheme.

Race also determines acceptance or/and rejection of reclaimed water. For instance, in Overstrand and Beaufort West, the perception is that the black population is more likely to resist and/or reject reclaimed water, than other racial groups because, from the legacy of apartheid, they are the historically disadvantaged group. On the other hand, in eThekweni, the perception is that the black population will readily accept reclaimed water because they are the poorer segment of the population and because they do not, as a result of their poverty, have a choice. Some racial groups can afford other options such as buying bottled water. Lack of choice due to poverty is experienced in Beaufort West and Overstrand as well. Racial inequities is one concern but it is clear that the topic of reclaimed water is a sensitive one and that there are negative perceptions amongst many segments of the population, irrespective of age, gender and race.

Those practicing Christianity are more likely to accept reclaimed water than those practicing Islam. The perception from a Christian perspective in all three case studies is that, what is consumed and goes into the human body does not have a spiritual effect on a person. According to the Muslim perspective, IPR is preferred over DPR. The view is that water that has not been channelled into a natural water body is not fit for spiritual ablution.

The overall observation is that inadequate public engagement or the lack of public involvement limits opportunities or capabilities for public respondents to acquire knowledge about reclaimed water as a solution to water scarcity. It is through networks where the public is able to engage both amongst themselves and with the municipalities that there is an opportunity to raise their concerns and to make informed choices about reclaimed water. By talking and sharing ideas in public fora, members of the public are likely to feel good about themselves and to experience a sense of pride in being part of a decision-making process and in being part of the solution to a serious problem of water scarcity. The alternative is all too often the escalation of negative feelings such as shame.

#### **6.4 A Proposition for Terms of Engagement that Result in Positive Perceptions around Reclaimed Water**

It is not enough that municipal officials understand the risks of water scarcity and their need to supply potable water for a growing demand, as there is in addition the critical need to take into consideration people's values, beliefs, norms and preferences through public consultation. This needs to happen before taking a decision on the choice of any water augmentation scheme – such as reclaimed water for domestic applications.

Engaging the public through mutual understanding and building of trust through constructive consultation is crucial in addressing public perceptions and this is a process that needs to be iterative and not just a 'once-off.' The study posits that the public should be involved at the very beginning of decision-making, setting the scene for active public engagement through the various stages; the acceptance of the urgency to address water scarcity and risk management through the Reconciliation study and into the final stages of the project. In this way the public would know why the reuse decision is envisaged as a water augmentation choice in the first place and they would be more likely to accommodate the idea rather than being 'shocked' about it.

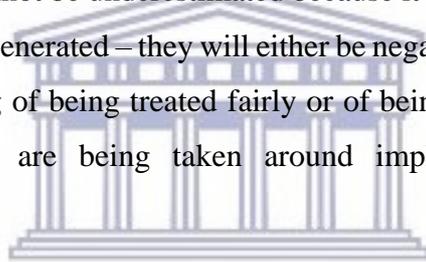
This study proposes moving beyond the usual 'modus operandi' of public engagement which has been via the EIA and other forms of engagement, into a more inclusive way of engaging, which provides a space to capture the voices of the affected persons when implementing a sensitive scheme such as DPR. The study however acknowledges the genuine efforts of the municipalities in raising awareness regarding water scarcity crises via media, posters etc. Despite these efforts there needs to be more opportunity for face-to-face meetings where a two-way communication can take place – from the municipal officials to the public and vice versa.

The empirical data has shown that municipalities pass through certain stages of decision-making around the management of water resources. There are six different decision-making stages around reuse, the first of which is the acknowledgement of water scarcity and the need to manage risks associated with this scarcity. Once this is acknowledged, the municipality carries out a Reconciliation study which is then

followed by a feasibility study. Once these studies have been completed, the next stages are the reuse decision, reuse implementation and finally post-implementation.

From the empirical data it is clear that different emotions emerge at different stages of decision-making. It would be helpful to address negative perceptions when and where they arrive at earlier stages of decision-making as perceptions about reuse are shaped very early on in the life cycle of a project.

The public needs to be informed about water scarcity and risk management before it becomes an emergency, and the radio, water bills and billboards are important media in doing so. Public meetings and school programs should be held for knowledge sharing about the situation. Posters are helpful here too. Communication has been lacking and as a result people feel the process has not been a fair one. Good communication between officials and the public cannot be underestimated because it makes all the difference in the way that emotions are generated – they will either be negative or positive and people will have a general feeling of being treated fairly or of being treated unfairly when it comes to decisions that are being taken around implementing DPR in their communities.



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Information about the Reconciliation study is available on the DWA website, but this does not suffice because not everyone has access to the Internet. For this reason there needs to be well organised education programs and/or public meetings where the public can learn about reuse as one of the water augmentation options earlier on before it is considered as the best option.

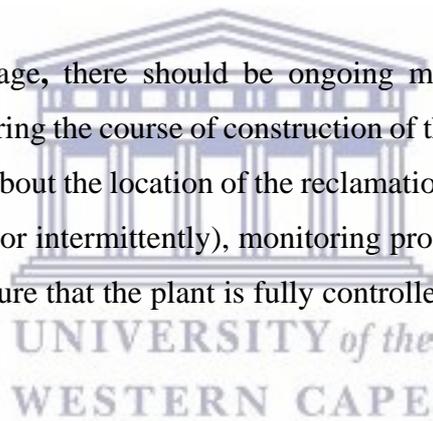
Detailed information of what has gone into a feasibility study is not required but some basic information must be shared with the public. Public meetings should be convened before and after the study has been conducted, to know the purposes, outcomes and impacts of the study.

The public is interested and should be informed about the safety of DPR technology and the implications on tariffs. During the feasibility stage, the typical emotion expressed is that of unfairness because most of the public do not know the purpose of this study and they also have doubts in the municipality who they feel might be hiding

something. By recognising this emotion, it is likely that feelings of fairness and a sense of belonging would be boosted as well as more confidence expressed in the municipality. A discussion forum including mainly public representatives such as community and religious leaders and the municipality should be created to discuss the decision-making process and choose the types of information that should be communicated to the public, the timing of these communications and how the communication will be structured.

The municipality should be completely transparent with the public about the basis or rationale for decision-making and the process used to arrive at such decisions. The reuse decision should be communicated to the public during public meetings where information can be disseminated to the public. The general public should be given the opportunity to express their views in response to the information provided to them.

At the implementation stage, there should be ongoing measures to address social concerns that may arise during the course of construction of the plant. The public at this stage should be informed about the location of the reclamation plant, how the plant will be operated (continuously or intermittently), monitoring programs and other measures that will be in place to ensure that the plant is fully controlled and risks are reduced to a minimum.



Disgust concerns, fears and doubts in the safety of the water and feelings of unfairness due to inadequate engagement is likely to be experienced at this stage if all the other stages have not been properly handled by the municipality. Public meetings should be used to convey information to the public where they are allowed to ask questions and raise concerns. Presentations, posters and use of other experts, such as water and medical experts, will add value in re-assuring the public about the operation of the plant and the safety of water that will be produced.

Religious leaders emerged as having a crucial role in educating their congregations regarding the safety and other issues regarding DPR. Targeting schools has also been recommended as this is crucial for the dissemination of information regarding DPR. Regarding equity issues, this should also be addressed at the implementation stage.

At the post-implementation phase, where the reclaimed water scheme is operational, the public at this stage expects to know more how the plant is monitored and what measures are in place to ensure that the quality of water is safe and that it meets quality standards. They also expect to know whether the monitoring program that was promised at the implementation phase is in fact being applied. It is also important for the results to be communicated in a manner that could be easily interpreted. The public should be engaged through various means including guided plant visits, information campaign, school visits, roadshow, and information sharing sessions.

Issues of mistrust have been expressed because of the perception that officials themselves do not drink this water. Issues around trust become increasingly crucial at this stage. Once again, engagement processes should be transparent to build continuous trust.

## **6.5 Conclusions about the Research Problem**

Addressing public perceptions is a principal challenge in the implementation of reclaimed water for potable applications in South Africa. The overall findings of this study suggest that public perceptions about reclaimed water emanate from a knowledge deficit and inadequate public engagement. Therefore, it is likely that with the implementation of the proposed approach that considers citizen voice, the public will feel good about themselves and that more positive feelings around reclaimed water for domestic applications will be promoted. Trust in municipalities would also be gained. Trust is a critical intangible good because it offers freedom to engage with people and to learn what works and does not work. Trust enhances collaboration and bearing in mind that collaboration is about working together, it would be hard for municipalities and the public to work together when trust is a scarce resource.

The Capability Approach applied in this study makes the links between public emotions and perceptions and the implementation of reclaimed water for domestic applications explicit. The application of a new approach in dealing with people's perceptions around reclaimed water might offer new answers because it will have as its central focus on people rather than technology or scientific 'facts' which tend to dominate the realm of water management discourse. It will also shine the torch on people's perceptions and

feelings – how they feel about reclaimed water for domestic applications. Emotions (fear, anger, hope etc.) are a function of social relations and processes and as Goldin's (2003, 2010) work on shame has shown, some water users feel helpless – and this might be how they feel in the face of extreme climatic events such as droughts, which might result in emotions such as fear, anger, hope, shame etc. These feelings determine action and the way in which people act – or do not act – when it comes to environmental concerns and their relationship with the environment, for instance climatic occurrences such as droughts and floods.

The results showed that the public has exercised collective capabilities in acting together and exercising collective freedoms and collective agency by suggesting what works for them, rather than the 'decide announce defend' way of 'doing things' by the institutions. It is evident from the study that people do not act in isolation but are embedded within social structures and networks such as community leaders, religious leaders, CBOs, NGOs etc, and that they are influenced by these structures, and in turn influence themselves. Attitudes and emotions are embedded within social structures and subjective beliefs, norms and values that are the product of interaction between people who engage – and influence – one another (Goldin, 2010 & Morales & Harris, 2014). Goldin (2015) claims that in order to better understand social behaviour within the context of development, it is helpful to study emotions and the way in which emotional states shape the development agenda.

There is therefore great value for institutions (municipalities) to build on existing public's social structures and 'intangible' goods such as trust, when introducing new technologies such as DPR. The proposed approach is likely to address public perceptions where the public is given the opportunity to be involved at all stages of the activities. The introduction of a new scheme such as DPR, presents in the ideal, an opportunity for the municipality to become more familiar with their constituents. Public perceptions might not change instantly once they have knowledge about the scheme but at least the public will feel that they have been given an opportunity to make an informed choice about reclaimed water. The emphasis is therefore on choice and opportunity as having intrinsic value – and not only instrumental value. In other words, as Robeyns (2003) claims, it is the right thing to do to give people the opportunity to choose when it comes to decisions that impact on their everyday lives.

In summation, water scarcity is a very real problem facing developed and developing countries. This study has focused on DPR as a solution to water scarcity and proposed a theoretical frame – the CA, which emphasises quality of life and social justice, and which has provided useful insights to the inquiry on public emotions and perceptions in reuse. The application of DPR as a solution needs to be carefully introduced so that the public does not feel such a choice is being imposed on them.

The study takes emotions as proxies for better understanding whether and in what ways the public have been engaged with and concludes that negative emotions point to inadequate engagement. Municipalities in all three case study sites have not engaged adequately with the public. According to Sen (2005, pp. 158), “...to be educated and be able to participate in public life”, forms part of the capabilities that are critical to human well-being. As DPR is a highly sensitive concern, it is more important than ever to ensure that the public is on board when an option such as DPR is considered and that they are given the knowledge that they need to make an informed decision regarding the introduction of DPR. As Sen (1999) notes, freedom is central to the idea of development and that the achievement of development is dependent on the free agency of people. The opportunity for people to engage in reuse decision-making, which improves their quality of lives is crucial and this opportunity can make all the difference from predominantly negative emotions – ranging from disgust to fear for instance – to more positive attributes such as pride, hope, dignity and trust.

## **6.6 Research Contributions**

The researcher makes three contributions; one offers theoretical implications, the other, practical implications and lastly research methods implications. On the theoretical side, the researcher advances the benefits of the Capability Approach, which considers ‘intangible’ assets such as emotions and which has not yet been applied within the context of wastewater reuse in general and for domestic applications in particular.

On the practical side, the researcher proposes an approach that is more likely to shift negative perceptions of reclaimed water into acceptance. This approach aims to improve the way in which municipalities engage with communities to advance the use of reclaimed water as a solution to water scarcity. The premise is that the proposed

approach will foster trust and a range of positive emotions such as pride, dignity, hope etc. because it brings people right into the centre of decision-making processes. In so doing, it pays attention to positive ‘intangible assets’ such as trust, self-esteem, confidence, hope and pride as well as the negative ‘intangible assets’ such as fear, disgust etc. In the long run, an approach that is able to take negative ‘intangibles’ such as fear and mistrust and convert them into positive ‘intangible’ assets such as hope and trust is likely to help change public perceptions on reuse for domestic applications and in so doing, to better promote DPR as a solution to water scarcity.

As far as the research methodology goes, this study uses a combination of different PAR methods to get an in-depth understanding of issues regarding the implementation of reclaimed water for domestic applications. It does not simply rely on focus group discussions which several studies, identified in Chapter two, have used. The Emoticon tool in particular, which has been used mainly in computer sciences and quantitative studies, has been helpful in understanding public emotions. This is a unique contribution that the study makes and the use of emoticons has added depth, texture and meaning to this study.

## **6.7 Recommendations for Further Research**

The researcher recommends two research topics:

- Firstly, political implications have emerged in this study as one of the factors that can hinder the implementation of the proposed terms of engagement in addressing public perceptions. Further research on the political implications of implementing DPR in South Africa is thus crucial.
- Secondly, further research within the context of a household survey to assess the extent of impact of the proposed terms of engagement would add value to the research focus.

## REFERENCES

Africa Water Facility (2006). Support to the development of an Integrated Water Resources Management (IWRM) Plan for Namibia.

Alam, U. (1997). The Indus Water Treaty: Peace amidst War. In *Comunicação apresentada no IX Congresso Mundial da Água-Water Resources Outlook for the 21st. Century: Conflicts and Opportunities, organizado pela Associação Internacional de Recursos Hídricos de* (Vol. 1).

Alan Plumer Associates (2011). History of water reuse in Texas. Texas Water Development Board.

Algozzine, B. & Hancock, D. R. (2006). Doing case study research: A practical guide for beginning researchers. *New York: Teachers College.*

Alhumoud, J.M. & Madzikanda, M. (2010). Public Perceptions On Water Reuse Options: The case of Sulaibiya wastewater treatment plant in Kuwait. *International Business & Economics Research Journal*, 9 (1) 141-158.

Anand, P. (2007). Capability, sustainability, and collective action: An examination of a river water dispute. *Journal of Human Development*, 8(1), 109-132.

Angelakis, A.N. & Bontoux, L. (2001). Wastewater reclamation and reuse in Eureau countries. *Water Policy*, 3, 47-59.

Angyal, A. (1941). Disgust and related aversions. *Journal of Abnormal and Social Psychology*, 36, 393-412.

Aravinthan V. (2006). Reclaimed wastewater as a resource for sustainable water management. Southern Queensland.

Ardeni, P. G. & Andracchio, A. (2001). Women and Poverty in Mozambique: Is there a Gender Bias in Capabilities, Employment Conditions and Living Standards. In

Comim, F., Qizilbash, M., & Alkire, S. (Eds.). (2008). *The capability approach: Concepts, measures and applications*, 510-560.

Arnold, R., Sáez, A., Snyder, S., Maeng, S., Lee, C., Woods, G., Li, X. & Choi, H. (2012). Direct potable reuse of reclaimed wastewater: It is time for a rational discussion. *Reviews on Environmental Health*, 27(4) 197-206.

Asano, T. (2002). Water from (waste) water—the dependable water resource (The 2001 Stockholm Water Prize Laureate Lecture). *Water Science and Technology*, 45(8), 23-33.

Asano, T. & Bahri, A. (2010). Global challenges to wastewater reclamation and reuse. In selections from the 2010 World Water Week in Stockholm. Lundqvist, J. (ed). 64-72.

Atique, A. (2014). Assessing Capabilities Approach as an evaluative framework for climate justice. LLM Environmental Regulation and Sustainable Development Newcastle Law School.

Australian Research Centre for Water in Society (ARCWIS) (2002). Perth Domestic Water- Use Study Household Appliance Ownership and Community Attitudinal Analysis 1999- 2000. Sydney: CSIRO Urban Water Program.

AWR (2013). Drinking water through recycling: The benefits and costs of supplying direct to the distribution system. Report of a study by the Australian academy of technological sciences and engineering (ATSE), Melbourne Victoria 3004 Australia.

Babbie, E. & Mouton, J. (2001). *The practice of social research*. Cape Town: Oxford University Press Southern Africa.

Baggett, S., Jeffrey, P., & Jefferson, B. (2004). Participatory water reuse planning: a conceptual model based on social learning and personal constructs. In *Workshop on Participative Planning for Water Reuse Projects at IWA 4th World Water Congress*, 19-24.

Bahri, A. (2009). Managing the other side of the water cycle: Making wastewater an asset. GWP TEC Background Paper No 13, January, 66.

Bahri, A. (2012). Integrated urban water management. GWP TEC Background Paper No 16, May, 89.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, 13(4), 544-559.

Beaufort West Municipality (2013). Integrated Development Plan Annual Review 2012/2013.

Beck, S. (2009). Between disgust and trust: State of social science research on the implementation and acceptance of water and wastewater reclamation and re-use (WWT&R).

Bless, C. & Higson-Smith, C. (1994). *Fundamentals of Social Research Methods: An African Perspective*. Cape Town: Juta Press.

Boucher M., Jackson T., Mendoza I. & Snyda K. (2011). Public perception of Windhoek's drinking water and its sustainable future: A detailed analysis of the public perception of water reclamation in Windhoek, Namibia; Department of Infrastructure, Water and Waste Management. The City of Windhoek, Namibia.

Bourblanc, M. (2010). Social participation in water governance and management: critical and global perspectives.

Brannen, J. (1992). Combining qualitative and quantitative approaches: an overview. *Mixing methods: Qualitative and quantitative research*, 3-37.

Bruvold, W., Olson, B. & Rigby, M. (1981). Public Policy for the Use of Reclaimed Water. *Environmental Management*, 5(2), 95-107.

Bruvold, W. (1972). Public attitudes towards reuse of reclaimed water. Contribution 137, Water Resource Centre, University of California: Berkeley CA. 1-54.

Bruvold, W. (1998). Public opinion on water reuse options. *J. Water Pollution Control Federation*, 60(1) (1998) 45–50.

Bruvold, W.H., (1988). Public opinion on water reuse options. *Journal WPCF* 60(1), 45–49.

Bungu, L. (2014). Assessing the perceptions of consumers on wastewater reuse in the Vaal Triangle. MBA, North-West University, South Africa.

Buurma, H. (2001). Public policy marketing: marketing exchange in the public sector. *European Journal of Marketing*, 35(11/12), 1287-1300.

Cain, R. (2011). Analysis of direct potable water reuse acceptance in the United States: Obstacles and opportunities. Johns Hopkins Bloomberg School of Public Health.

California Urban Water Agencies, National Water Research Institute & WaterReuse California (2010). Direct potable reuse workshop report. Workshop held in 26-27 April, Sacramento, California.

Cavestro, L. (2003). PRA-Participatory Rural Appraisal Concepts Methodologies and Techniques. *Padova, Universita'degli Studi di Padova*, 38.

Central Areas JV Consultants (2004). Feasibility study on water augmentation to the central area of Namibia. Volumes 1, 6 and 7. Windhoek artificial recharge scheme: Concept design, financial and economic evaluation.

CGIAR (Consultative Group on International Agricultural Research) (2006). Insights from the Comprehensive assessment of Water Management in Agriculture. Stockholm World Water Week.

Chambers, R. (2008). *PRA, PLA and pluralism: practice and theory* in Reason, P. & Bradbury, H. *The SAGE Handbook of Action Research: Participative inquiry and practice*. London: 2<sup>nd</sup> Edition, Sage.

Chen, W., Bai, Y., Zhang, W., Lyu, S. & Jiao, W. (2015). Perceptions of different stakeholders on reclaimed Water reuse: The Case of Beijing, China. *Sustainability*, 7 9696-9710.

Christen, K. (2005). Water Reuse: Getting Past the 'Yuck Factor'. *Water Environment and Technology*, 17, 11-15.

City of Windhoek (2005). Advertisement by the Windhoek Goreangab Operating Company (Pty) Ltd. City of Windhoek Diary.

Clark, D. (2005). The capability approach: Its development, critiques and recent advances. Global Poverty Research Group.

Cleaver, F. (2007). Understanding agency in collective action. *Journal of human development*, 8(2), 223-244.

Comim, F., Qizilbash, M., & Alkire, S. (Eds.). (2008). *The capability approach: Concepts, measures and applications*. Cambridge: Cambridge university press.

Corcoran, E., Nellemann, C., Baker, E., Bos, R., Osborn, D. & Savelli, H. (Eds) (2010). Sick Water? The central role of wastewater management in sustainable development. A Rapid Response Assessment. United Nations Environment Programme, UN-HABITAT, GRID-Arendal.

Cornwall, A. & Pratt, G. (Eds.) (2003). *Pathways to participation: Reflections on PRA*. Intermediate Technology.

Costello, A., Abbas, M., Allen, A., Ball, S., Bell, S., Bellamy, R., & Lee, M. (2009). Managing the health effects of climate change. *The Lancet*, 373(9676), 1693-1733.

Creswell, J. W. & Clark, V. L. P. (2007). Designing and conducting mixed methods research.

Crook, J. (1985). Water reuse in California. *Journal of the American Water Works Association*, 77(7) 60-71.

Crook, J. (2010). Regulatory aspects of direct potable reuse in California. An NWRI (National Water Research Institute) White Paper.

D'Angelo Report. (1998). See Using Reclaimed Water to Augment Potable Water Resources. Public Information Outreach Programs (Special Publication, Salvatore D'Angelo, Chairperson). Publishers: Water Environment Federation & American Waterworks Association.

De Herdt, T. (2001). Social policy and the ability to appear in public without shame: Some lessons from a food relief programme in Kinshasa. In Comim, F., Qizilbash, M., & Alkire, S. (Eds.). (2008). *The Capability Approach: Concepts, Measures and Applications*, 458-488.

de Ronde, A., van der Mescht, A., Laurie, N., Spreeth, H. & Cress, A. (1999). Molecular and Physiological Approach to Drought and Heat Tolerance for Selected Crops. WRC Report No. 479/199.

De Vos, A.S. (1998). *Conceptualisation and operationalisation*. In De Vos, A.S. (ed). Research at grass roots. A primer for the caring professions. Pretoria: Van Schaik Publishers.

Dent, M. (2012). Catchment management agencies as crucibles in which to develop responsible leaders in South Africa. *Water SA*, 38(2) 313-326.

Denzin, N. (1989). *The Research Act: A Theoretical Introduction to Sociological Research Methods* (3rd edition, first published on 1970), Prentice Hall.

Denzin, N. & Lincoln, Y. (1998). *Collecting and interpreting qualitative materials*, London, UK: Sage Publications.

Devi, M. & Samad, M. (2008). Wastewater treatment and reuse: an institutional analysis for Hyderabad, India. In *Conference Paper, IWMI, Colombo, Sri Lanka*.

Dishman, M., Sherrard, J. & Rebhum, M. (1989). Gaining Support for Direct Potable Water Reuse. *Journal of Professional Issues in Engineering*, 115(2), 154-161.

Dolnicar, S. & Saunders, C. (2006). Recycled Water for Consumer Markets: A Marketing Research Review and Agenda. *Desalination*, Vol. 187, 203–214.

Dolnicar, S. & Schäfer, A. (2006). Public perception of desalinated versus recycled water in Australia. Proceedings of the AWWA Desalination Symposium, May 7-9, Honolulu, Hawaii.

Dolnicar, S. & Schäfer, A. (2009). Desalinated versus recycled water: public perceptions and profiles of the accepters. *Environmental Management*, 90(2) 888-900.

Dolnicar, S., Hurlimann, A. & Grun, B. (2011). What affects public acceptance of recycled and desalinated water? *Water Research*, 45(2) 933–943.

Drever, E. (1995). Using semi-structured interviews in small-scale research. A teacher's guide. Scottish Council for Research in Education, Edinburgh.

Du Pisani, P. (2005). Direct Reclamation of Potable Water at Windhoek's Goreangab Reclamation Plant. In S. J. Khan, M. H. Muston, and A. I. Schaefer, (eds.), Proceedings from Integrated Concepts in Water Recycling. Wollongong: Wollongong University, 193-202.



DWA (2013). National Water Resource Strategy II (NWRSSII). Water for an Equitable and Sustainable Future. 2nd Edition. Pretoria, South Africa.

DWA (2010). Blue Drop Report 2010 – South African Drinking Water Quality Management Performance.

EIB (European Investment Bank) (2009). Identification and Removal of Bottlenecks for extended Use of Wastewater for Irrigation or for other Purposes. RG/2008-01/FTF

EPA (Environmental Protection Agency) (2012). Guidelines for water reuse. Washington D.C.

eThekweni Municipality (2011a). Analysis of Global Insight database. Unpublished research note.

eThekwini Municipality (2011b). Water Service Development Plan, July 2011, eThekwini Water and Sanitation Unit, Durban.

Falkenmark, M., Gottschalk, L., Lundqvist, J. & Wouters, P. (2004). Towards Integrated Catchment Management: Increasing the Dialogue between Scientists, Policy-makers and Stakeholders. *Water Resources Development*, 20(3), 297-309.

FAO (2011). The state of the world's land and water resources for food and agriculture (SOLAW) – managing systems at risk. Rome and Earthscan, London.

Fielding, N. & Fielding, J. (1986). Linking data. Qualitative research methods. Vol. 4. Beverly Hills, CA. Sage University paper series.

Flick, U. (1992). Triangulation revisited: strategy of validation or alternative?. *Journal for the theory of social behaviour*, 22(2), 175-197.

Foley, J. *et al.* (2007). Amazonia revealed forest degradation and loss of ecosystem goods and services in the Amazon Basin. *Front. Ecol. Environ.* 5, 25–32.

Gagliardo, P. (2003). Use of Reclaimed Water for Industrial Applications. Paper presented at the Ozwater 2003 Convention and Exhibition, Perth, Australia.

George, J. & Jones, G. (2005). Chapter 4: Perception, Attribution, and the management of diversity. Prentice Hall.

Golder Associates (2012). eThekwini Water reuse, Basic Assessment Report.

Goldin J. (2003). Washing away the sins of the past: Transformation in the water sector. *International Journal of Public Administration*, 26 (6) 711–731.

Goldin, J. (2010). Water policy in South Africa: Trust and knowledge as obstacles to reform. *Review of Radical Political Economics*, 42(2) 195 – 212.

Goldin, J. (2015). Hope as a critical resource for small scale farmers in Mpumalanga. *Human Geography, a new Radical Journal*, 8 (3) 24 – 36.

Goldin, J. (2005). Prepacked trust in the water sector in Askvik, S. & Bak, N. (eds.) *Trust and public administration in South Africa*. Ashgate, UK.

Goldin, J. (2013). From Vagueness to Precision: Raising the Volume on Social Issues in the Water Sector. *Water Policy*, 15, 309-324.

Goldin, J., Botha, C., Anderson, K., Owen, G. & Koatla, T. (2016). Towards a gender sensitive vulnerability assessment for climate change: Lambani, Limpopo Province, South Africa. *Forthcoming in International Feminist Journal of Politics*.

Goldin, J., Fatch, J., Owen, G. & Ncube, G. (2013). Towards an institutional adequacy index using the multi-dimensional poverty approach. WRC K5/1971 Final Report.

Goldin, J., Rutherford, R., & Schoch, D. (2008). The place where the sun rises: an application of IWRM at the village level. *International Journal of Water Resources Development*, 24(3), 345-356.

Hamilton, G. & Greenfield, P. (1991). Potable reuse of treated wastewater. In *Australian Water and Wastewater Association, 14th Federal Convention Proceedings* 1, 497-506.

Hartley, W. (2001). Public Perception and Participation in Water Reuse: Literature Summary. Washington DC: Resolve Inc.

Hartley, W. (2003). Water Reuse: Understanding public perception and participation. Virginia: Water Environment Research Foundation.

Hartley, W. (2006). Public perception and participation in water reuse. *Desalination* 187 115–126.

Hay, E., Riemann, K, van Zyl, G. & Thompson, I. (2011). Ensuring water supply for all towns and villages in the Eastern Cape and Western Cape Provinces of South Africa. *Water SA* 38(3).

Heys, P. (2005.) Water institutional reforms in Namibia. *Water Policy*. 7(1) 89-106

Hurlimann, A. & McKay, J. (2003). Community Attitudes to an Innovative Dual Water Supply System at Mawson Lakes South Australia, in Oz Water Conference 2003. Perth, Western Australia.

Hurlimann, A. & McKay, J. (2007). Urban Australians Using Recycled Water for Domestic Non-Potable Use—An Evaluation of the Attributes Price, Saltiness, Colour and Odour Using Conjoint Analysis, *Journal of Environmental Management*, 83, 93–104.

Hurlimann, A. & McKay, J. (2002). Community attitudes to an innovative dual watersupply system at Mawson Lakes South Australia. Paper presented at the Enviro 2002 Convention and Exhibition, Melbourne, Australia.

Hurlimann, A. & McKay, J. (2004). Attitudes to reclaimed water for domestic use: Part 2. Trust Water. *Journal of the Australian Water Association*, 31(5), 40-45.

Hurlimann, A. (2009). Water Supply in Regional Victoria Australia: A Review of the Water Cartage Industry and Willingness to Pay for Recycled Water. *Resources, Conservation and Recycling*, 53, 262–268.

Ibrahim, S. (2011). From individual to collective capabilities: The Capability Approach as a conceptual framework for self-help. *Human Development*, 7(3) 397-416.

Ilemobade, A., Olanrewaju, O. & Griffioen, M. (2011). Greywater reuse for toilet flushing in high-density urban buildings in South Africa: A pilot study. WRC report no. 1821/1/11. A report to Water Research Commission, Pretoria, South Africa.

IPCC (Intergovernmental Panel on Climate Change) (2007). *Climate change – impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the IPCC*. Parry, M.L., Canziani, O.F., Palutikof J.P., van der Linden P.J. & Hanson, C.E. (Eds). UK: Cambridge University Press.

IPCC (Intergovernmental Panel on Climate Change) (2008). *Climate Change and Water*. Bates, B.C., Kundzewicz, Z.W., Wu, S. & Palutikof, J.P. (Eds). Technical Paper of the IPCC Secretariat, Geneva, 210.

Ivarsson, O. & Olander, A. (2011). Risk Assessment for South Africa's first direct wastewater reclamation system for drinking water production. MSc. Thesis, Chalmers University of Technology Gothenburg, Sweden.

Jeffery, P. (2001). Understanding public receptivity issues regarding "in-house" water recycling. Results from a UK survey, unpublished manuscript, Cranfield University, UK, 2001.

Jeffrey, P. (2002). Public Attitudes to In-House Water Recycling in England and Wales. *Water and Environment Journal*, 16(3), 214-217.

Jeffrey, P. & Jefferson, B. (2002). Public receptivity regarding 'in-house' water recycling: Results from a UK survey. Paper presented at the Enviro 2002 Convention and Exhibition, Melbourne, Australia.

Jhansi, S. & Mishra, S. (2013). Wastewater treatment and reuse: Sustainability options. *Journal of Sustainable Development*, 10, 1-15.

Jimenez, B. & Asano, T. (Eds.) (2008). *Water reuse: An international survey of current practice, issues, and needs*. Scientific and Technical Report No. 20. London, UK: International Water Association Publishing.

Johnson, B. & Christensen, L. (2008). *Educational research: Quantitative, qualitative, and mixed approaches*. Thousand Oaks, CA: Sage Publications.

Kaercher, J. D., Po, M. & Nancarrow, B. E. (2003). Water Recycling Community Discussion Meeting I (Unpublished Manuscript). Perth: Australian Research Centre for Water in Society (ARCWIS).

Kamizoulis G., Bahri A., Brissaud F. & Angelakis A. (2005). Wastewater recycling and use practices in the Mediterranean region: Recommended Guidelines. *Water International*, 841-854.

Kasperson, E. *et al.* (1974). Community adoption of water reuse system in the United States. Office of Water Resources Research, U.S. Department of the Interior, Washington D.C.

Kemp, B., Randle, M. J., Hurlimann, A. & Dolnicar, S. (2012). Community acceptance of recycled water: Can we inoculate the public against scare campaigns? *Journal of Public Affairs*, 12 (4), 337-346.

Keremane, G. (2011). Public private partnerships in urban wastewater management: The Adelaide experience and lessons for developing countries. *Economic Journal of Development Issues*, 13 & 14(1-2), 34-50.

Khan, S. (2013). Drinking water through recycling: The benefits and costs of supplying direct to the distribution system. A report of a study by the Australian Academy of Technological Sciences and Engineering (ATSE). ATSE, Melbourne Victoria.

Kidd M. (2008). *Environmental Law*. 2<sup>nd</sup> ed. Cape Town: Juta. 33.

Kidd M. (2011). *Environmental Law*. 2<sup>nd</sup> ed. Cape Town. Juta. 332p.

Kochhar, K., Pattillo, C. & Sun, Y. (2015). Is the glass half empty or half full?: Issues in managing water challenges and policy instruments. *Finance & Development*, 52(2), 18-21.

Kotler, P. & Zaltman, G. (1971). Social Marketing: An Approach to Planned Social Change. *Journal of Marketing*, 35, 3-12.

Kraft, M. & Clary, B. (1991). Citizen Participation and the NIMBY Syndrome: Public response to radioactive waste disposal. *The Western Political Quarterly*, 44(2), 299-328.

Krishna, A. (2002). *Active social capital: Tracing the roots of development and democracy*. Columbia University Press.

Krohn, F. (2004). A generational approach to using emoticons as non-verbal communication. *Journal of Technical writing and Communication*, 43, 321-328.

Kumar, R. (1999). *Research Methodology: A Step-by-Step Guide for Beginners*. Sage, London.

Lahnsteiner, J. & Lempert, G. (2007). Water management in Windhoek, Namibia. *Water Science & Technology*, 55(1-2), 441-448.

Lazarova, V., Asano, T., Bahri, A. & Anderson, J. (2013). *Milestones in water reuse: The best success stories*. London, United Kingdom: IWA publishing.

Lee, H. (2011). Speaking on leadership renewal—the fourth generation and beyond. *In Kent Ridge Ministerial Forum. National University of Singapore, Singapore*.

Lemonick, S. (2013). *Drinking toilet water: The science (and psychology) of wastewater recycling*. American geo-science Institute. Washington, DC.

Leverenz, H. L., Tchobanoglous, G. & Asano, T. (2011). Direct potable reuse: A future imperative. *Journal of Water Reuse and Desalination*, 1(1), 2-10.

Lind, E. A. & Tyler, T. R. (1988). *The social psychology of procedural justice*. New York: Springer Science & Business Media.

Lockie, S. & Rockloff, S. (2005). Decision frameworks: Assessment of the social aspects of decision frameworks and development of a conceptual model. Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management, Brisbane.

Luhmann, N. (1979). *Trust and Power*. New York: John Wiley.

Lundqvist, J. & Gleick, P. (1997). *Comprehensive assessment of the freshwater resources of the world: Sustaining our waters into the 21st century*, Stockholm: Stockholm Environment Institute.

Marks, J. S. (2003). *The experience of urban water recycling and the development of trust* (Doctoral dissertation, The Flinders University of South Australia).

Marks, J., Cromar, N., Howard, F., Oemcke, D., & Zadoroznyj, M. (2002). Community experience and perceptions of water reuse. Paper presented at the Enviro 2002 Convention and Exhibition, Melbourne, Australia.

Marsalek, J., Schaefer, K., Exall, K., Brannen, L. & Aidun, B. (2002). Water Reuse and Recycling. Canadian Council of Ministers of the Environment, Winnipeg, Manitoba. CCME Linking Water Science to Policy Workshop Series. Report No. 3, 39.

Martin, K., Hart, R., MacLeod, S. & Kinder, K. (2010). *Positivity in Practice: Approaches to Improving Perceptions of Young People and their Involvement in Crime and Anti-social Behaviour*. Slough: NFER.

Mayers, J. (2005). Stakeholder power analysis. Power tool series. International Institute for Environment and Development. London, United Kingdom.

McKay, J. & Hurlimann, A. (2003). Attitudes to reclaimed water for domestic use: Part 1, Age. *Journal of the Australian Water Association*, 30(5), 45-49.

McKay, J. (2005). Water institutional reforms in Australia. *Water Policy*, 7, 35-52.

McKenzie-Mohr, D. (2000). Fostering Sustainable Behaviour through Community-Based Social Marketing. *American Psychologist*, 55(5), 531-537.

Mehrotra, S. (2008). Democracy, decentralization and access to basic services: An elaboration on Sen's capability approach. In Comim, F., Qizilbash, M., & Alkire, S. (Eds.). (2008). *The Capability Approach: Concepts, Measures and Applications*, 385-420.

Melbourne Water (1998). Exploring Community Attitudes to Water Conservation and Effluent Reuse. A consultancy report prepared by Open Mind Group. St Kilda, Victoria.

Menge, C. (2010). Treatment of wastewater for re-use in the drinking water system of Windhoek.

Morales, M. & Harris, L. (2014). Using subjectivity and emotions to reconsider participatory resource management. *World Development*, 64 703-712.

Morrison, J., Morikwa, M., Murphy, M. & Schulte, P. (2009). Water scarcity and climate change: Growing risk for businesses and investors. Pacific Ocean.

Mounton, J. (2001). *How to succeed in your master's and doctoral studies: a South African guide and resource book*. Pretoria, Van Schaik.

Muanda, C., Owen, G. & Lagardien, A. (2014). Enabling factors contributing to the use of reclaimed water – understanding of specific institutional factors, capacities and strategies for treatment and use of reclaimed water for potable applications. Report 2, WRC K5/2208.

Naidoo, M. (2008). A situational Analysis of public integrated water resources management in the Kat River Valley, Eastern Cape, South Africa. [MSC thesis]. South Africa. Rhodes University.

NamWater (1998). Guidelines for the evaluation of drinking water for human consumption with regard to chemical, physical and bacteriological quality. Namibia Water Corporation Ltd., Namibia.

Nancarrow, E., Kaercher, J. D., & Po, M. (2002). Community attitudes to water restrictions policies and alternative water: A longitudinal analysis 1988-2002. Perth: CSIRO Land and Water.

Nancarrow, E., Leviston, Z., Po, M., Porter, N. & Tucker, D. (2008). What drives communities' decisions and behaviours in the reuse of wastewater. *Water Science and Technology*, 57(4), 485–491.

Nancarrow, E., Porter, B. & Leviston, Z. (2010). Predicting community acceptability of alternative urban water supply systems: A decision making model, *Urban Water Journal*, 7(3), 197 –210.

National Academy of Sciences (2012). Water reuse: Potential for expanding the nation's water supply through reuse of municipal wastewater. Washington, D.C.: The National Academies Press.

Nightingale, A. (2013). Fishing for nature: The politics of subjectivity and emotion in Scottish inshore fisheries management. *Environment and Planning A* 45(10), 2362-2378.

Noga, J. & Wolbring, G. (2013). Perceptions of water ownership, water management, and the responsibility of providing clean water. *Water*, 5(4), 1865-1889.

Nussbaum, M. (2011) *Creating Capabilities: the Human Development Approach*. Cambridge, MA: Harvard University Press.

OECD (2003). Public-private partnerships in the urban water sector. *OECD Policy Brief*, April.

OECD (2009). Alternative Ways of Providing Water: Emerging options and their policy implications. Advance copy for 5<sup>th</sup> Water World Forum. OECD Publishing, Paris.

OECD (2011). *Water Governance in OECD countries: A multi-level approach*. OECD studies on water. Paris: OECD Publishing.

Okun, D. (1985). *Reuse: Panacea or pie in the sky?* *American Water Works Association*, 77(7) 26-26.

Olson, B. *et al.* (1979). Educational and Social Factors Affecting Public Acceptance of Reclaimed Water, in Water Reuse Symposium. Denver, Colorado.

Overstrand Municipality (2012). Integrated development plan.

Overstrand Municipality. Integrated Development Plan (IDP) Review for 2013/14.

Owen, G. & Goldin, J. (2015). Assessing the relationship between youth capabilities and food security: A case study of a rainwater harvesting project in South Africa. *Water SA* 41(4) 541-548.

Patton, M. (2002). *Qualitative Research and evaluation methods*. 3<sup>rd</sup> edition. Thousand Oaks: Sage.

Piao, S., Ciais, P., Huang, Y., Shen, Z., Peng, S., Li, J., Zhou, L., Liu, H., Ma, Y., Ding, Y., Friedlingstein, P., Liu, C., Tan, K., Yu, Y., Zhang, T. & Fang, J. (2010). The impacts of climate change on water resources and agriculture in China. *Nature*, 467(7311), 43-51.

Pithey, S. (2007). Water and Sanitation in the City of Cape Town—Integrated Analysis Baseline Report. *Report compiled for the UNDP. Stellenbosch: Sustainability Institute.*

Po, M., & Nancarrow, B. E. (2004). Consumer perceptions of the use of reclaimed water for horticultural irrigation. A Literature Review for Land and Water Australia.

Po, M., Kaercher, D. & Nancarrow, E. (2004). Literature review of factors influencing public perceptions of water reuse. CSIRO Land and Water, Australian Water Conservation and Reuse Research Program.

Po, M., Kaercher, D. & Nancarrow, E. (2003). Literature review of factors influencing public perceptions of water reuse. CSIRO Land and Water. Technical Report 54/03.

Po, M., Nancarrow, E., Leviston, Z., Poter, N., Syme, J. & Kaercher, D. (2005). Predicting community behaviour in relation to wastewater reuse: What drives decisions

to accept or reject? Water for a Healthy Country National Research Flagship CSIRO Land and Water, Perth, WA.

Porter, N., Nancarrow, E., Syme, J. & Po, M. (2002). Drinking water aesthetics: An evaluation of the introduction of improved scheme waters. Neerabup Groundwater Treatment Plant. A Confidential Final Report to the Water Corporation, WA. *CSIRO Land and Water Consultancy Report*, June.

Porter, N., Nancarrow, E., Syme, J. & Kelly, L. (2000). Drinking water aesthetics: A policy direction based on community preferences and willingness to pay. A Confidential Final Report to the Water Corporation, WA. *CSIRO Land and Water Consultancy Report*.

Priscoli, D. (1992). Collaboration, participation and alternative dispute resolution: process concepts for the World Bank's role in water resources. Draft.

Rebhun, M. (1985). Wastewater reuse systems. Prepared for workshop in Management of Water Resources, Varese, Italy.

Recycled Water Task Force (2003). White paper of the public information, education and outreach workgroup on better public involvement in the recycled water decision process. California Department of Water resources.

Reed, M., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J. & Stringer, L. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of environmental management*, 90(5), 1993-1949.

Roberts, D. (2008). Thinking globally, acting locally—institutionalizing climate change at the local government level in Durban, South Africa. *Environment and Urbanization*, 20(2), 521-537.

Robeyns, I. (2003, September). The capability approach: an interdisciplinary introduction. In *Training course preceding the Third International Conference on the Capability Approach, Pavia, Italy*.

Robeyns, I. (2011). Presentation at the Human Development and Capability Association conference: Innovation development and human capabilities. September 6-8. The Hague, Netherlands.

Rodriguez, C. Buynder, P., Lugg, R., Blair, P., Devine, B., Cook, A. & Weinstein, P. (2009). Indirect potable reuse: A sustainable water supply alternative. *International Journal of Environmental Research and Public Health*, 6(3), 1174-1209.

Rouault, M. & Richard, Y. (2003). Intensity and spatial extension of drought in South Africa at different time scales. *Water SA*, 29(4) 489-500.

Rozin, P. & Fallon, A. E. (1987). A perspective on disgust. *Psychological Reports*, 94(1), 23-41.

Russell, S. & Hampton, G. (2005). Challenges in understanding public responses and providing effective public consultation on water reuse. In S. Khan, M. H. Muston & A. Schafer (eds), *Proceedings of the International Conference: Integrated Concepts in Water Recycling (ICWR 2005)*, University of Wollongong, Australia, 587-600.

Schroeder, E., Tchobanoglous, G., Leverenz, H. & Asano, T. (2012). Direct Potable Reuse: Benefits for public water supplies, agriculture, the environment and energy conservation. An NWRI White Paper.

Sen A. (1993). Capability and well-being. In Nussbaum M. and Sen A. (eds) *The Quality of Life*. Clarendon Press, Oxford 30-53.

Sen A. (1999). *Development as Freedom*. Oxford University Press, Oxford.

Sen, A. (1987). *The standard of living*. The Tanner lectures. Cambridge: Cambridge University Press.

Sen, A. (1990). Development as capability expansion. In Keith Griffin and John Knight (Eds). *Human Development and the International Development Strategy for the 1990s*. Macmillan, London. 41-58.

- Sen, A. (2000). Social exclusion: Concept, application, and scrutiny.
- Sen, A. (2002). Response to commentaries. *Studies in Comparative International Development*, 37(2), 78-86.
- Sen, A. (2005). Human rights and capabilities. *Journal of Human Development*, 6(2), 151-166.
- Shaver, K. & Tarpy, M. (1993). *Psychology*. New York: Macmillan.
- Skovholt, K., Grønning, A., & Kankaanranta, A. (2014). The communicative functions of emoticons in workplace e-mails. *Journal of Computer-Mediated Communication*, 19(4), 780-797.
- Slovic, P. (1998). The risk game. *Reliability engineering and system safety*, 59(1), 73-77.
- Smith, A. (1776). An inquiry into the nature and causes of the wealth of nations. Cannan & Edwin (Eds).
- Smith, T. (2011). Overcoming Challenges in Wastewater Reuse: A case study of San Antonio, Texas. (BA thesis, Harvard College Cambridge, Mass).
- Srinivasan, L. (1990). Tools for community participation: A manual for training trainers in participatory techniques. PROWWESS/UNDP, New York.
- Stake, E. (1995). The art of case study research. Thousand Oaks, CA: Sage.
- Republic of South Africa (2007). Statistics South Africa Community Survey 2007.
- Steirer, M. & Thorsen, D. (2013). Potable reuse: Developing a new source of water for San Diego (PDF). *Journal-American Water Works Association*, 105(9), 64-69.
- Sultana, F. (2009). Fluid lives: subjectivities, gender and water in rural Bangladesh. *Gender, Place and Culture*, 16(4), 427-444.

Sultana, F. (2011). Suffering for water, suffering from water: Emotional geographies of resource access, control and conflict. *Geoforum*, 42(2), 163-172.

Sydney Water (1999). Community Views on Re-cycled Water. Sydney.

Sydney Water (2002). *Doing Things Differently, Edmondson Park Customer Reactions to Service Delivery*. An internal report prepared by Eureka Strategic Research. Sydney.

Syme, G. & Nancarrow, E. (Eds.) (2001). Applying social justice research to environmental decision-making. *Social Justice Research*, 14(4).

Syme, G. & Williams, K. (1993). The psychology of drinking water quality: An exploratory study. *Water Resources Research*, 29(12), 4003-4010.

Syme, G., Nancarrow, E. & McCreddin, J. (1999). Defining the components of fairness in the allocation of water to environmental and human uses. *Journal of Environmental Management*, 57(1), 51-70.

Tchobanoglous, G., Leverenz, H., Nellor, M. & Crook, J. (2011). Direct Potable Reuse: A Path Forward, WaterReuse Research Foundation, WaterReuse California, Alexandria, VA.

Thorp, R., Stewart, F. & Heyer, A. (2005). When and how far is group formation a route out of chronic poverty? *World development*, 33(6), 907-920.

Tortajada, C. & Joshi, Y. K. (2013). Water demand management in Singapore: Involving the public. *Water resources management*, 27(8), 2729-2746.

UN Habitat. (2003). Water and Sanitation in the World's Cities. United Nations Human Settlements Programme, Earthscan, London.

UNDESA (2013). World Population Prospects: the 2012 revision. New York, Population division, united nations (UN).

UNESCO (2003). Water for people- water for life, The United Nations World. Water Development Report. UNESCO Publishing/Berghahn Books.

United Nations World Water Assessment Program (UNWWAP) (2015). The United Nations World Water Development report: water for a sustainable world. Paris, UNESCO.

Unterhalter, E. (2008). The capability approach and gendered education: Some issues of operationalisation in the context of the HIV/AIDs epidemic in South Africa. In Comim, F., Qizilbash, M., & Alkire, S. (Eds.). *The Capability Approach: Concepts, Measures and Applications*, 489-509.

US Environmental Protection Agency (1992). Manual: Guidelines for Water Reuse, Office of Water and Office of Research and Development.

USCB (United States Census Bureau) (2012). *International Programs. World Population*.

Van Rensburg, F. (2006). Urban Water Resources in Windhoek, Namibia.

Van Wijnendaele, B. (2011). Social Justice and the Politics of Emotions. *Human Geography*, 4(2), 1-15.

Van Wijnendaele, B. (2013). The Politics of Emotion in Participatory Processes of Empowerment and Change. *Antipode*, 46(1), 266-282.

Venn, J. (1880). On the diagrammatic and mechanical representation of propositions and reasonings. *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 10(59), 1-18.

Vigneswaran, S. & Sundaravadivel, M. (2004). Recycle and reuse of domestic wastewater, in Wastewater Recycle, Reuse and Reclamation, (Ed. S.Vigneswaran), in Encyclopedia of Life Support Systems (EOLSS). Developed under the Auspices of the UNESCO.

Weeramanthri, T. (2011). Guidelines for the non-potable uses of recycled water in Western Australia.

Wegner-Gwidt, J. (1998). Public support and education for water reuse. In T. Asano (Ed.) *Wastewater Reclamation and Reuse*, 1417-1462. Pennsylvania: Technomic.

Western States Water Council (2011). *Water reuse in the west: state programs and institutional issues*.

White, S. (2003). *Participatory Techniques for Water and Wastewater*. Presented at Community Consultation in the Australian Water Industry Workshop, Sydney, 19 August.

WHO (1993). *Guidelines for Drinking-Water Quality*, 2nd edition.

WHO (2006). World Health Organisation. *Guidelines for drinking-water quality: incorporating first addendum*. Vol. 1, Recommendations. 3rd Ed.

Wilson, Z. & Pfaff, B. (2008). Religious, philosophical and environmentalist perspectives on potable wastewater reuse in Durban, South Africa. *Desalination*, 228(1), 1-9.

Wolf, A. (1998). Conflict and cooperation along international waterways. *Water policy*, 1(2), 251-265.

World Health Organization (2010). *UN-Water Global Assessment of Sanitation and Drinking Water: Targeting resources for better results*. World Health Organization (WHO).

World Health Organization (1996). *The world health report 1996: fighting disease; fostering development*. World Health Organization.

Wu, L. (2006). Reclaiming wastewater for beneficial uses. Southwest States and Pacific Island. Regional water program.

Wutich, A. (2009). Intrahousehold Disparities in Women and Men's Experiences of Water Insecurity and Emotional Distress in Urban Bolivia. *Medical Anthropology Quarterly*, 23(4), 436-454.

Wutich, A. & Ragsdale, K. (2008). Water Insecurity and Emotional Distress: Coping with supply, access and seasonal variability of water in a Bolivian squatter settlement. *Social Science & Medicine* 67 2116-2125.

Yin, K. (1994). Case study research: Designs and methods. 2<sup>nd</sup> Edition CA: Sage, Thousand Oaks.

Yin, K. (2003). Case study research: design and methods. Thousand Oaks, California: Sage Publications.

Yin, K. (2009). Case study research: Design and methods. 4<sup>th</sup> ed. California: Thousand Oaks: Sage Publications, 240.

Yin, K. (2009). Case study research: Design and methods 4th Ed. In *United States: Library of Congress Cataloguing-in-Publication Data*.

Zavaleta Reyles, D. (2007). The Ability to go About without Shame: A proposal for internationally comparable indicators of shame and humiliation. *Oxford Development Studies*, 35(4), 405-430.

## APPENDIX

### APPENDIX A



UNIVERSITY of the  
WESTERN CAPE

OFFICE OF THE DEAN  
DEPARTMENT OF RESEARCH DEVELOPMENT

05 June 2015

#### To Whom It May Concern

I hereby certify that the Senate Research Committee of the University of the Western Cape approved the methodology and ethics of the following research project by:  
Prof Y Xu & BG Ndoh Owen (Earth Sciences)

Research Project: Opportunity for implementing reclaimed water reuse for domestic applications in South Africa: public perceptions and institutional engagement.

Registration no: 15/4/101

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

The Committee must be informed of any serious adverse event and/or termination of the study.

A handwritten signature in black ink, appearing to read 'P. Josias'.

*Ms Patricia Josias*  
*Research Ethics Committee Officer*  
*University of the Western Cape*

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a place to grow, from hope  
to action through knowledge

## APPENDIX B



### Faculty of Natural Sciences Department of Earth Sciences

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#### APPENDIX B: INFORMATION SHEET

##### Opportunity for implementing reclaimed water reuse for domestic applications in South Africa: public perceptions and institutional engagement

I would like to take this opportunity to introduce our research project entitled “An investigation into the social, institutional and economic implications of reusing reclaimed wastewater for domestic application in South Africa” to you. It is funded by the Water Research Commission (Project No 2208). High population growth and water demand in cities is increasing the demand for potable water so that various water services authorities are considering alternative sources of water. Reclaimed wastewater for potable reuse has become a viable, safer and cheaper alternative to desalination and dams for augmenting water supplies. This alternative is not yet well understood by the public.

The project aims to understand more about public responses to reuse of reclaimed wastewater for domestic purposes. Our research is designed to gain understanding of what information needs to be communicated to the public, how and when it should be communicated and by whom. These are just some issues that require careful consideration. We would also like to know more about public engagement strategies in considering decisions such as this and what impediments as well as opportunities confront implementation. We depend on experts such as yourself to assist us in gathering information so that we can generate better understanding of this sensitive topic.

As you are imminently well placed to provide insight into communities that surround you and the municipalities and institutions that are involved in this issue, we would greatly value your insights and expertise regarding this topic. We work under a strict code of ethics, which ensures that all information that is provided remains confidential and respects your right to anonymity. Our final results will be made available to you and your colleagues.

I am available to respond to any queries that you might have regarding our research.

Sincerely

**Professor Jacqueline Goldin**

Contact numbers/email address: 0844380203/

[jgoldin@uwc.ac.za](mailto:jgoldin@uwc.ac.za)



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**APPENDIX C: RESEARCH ACTIVITIES IN CASE STUDY  
MUNICIPALITIES**

**Case 1: Overstrand Municipality**

<b>Overstrand</b>			
<b>Date</b>	<b>Organisation</b>	<b>Role</b>	<b>Activity</b>
<b>2014</b>	Overstrand Municipality	Engineering Services	- Semi-structured face to face interviews
<b>18/06/2014</b>	Overstrand Municipality	Engineering Services	- Ditto Interview
	Camphill special needs school	Principal	- Ditto Interview
<b>19/06/2014</b>	Curro Hermanus school	Campus Manager	- Ditto Interview
	Qhayiya secondary school	Deputy Headmaster, Teachers & Learners	- Focus group discussions
	Environmental NGO: Whale Coast Conservation	Manager & Programme coordinator	- Ditto Interview
	Overstrand Municipality	Councilors	- Ditto Interview
<b>20/06/2014</b>	Ismail and Mariam Ebrahim Islamic centre	Religious leader	- Ditto Interview
<b>03/03/2015</b>	Overstrand Municipality	Engineering Service	- Validation workshop ➤ Focus group discussions ➤ Resistance to Change Continuum
	Overstrand Municipality	Councilor	
	Camphill special needs school	Educator	
	Qhayiya secondary school	Deputy Headmaster & Learners	
	Ismail and Mariam Ebrahim Islamic centre	Religious leader	
<b>10/12/2015</b>	Zwelihle Township community	Community members	- Focus group discussions - Emoticons - Story with a gap - Mapping
	Church of Christ Ministries	Pastor	- Ditto Interview
	Print Media	Editor	- Ditto Interview
<b>2016</b>	Telephonic interviews for additional data		

**Case 2: eThekweni Municipality**

<b>eThekweni</b>			
<b>Date</b>	<b>Organisation</b>	<b>Role</b>	<b>Activity</b>
<b>2014</b>	eThekweni municipality	Engineering services	- Telephonic interview
<b>28/07/2014</b>	eThekweni Municipality	Engineering Services-Director	- Interview - Venn Diagram - Emoticons
	eThekweni Municipality	Management Researcher	- Focus group discussions - Venn Diagram - Story with the gap - Emoticon
	- eThekweni Municipality - Environmental health	Field practitioners	- Focus Group discussions - Venn Diagram - Story with the gap, - Emoticons
	eThekweni Municipality	Consultant Golder Associates	- Interview - Venn Diagram - Story with the gap - Emoticons

<b>29/07/2014</b>	Community groups Ward Committee AA Focus Group User Platform	Community participants	- Focus Group discussions - Mapping of knowledge - Venn Diagram - Story with the gap - Emoticons
	eThekwini municipality	CLO	- Interview
<b>30/07/2014</b>	eThekwini Municipality- Northern Wastewater treatment plant	Process Controller	- Interview
	Education Centre	Education officers	- Interview
<b>21/04/2015</b>	Education Centre	Education officer	- Validation workshop ➤ Focus group discussions ➤ Resistance to Change Continuum
	eThekwini Municipality	Community Liaison	
	eThekwini Municipality & Environmental Health	Field practitioners	
	Qhilika High School	Educator Learners	
	Sandaka Primary school	Educator	
	Community groups Ward Committee User Platform	Community participants	
<b>2016</b>	Telephonic interviews for additional data		

### Case 3: Beaufort West Municipality

Beaufort West			
Date	Organisation	Role	Activity
<b>2014</b>	Beaufort West Municipality	Director Engineering services Manager	- Group interview
<b>25/08/2014</b>	BWLADO	Programme coordinator Manager	- Interview - Venn Diagram - Story with the gap
	Media- Radio Gamkaland	Manager Board member	- Interview - Emoticon
<b>26/08/2014</b>	BADISA	Office coordinator	- Interview
	St. Matthews Primary	Principal	- Interview - Emoticon
	Beaufort West Municipality	Engineering services Director	- Interview - Emoticon
	Beaufort West Secondary School	Teachers	- Group interview - Venn Diagram - Story with the gap - Emoticon
<b>27/08/2014</b>	Beaufort West municipality	Municipal Manager	- Interview - Emoticon
<b>27/03/2015</b>	Media- Radio	Board member Manager	- Validation Workshop ➤ Focus group discussions ➤ Resistance to Change to Continuum
	St. Mathews Primary	Principal (retired)	
<b>07/10/2015</b>	Mandlenkosi community	Community members & Christian Pastor	- Focus group discussions - Mapping
<b>2016</b>	Telephonic interviews for additional data		

## APPENDIX D: INTERVIEW SCHEDULES

### 1) INTERVIEW SCHEDULE I – For municipal officials

Organisation: .....Position:

.....

#### 1. Factors (referring to reasons or motives) and conditions (referring to circumstances) contributing to the use of reclaimed water (RW)/wastewater for domestic applications

1.1 What types of factors and conditions are contributing to the reuse of wastewater for domestic/potable purposes? – Can you Please list these factors for me

1.2 Now, looking at each of the different factors and conditions that you have identified, can you tell me in what ways it contributes to the reuse of wastewater for domestic/potable purposes?

1.3 Some of these factors and conditions would be impacting on the refusal of reclaimed water for domestic applications whilst others would be contributing its acceptance. Could you go through these with me and tell me which ones are more likely to contribute to the refusal and which to the acceptance. To what extent can it impact on the acceptance or refusal of reuse of wastewater for potable purposes?

1.4 How are these factors and conditions perceived by different water services practitioners (engineers, municipal officials and laboratory technicians)?

1.5 What are the most predominant factors and conditions (from the provided list) that can be used as basis for initiating reclaimed wastewater reuse?

1.6 I am interested in the way that decisions are being taken around reclaimed water for domestic applications. Can you give me some insights into the decision-making processes – who takes the decisions, are there special committees where the decisions are being taken? ..... etc. How are decisions being made regarding reuse of wastewater for domestic purposes?

1.7 How have these conditions been addressed to alleviate its impacts?

#### 2. Impacts of factors and conditions contributing to the reuse of wastewater on the public

2.1 How, for instance do the factors impact on the public?

2.2 What is the extent of the impacts of factors and conditions that have contributed to the reuse of wastewater on the general public?

2.3 How has the public reacted to the reclaimed wastewater reuse proposal?

2.4 Were these factors and conditions sufficient to convince the public about the usefulness of initiating reclaimed wastewater reuse as alternative option?

### **3. Strategies for implementing reuse of wastewater for domestic purposes**

In your organisation do you have a number of strategies that have been designed to further the aims of implementing RW for domestic applications? If yes, can you tell me about these strategies?

3.1 How is reclaimed wastewater for domestic applications introduced to the public?

3.2 At what stage of the reclaimed wastewater scheme is the public contacted?

3.3 Who from the Municipality contacts the public and who do you contact from the public?

3.4 How is decision-making arrived at the interface between the Municipality and the public?

3.5 Does the public trust their (institution) competencies? What is your opinion on this?

3.6 What strategies are or have been in place for implementing the reuse of wastewater for potable purposes?

3.7 Are there any guidelines or framework that has been used to implement wastewater reuse for domestic purposes? Could you give me a copy of these guidelines?

3.8 Are these guidelines in the public domains? Are they readily accessible and if so in what format and in what languages?

3.9 And what are the key guiding principles of the guideline/framework (if existing)?

3.10 Have you engaged with public to discuss these strategies? If yes, how?

3.11 Have you had any feedback from the public on these strategies? How are they being reviewed? And what type of feedback have you received?

3.12 What mechanisms does your institution have to deal with the feedback – do you meet and discuss the feedback for instance? Are the views of the public taken into consideration and if so in what ways?

3.13 How are these strategies viewed by various stakeholders involved directly or indirectly in the reuse of wastewater for potable purposes?

3.14 Can you give me an idea of your procedures – once you have a strategy – how do you actually implement it or plan to implement it. What steps do you have in place for the implementation

3.15 Are there any mechanisms to monitor the implementation process – if so what are these mechanisms. How these strategies are, will or have been implemented? (Stepwise procedures)

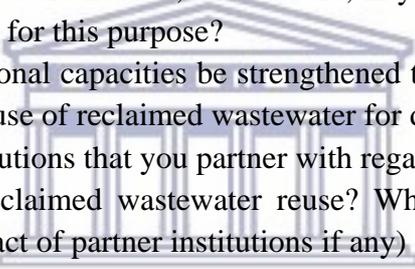
**4. Institutional capacities for implanting reuse of wastewater at domestic level for potable use**

4.1 In your opinion, what institutional capacities are required to ensure successful implementation of wastewater reuse for potable purposes? – can you tell me why you say

4.2 And if these capacities are needed, what would, in your opinion strengthen the institutional capacity for this purpose?

4.3 How should institutional capacities be strengthened to enhance the public trust with regard to the reuse of reclaimed wastewater for domestic purposes?

4.4 Are there other institutions that you partner with regard to developing strategies for implementing reclaimed wastewater reuse? What roles are they playing (please provide contact of partner institutions if any)



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## 2) INTERVIEW SCHEDULE II – Both Municipal officials and public

A. Knowledge		Respondent
1. Do you know about Reconciliation studies?	1.1 If yes, do you know the purpose of the study?	P
	1.2 Have you been involved in the study? And how?	P
	1.3 In your opinion was the public involved in the Reconciliation study?	P
	1.4 If yes, Who and what were their roles?	P
2. Do you know about Feasibility studies?	1.1 If yes, do you know the purpose of the study?	P
	1.2 Have you been involved in the study? And how?	P
	1.3 In your opinion was the public involved in the Feasibility study?	P
	1.4 If yes, Who and what were their roles?	P
3. Do you think the public was adequately involved in the Reconciliation and Feasibility studies	3.1 If yes or no, why do you say this?	P
4. Can you tell me where you get your potable water?	4.1 Where does your community get potable water?	P
	4.2 Do you experience any particular problems?	P
	4.3 Are there any particular water quality issues that you are concerned about?	P
	4.4 Are there any particular water quality issues that you think your community or the public is concerned about?	P
5. Can you tell me something about your municipal water treatment technologies?	5.1 What do the public need to understand about treatment technology?	P
	5.2 Who do you think needs to know about treatment technology?	P
6. Do you know about reuse of reclaimed water?	6.1 What do you understand about reclaimed water reuse?	P
	6.2 Does your community know about reclaimed water reuse?	P
	6.3 Is reclaimed water being used in your community and how?	P
7. Do you know about reuse of reclaimed water for potable/domestic use?	7.1 What do you understand by potable reuse of reclaimed water?	P
	7.2 Does your community know about potable reuse of reclaimed water?	P
	7.3 Have you and your community heard about plans for potable reuse of reclaimed water?	P
	7.4 How did you and your community hear about plans for potable reuse of reclaimed water?	P

	7.5 Who do you think opted for potable reuse of reclaimed water?	P
	7.6 What could be the reasons for potable reuse of reclaimed water?	P
8. Can you tell me something about your EIA process?	8.1 Have you been involved in the study? And how?	P
	8.2 To what extent do you think the public is involved in the EIA process?	P

<b>B. Social capital</b>		<b>Respondent</b>
1. Do you know the stakeholders that were involved in potable reuse of reclaimed water?		P & GO
	1.1 In your view who represents the public?	P & GO + CLO
	1.2 How was the public involved?	P & GO + CLO
2. In your opinion do the people of this community trust one another?		P & CLO
3. Do they cooperate with one another on topics around water?		P & CLO
4. Do you trust the Municipality to look after you?		P
	4.1 And in particular around water provision, do you think the Municipality is doing its best to serve you?	P
5. Do you think all segments of your population are treated fairly?		NGO, GO & MO
	5.1 Do you think all segments of your community have the same opportunities to be involved in decisions around water issues?	NGO, GO & MO
	5.2 Why do you say this?	NGO, GO & MO
6. How did it come to be that the municipality/institution came to decide on reuse?		MO, GO & NGO
7. How was reuse introduced to the public?	7.1 Do you think these steps were adequate?	P, GO & MO
	7.2 What process/steps would you propose to be adequate?	P, GO & MO
8. What kinds of committees are there in this community?	8.1 Is there a water committee in this community?	P & CLO
	8.2 How often does the committee meet and discuss on water issues/reuse?	P & CLO
	8.3 Do you attend public meetings?	P
9. Do you think that people in your community are concerned about reuse?		MO
	9.1 Is it being discussed/talked about in the streets?	MO
10. In your opinion, has this being an opportunity for the Municipality to get to know the public and vice versa?	10.1 If yes/no, Why do you say this?	MO
11. At what stage do you think the public should be involved in water related issues?		MO
	11.1 How should the public be involved and in what?	MO
12. Is the EIA process fit for the purpose?		MO

**In the next part of my interview, I just want to ask you about emotions and perceptions regarding reuse**

<b>C. Emotions</b>		<b>Respondent</b>
1. Does the public feel that they have been adequately involved in the concerns of this community for water scarcity?		CLO, NGO
	1.1 Why do you say this?	CLO, NGO
2. Do you think they have been adequately informed in discussing potable water?		CLO, NGO
3. Do you feel good about yourself regarding this topic?		P
4. In general, what feelings do you have about reclaimed water reuse?		P
5. Do you really feel that this is necessary?		P
6. Do you really feel comfortable with the idea of water reuse?		P
7. Do you think you had a choice regarding reuse?		P
	7.1 If no, how did you feel about not having a choice?	P
8. Do you feel that the way this topic has been dealt with in your community makes a difference in the way you view reclaimed water reuse?		P
9. When you first heard about the idea of reuse, what was your first reaction?		P
10. When the public first heard about reclaimed water reuse, what was their reaction?		MO & GD
11. You probably had your opinion about reuse, but do you think others influenced your decision?		MO & GD
	11.1. When was that?	MO & GD
	11.2. How did that change things/make you feel?	MO & GD

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<b>D. Perceptions</b>		<b>Respondent</b>
1. What are the benefits of potable reuse of reclaimed water to your community?		P
	1.1 What are the benefits of reclaimed water reuse to you and your household?	P
2. Do you think the water quality is safe?		P
3. Do you personally drink reuse water?		P
	3.1 If no, why not?	P
4. Will you use this water under all circumstances? For ex. Give to baby in bottle?		P
	4.1 Why do you say that?	P
5. Are there any particular segments of the population who feel particularly strongly against water reuse?		P, MO & GD
6. If you don't have to drink it, would you have a preferred choice?		P, MO & GD
7. Has reuse water has any cost implications for you?		P
8. Do you trust the fact that the municipality would do the right thing for you?		P

9. Is choice and freedom to decide for yourself of value to you?		P
10. Do you think that the decisions that your Municipality takes for you around water issues are fair to you?	10.1. If not, why do you say that?	P
11. Do you consider that the discussion on reuse is providing for you and others in your community an opportunity for you to learn about water concerns?	11.1. Why do you say this?	P
12. Do you think there is an element of unfairness in some rather than all going this route of water reuse		All respondents
13. Do you think your perceptions will change in the future?	13.1. Why do you say this?	P
14. If reuse water meant that you will pay less for your water would you or your community change their perceptions about reuse?		P
15. What is your opinion about the media regarding potable reuse of reclaimed water?		P
	15.1 Do you trust the media?	P
	15.2 Do you think the media has influenced your view? And that of the community?	P
16. What do you think the public is concerned about?		All respondents
17. What do you think the public needs to know?		All respondents
18. Do you have any particular quality issues with potable reuse reclaimed water?		P

### ADDITIONAL QUESTIONS – BEAUFORT WEST & OVERSTRAND

### **3) Semi-structured Interview Schedule III – BEAUFORT WEST**

#### **A) Impacts of reuse decision factors on the public (there is data that shows the public is aware of the reasons for the decision)**

1. How were you impacted by the 2010 droughts? (Natural factor)
  - Hunger or famine
  - Thirst
  - Disease
  - Overdraft of natural resources
2. How were you impacted by municipality's decision on water restrictions during the droughts? (Institutional factor)

3. Were you impacted by the technology and how? (Technical factor)
4. Were you impacted by water tariffs as a result of the reuse implementation? Are you impacted by the tariffs post-implementation? (Economic factor)
5. Does the decision to augment limited water resources have an impact on you? And why? (Motivational factors)

## **B) Perceptions**

1. **Water use:** Which would you prefer? Use of reclaimed water for cooking, washing, gardening or drinking purposes?
2. **Sources of water to be recycled:** In Beaufort West, reclaimed water is distributed to everyone. But would you be more comfortable if the wastewater originated from your neighbourhood only or from other public sources?
3. **Attitudes towards the environment:** How do you perceive reclaimed water for potable applications and the environment?
4. **Socio-demographic factors**
  - 4.1 **Age:** Which age group is likely to accept RW and which is not? *Young, Youth and old and why?*
  - 4.2 **Gender:** Which would be more likely to accept RW and which would not? Men or women and why?
  - 4.3 **Education:** At which level of education would people be more likely to accept RW or not and why?
  - 4.4 **Race:** Which racial group/s would be more likely to accept RW and which would not? Black, colored, Indian or White and why?
  - 4.5 **Religion:** How does religion influence perceptions towards reclaimed water?
  - 4.6 **Culture:** How does culture influence perceptions towards reclaimed water?

## **C) Social capital and empowerment**

1. Were you involved in the campaign/meetings that was launched before the implementation of the reuse project? If yes or no, why?.....
  - 1.1. Who were the majority who attended, men or women? And why?
  - 1.2. Are there any other reasons why people do not attend meetings?
2. Do neighbours help each other out in your community?

3. Do you discuss water reuse issues post implementation in general on the road, in the shops or at hot spots? How often do you meet and discuss. What are the common issues discussed?
4. Have you experienced any problems with reuse water?
5. If you experience any problems with the reuse water, who would you talk to?
6. Do you drink reclaimed water yourselves? If yes, why? And if no, why not?
7. Do you feel you can promote reclaimed water as a viable option for water augmentation? If yes, why? And if no, why not?
  - 7.1 How would you promote reclaimed water in your own capacity?
8. How do you feel generally about reclaimed water these days?
  - 8.1 Has your feelings changed since the initiation of the project?
9. Has the use of reclaimed water for potable applications given meaning to your life and to your community? If yes why do you say this? If no, why do you say this?
10. Do you have access to information regarding reuse post-implementation?
11. Which associations do you belong to?
  - 11.1 Do you discuss water reuse in these meetings?
  - 11.2 Do you think this is an ideal place to talk about reuse?
12. If you do not belong to any association, why is it so?
13. Do you feel drinking reclaimed water impacts on your well-being? Why do you say this?
14. Do you feel the reuse project post-implementation is still a sensitive issue? Why do you say this?
15. What are your future expectations regarding use of reclaimed for potable applications?

#### **4) Semi-structured Interview Schedule III- Overstrand Municipality**

##### **A) Impacts of reuse decision factors on the public (*there is data that shows the public is aware of the reasons for the decision*)**

1. How were you impacted by the 20 droughts? (Natural factor)
  - Hunger or famine
  - Thirst
  - Disease
  - Overdraft of natural resources

2. How were you impacted by municipality's decision on water restrictions during the droughts? (Institutional factor)
3. Do you know about reclaimed water and the decision in Overstrand?
4. Does the decision to use reclaim water have any impact on you? And why? (Motivational factors)

**B) Perceptions (just adding to the list I already have)**

5. **Water use:** Which would you prefer? Use of reclaimed water for cooking, washing, flushing, laundry, gardening or drinking purposes?
6. **Sources of water to be recycled:** would you be more comfortable if the wastewater originated from your neighbourhood only or from other public sources?
7. **Attitudes towards the environment:** what is your opinion about reclaimed water for domestic applications and the environment? Do you think it is beneficial? Why do you say this?
8. **Socio-demographic factors**
  - 8.1 **Age:** Which age group is likely to accept RW and which is not? *Young, Youth and old and why?*
  - 8.2 **Gender:** Which would be more likely to accept RW and which would not? Men or women and why?
  - 8.3 **Education:** At which level of education would people be more likely to accept RW or not and why?
  - 8.4 **Race:** Which racial group/s would be more likely to accept RW and which would not? Black, colored, Indian or White and why?

**C) Social capital and empowerment**

9. Do you belong to any associations? If yes or no why?
  - a. Which associations do you belong to?
  - b. Do you discuss water reuse in these meetings?
  - c. Do you think this is an ideal place to talk about reuse?
10. Do you discuss water reuse issues in general on the road, in the shops or at hot spots? How often do you meet and discuss? What are the common issues discussed?
11. If you want to get more information on water services, to whom do you usually talk to in this community?
12. If it is about information on reclaimed water, whom will you talk to?
13. Do you have access to the municipality to talk with someone if you have any questions?
14. Will you drink reclaimed water yourselves? If yes, why? And if no, why not?

15. Do you feel you can promote reclaimed water as a viable option for water augmentation? If yes, why? And if no, why not?
16. Do you attend meetings regarding services in general? If yes or no why?
  - a. Is the community usually united in opinion in these meetings?
  - b. Is the community voice usually taken into consideration during meetings?
  - c. Who are those members of the community who talk more in meetings? Why?
  - d. Who are those members of the community who talk less or not at all? Why?
17. Do you think the use of reclaimed water for domestic applications will give meaning to your life and to your community? If yes or no, why do you say this?
18. What is your future expectations regarding use of reclaimed for potable applications?
19. Do neighbours help each other out in your community?



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## APPENDIX E: CONSENT FORM



### Faculty of Natural Sciences Department of Earth Sciences

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### CONSENT FORM

#### Opportunity for implementing reclaimed water for domestic applications in South Africa: public perceptions and institutional engagement

My name is Bella Germaine Ndoh Owen.

I am from the University of the Western Cape

Thank you very much for agreeing to participate in this focus group discussion. We are wanting to gather some information from people like yourself, living in this area, so that we know a bit more about the people who we are working with.

As a result of water scarcity, Municipalities have decided on augmenting water supplies by reclaiming/recycling municipal wastewater for domestic applications. The purpose of this study is to understand decision-making processes and public perceptions regarding the use of reclaimed/recycled water for domestic applications. Your perceptions are crucial in the development of an approach to assist Municipalities in introducing reclaimed/recycled water for domestic applications, to the public.

Your participation is entirely voluntary. Your privacy will be respected and all information that is provided will be handled confidentially. You may refuse to take part in the focus group discussion, and you may stop at any time if you do not want to continue. You also have the right not to respond to any issues during the discussions if you feel uncomfortable.

The focus group discussion is about 1 hour and 30 minutes.

- By signing below, you signify that you agree to participate in the study and that your participation is entirely voluntary.
- If you have questions about this focus group meeting or project you can contact my supervisor:

**Professor Jacqueline Goldin**

Contact numbers/email address: 0844380203/ [jgoldin@uwc.ac.za](mailto:jgoldin@uwc.ac.za)

.....  
SIGNATURE

.....  
DATE



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