DIRECT RECLAMATION OF MUNICIPAL WASTEWATER FOR DRINKING PURPOSES

Volume 2: Investigation into institutional and social factors influencing public acceptance of reclaimed water for potable uses in South Africa

C. Muanda, D. Cousins, A. Lagardien, G. Owen and J. Goldin

WATER RESEARCH COMMISSION

TT 734/17

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Volume 2: Investigation into institutional and social factors influencing public acceptance of reclaimed water for potable uses in South Africa

A Report to the

Water Research Commission

by

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Volume 1: Guidance on Monitoring, Management and Communication of Water Quality (WRC Report No. TT 641/15)
Volume 2: Volume 2: Investigation into institutional and social factors influencing public acceptance of reclaimed water for potable uses in South Africa (This report)
Volume 3: Volume 3: Framework guidelines for public engagement on water reuse (WRC Report No. TT735/17)

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EXECUTIVE SUMMARY

Fresh water resources on a worldwide scale are limited and threatened by anthropogenic influences such as overexploitation. As water resources become limited, water authorities are obliged to seek or develop alternative sources of water. As large volumes of potable water are flushed away in urban contexts, reclaiming water is likely to become a more common strategy to supplement water demand deficiencies, while simultaneously addressing environmental concerns about the contamination of rivers and oceans. Water reclamation has proven to be a reliable alternative water resource in meeting the demands of urbanisation, and may constitute a significant component of integrated water resources management. However, implementation is contentious due to public perceptions that pose several challenges relating to the ways in which: (i) both institutions and the public respond to issues of water scarcity and choices; and (ii) institutions engage with the public to facilitate user acceptance of reclaimed water.

The overall aim of this study was to investigate and test the major factors that govern people's decisions towards the use of reclaimed water for drinking purposes; and develop strategies and tools to inform better information sharing and public engagement within the institutional decision-making process for introducing reclaimed water. The intention was to find ways to influence public perceptions through public knowledge acquisition and information flows, and to engage with the public in order to overcome resistance and build trust, so as to assist water institutions effectively to introduce and manage water reclamation schemes.

The objectives of this study were as follows:

- Document international and local knowledge on reclaimed water and its implications for society and the economy, and regulations that govern the use of reclaimed water for potable applications
- Investigate the enabling factors, drivers and conditions that facilitate the use of reclaimed water for potable applications
- Investigate and document the range of factors influencing public perceptions and governing people's decisions regarding the use of reclaimed water for potable applications
- Test the major factors that govern people's disposition towards potable applications of reclaimed water
- Develop strategies that can be used to influence public opinion regarding the use of reclaimed water for potable applications
- Develop an institutional framework for addressing public perceptions and introducing reclaimed water
- Develop a tool that will enable planners and water utilities to predict public behaviour in relation to proposed water reclamation schemes.

This research made use of a case study approach, employing qualitative research methods to investigate empirical phenomena within a real-life context. The methodology included:

- Desktop study: literature review of international and local experience
- Interviews with respondents (water services and individuals) in selected local case studies
- Validation workshops to discuss findings
- Comparative analysis to develop a generic guideline.

The overall findings emanating from this study were as follows:

- In South Africa, water reclamation has been identified as a potential water augmentation alternative to ensure continuous water supply. However, there are still social issues relating to the "yuck" factor and safety concerns, which are likely to lead to public resistance.
- Of the many conditions and factors that can prompt the introduction of water reclamation, this research found that in South Africa the main causes are droughts, limited reliable alternative water resources, minimisation of environmental pollution, growing discharge of large volumes of

wastewater, depletion of available water resources and their inadequacy to meet growing water demand.

- Public perceptions of risks associated with using reclaimed water are initially dominated by the "yuck" factor because the idea is at first repugnant. Deterioration of the quality of water, fear of drinking water of sub-standard quality, restrictions, tariffs and willingness to pay, and reduced water use were also identified as additional factors that govern the public's decision to accept or reject water reclamation.
- Emotions underlying public perceptions that prevail at different institutional stages of implementing water reclamation include doubt and denial, mistrust, fear and safety concerns. Although rooted in knowledge deficits, emotive issues were often associated with trust in municipal capacity and a sense of choice. Across the case studies, public resistance was predominantly attributable to doubt, fear, safety concerns and mistrust. In all cases, public trust in institutional processes needed to be built. Public perceptions cumulatively contribute to public resistance, which manifests at logical stages in the institutional process of implementation.
- Institutional process for introducing water augmentation options including water scarcity and risk management, reconciliation and feasibility studies, reuse decision, implementation and post-implementation. Following a thorough analysis, this research found that in practice the institutional process comprises four sequential stages namely planning, decision making, implementation and post-implementation. Strategies for influencing public perceptions emerge alongside the institutional process and are intended to address public knowledge deficits and public engagement challenges.
- The implementation of water augmentation options has many requirements that may differ from one region to another. Internationally, strategies used have included public meetings, use of the media, users' surveys and direct public engagement. In South Africa, where reclaimed water has recently been introduced, available strategies (e.g. EIA) are limited, not adequately applied and often not coherent. Water reclamation was implemented as a matter of urgency because of dire water scarcity, giving the water institutions involved no reasonable time for appropriate public engagement.

Based on the findings, public acceptance of reclaimed water in South Africa remains contentious because of social and institutional factors. Within each municipal context and at stages of the institutional process for introducing water reclamation, opportunities for public queries and institutional responses can serve simultaneously to enhance social learning and build trust in public institutions. Water institutions should engage with identified target groups to shift public resistance toward acceptance and promotion. This research proposes an approach that will address public resistance to improve acceptance of water reclamation. It is hoped that its findings will aid municipalities in their quest to improve service delivery through productive engagement with the public.

Although this research has produced a guideline for municipal application, there is an absence of documentation providing guidance or a framework for examining the capabilities and readiness of water institutions to implement water reclamation. It is therefore recommended that further research be undertaken to understand and evaluate water services institutions' readiness and capability to introduce water reclamation and implement a strategic approach to overcome public concerns.

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ACRONYMS & ABBREVIATIONS

BD	Blue Drop
CA	Capability Approach
CBO	Community-Based Organisation
CSO	Civil Society Organisation
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
FAQs	Frequently Asked Questions
GD	Green Drop
I&AP	Interested and Affected Parties
IDP	Integrated Development Planning
IWRM	Integrated Water Resources Management
IWRMP	Integrated Water Resources Management Plan
LoS	Level of Service
MoU	Memorandum of Understanding
NGO	Non-Governmental Organisation
NWRS	National Water Resource Strategy
O&M	Operation and Maintenance
PAR	Participatory Action Research
PRA	Participatory Rural Appraisal
SANS	South African National Standard
SNT	Social Network Theory
SWAG	Story with a Gap
WRC	Water Research Commission
WSDP	Water Service Development Plan

GLOSSARY[1]

Direct reuse	:	Involves the reuse of treated or untreated wastewater or effluent by direct transfer from the site where it was produced to the site of the new or different beneficial application.
Indirect reuse	:	Comprises the reuse of treated or untreated wastewater from a surface water or groundwater body where it was discharged to with the intention of reuse, before being abstracted for reuse at a new or different site of beneficial application.
Information dissemination	:	Constitutes a one-way flow of information from experts to those lacking knowledge.
Knowledge acquisition	:	A process of acquiring new information in order to become aware, beyond direct observation and experience. This requires opportunities to ask questions and a degree of analytical reflection for problem solving.
Non-potable reuse	:	The reuse of treated or untreated wastewater for purposes other than for drinking.
Planned reuse (intentional reuse)	:	Is the reuse of treated or untreated wastewater as part of a planned project, and is therefore always performed intentionally and consciously for specific applications
Perspectives	:	Different points of view held by individuals or groups when looking at and understanding problems and possible solutions.
Potable reuse	:	Potable reuse involves the reuse of wastewater for drinking purposes after it has been extensively treated to ensure its safety for human consumption and use.
Public engagement	:	Public engagement refers to ways in which the public engages with a municipality and ways in which public entities engage one another.
Unplanned reuse (incidental reuse or de facto reuse)	:	This is the reuse of treated or untreated wastewater after it has been discharged as return flow into a surface water or groundwater body without the intention of reuse, and from which it is then abstracted for a variety of applications.
Wastewater	:	Is any water that is derived from a variety of possible uses of the water, and typically contains residual pollutants associated with the use of water.
Water reuse	:	Comprises the utilisation of wastewater or effluent from a variety of sources (e.g. domestic, industrial, mine effluent) for a new or different beneficial application, such as for drinking purposes, industrial use or irrigation.

NOTE:

The term wastewater reuse is often used synonymously with the terms water recycling and water reclamation. It should be noted that the “reclamation” or “reuse” of water frequently implies the existence of distribution networks for delivering the reclaimed water (Asano & Bahri, undated). As the general public, often does not understand the differences between treated and untreated wastewater quality, many shorten the term to water reuse to create a more positive image (Lemonick, 2013). In this report, the terms reclaimed water and reclaimed wastewater are used interchangeably to refer to treated wastewater effluent that has been further treated to meet drinking water quality standards.

[1] Some of the terms above are borrowed Swartz et al., (2015)

CHAPTER 1: BACKGROUND

1.1 INTRODUCTION

The development of human societies is heavily dependent upon the availability of water of suitable quality and adequate quantity, for a variety of uses ranging from the domestic to the industrial. This demand for water, however, is becoming increasingly difficult to meet, as water resources on a worldwide scale are limited and threatened by anthropogenic influences such as overexploitation. Questions of how to meet the need in a sustainable manner and of where extra water may be sourced are being addressed globally. Given the large quantities of wastewater generated by domestic, commercial and industrial processes, treating wastewater effluent to bring it to drinking quality standard could help meet the increasing demand for water (Aravinthan, 2006). Water reclamation may be an option with the potential to become a valuable water resource that can be reused on various scales (National Water Resource Strategy, 2013; Ivarsson & Olander, 2011).

In South Africa, droughts and water stress have triggered many municipalities – including Bitou, Plettenberg Bay, Emalahleni, George and Knysna – to consider direct or indirect water reclamation. While most are still considering whether to introduce water reclamation as an alternative, Beaufort West has gone ahead and commissioned the first plant of its type in South Africa. eThekwini and Overstrand municipalities are at an advanced planning stage. With recent advances in technology and design, treating municipal wastewater and reusing it for drinking water supply maybe viable and an acceptable means for augmenting available water resources to meet growing demand, particularly in coastal areas facing water shortages. The practical experience of Windhoek demonstrates that water reclamation is a viable option to augment potable water supplies in arid regions, provided there is comprehensive planning, training and ongoing commitment to continued success (Kasperson, 1974; Okun, 1985; Crook, 1985).

While certain experts believe reclaimed water is of a better quality than conventionally treated potable supplies, the whole idea of it is considered unacceptable by many people (Po et al., 2004). A study by Cain (2011) suggests that potable use of reclaimed water is difficult for the regulators and the wider public to understand and accept. Several studies (Po et al., 2004; Po & Nancarrow, 2004) have identified factors that may significantly influence public acceptance of reclaiming water for a variety of uses, but there has been little research specifically relating to water reclamation for potable use. However, parallel studies (USFDA, 2009: e.g. food technology, service etc.) provide some insights into the perceived risks, benefits and knowledge about water reclamation, perceived control over the quality of water, trust in authorities, experts and technology, and personal feelings and emotions.

Despite public acknowledgement of water scarcity in various regions and countries, many communities know little about water sources, treatment and distribution systems. A large percentage of domestic water users are afraid of the potential presence of pathogenic organisms in reclaimed water (Nancarrow et al., 2008), but are willing to accept reclaimed water for non-potable purposes. Against this background, this research was formulated on the understanding that little is known about how people make decisions regarding water reclamation for a range of different uses. To date, there has been a few studies that succinctly outline how reclaimed water should be introduced to the public, and these have mostly been conducted by water institutions. What is apparent is that many technically sound water reclamation schemes around the world have failed because of public rejection. This has resulted in persuasion being used as an approach to gain public acceptance. However, it is now generally accepted that persuasion and social marketing are ineffective (Po et al., 2003). But it is difficult to know what to replace them with as there have been no systematic

programmes of social investigation to identify the different factors that might influence public perceptions or mediate public decision making.

In South Africa, the social context – people's cultural and religious beliefs – may render this process of introduction difficult. The public appears to be deeply sceptical about drinking reclaimed water due to fears about its health risks (Wilson & Pfaff, 2008). Currently, most water and wastewater treatment works are facing challenges, including a lack of qualified personnel and capacity, resulting in failure to produce final water that meets the requisite standard. As a result, many water utilities are battling to meet requirements such as those of Blue and Green Drop. Thus, the overall aim of this study is to understand the institutional and social issues hindering the introduction of reclaimed water. The intention of the research is to develop strategies and tools to address public resistance to the potable use of reclaimed water through promoting public awareness and engagement.

1.2 OBJECTIVES

The objectives of this study were as follows:

- Document international and local knowledge on reclaimed water and its implications for society and the economy, and regulations that govern the use of reclaimed water for portable applications
- Investigate the enabling factors, drivers and conditions that facilitate the use of reclaimed water for portable applications
- Investigate and document the range of factors influencing public perceptions and governing people's decisions regarding the use of reclaimed water for portable applications
- Test the major factors that govern people's disposition towards potable applications of reclaimed water
- Develop strategies that can be used to influence public opinion regarding the use of reclaimed water for portable applications
- Develop an institutional framework for addressing public perceptions and introducing reclaimed water
- Develop a tool that will enable planners and water utilities to predict public behaviour in relation to proposed water reclamation schemes.

1.3 RESEARCH HYPOTHESIS

Previous studies indicate that a lack of public education, engagement and communication, thus resulting in knowledge deficits, and are the main causes of public resistance to the use of reclaimed water. Based on these findings, it is hypothesised that water users are more likely to accept reclaimed water if there is trust between the water institution and the user and there are enabling spaces for meaningful knowledge sharing and active engagement.

1.4 SCOPE AND LIMITATION OF THE RESEARCH

This research was confined to three case study areas, Beaufort West, eThekwini and Overstrand municipalities, representing different stages of implementation, scales and locations. Only direct potable water reuse was investigated, focusing on institutional and social issues. Economic issues were embedded in institutional and social issues and limited to the costs associated with water reclamation and their implications for water tariffs. Qualitative methods were used for this purpose, to gain insight into public perceptions so as to overcome public resistance to reclaimed water. Public opinion on reclaimed water, treatment technologies and the costs associated with treatment and supply were beyond the scope of this research. This research deliberately avoided the duplication of public surveys regarding the "yuck" factor as conducted by Hartley et

al. (2006), Friedler et al. (2006) and other scholars, by adopting qualitative research methods. Qualitative research provides a means of gaining deeper insight into the human issue being researched (Morse, 1994; Field and Morse, 1985), such as public perceptions pertaining to water reclamation.

The general methodology applied in this research is a case study approach, which is used extensively for its strength in investigating observed phenomena[2] within a real-life context, especially when the boundaries between the phenomenon and its context are not clearly evident (Yin, 2003). The object is to acquire a better understanding of issues and events that cannot be controlled by the researcher, and when the research questions focus on why and how. To generate data on social and institutional implications, a qualitative research orientation involved the application of social theories and a case study approach to ensure that diversities across municipal scenarios and the public realm were accommodated.

1.5 OUTLINE OF THE REPORT

Research findings covered in this report are set out as per outline below:

- **Chapter 1: Introduction -** This chapter introduces the background of the study, presents its aims, the hypothesis, and briefly describes the research methodology. Components of investigation retained in the structure of this report are outlined.
- **Chapter 2: Research methods and framework -** This chapter presents the research methods and a framework covering the selection of case studies, research methods (case study approach and qualitative research, using snowballing samples, interviews and participatory focus groups) and data analysis.
- **Chapter 3: Review of institutional and social aspects of reclaimed water -** This chapter documents international and local knowledge about the institutional and social aspects of reclaimed water, regulations, reasons for choosing water reclamation as an alternative, public perceptions, and approaches to introducing reclaimed water.
- **Chapter 4: Potable use of reclaimed water: Institutional and social issues and regulations** - This chapter documents institutional and social issues surrounding the introduction of water reclamation for potable use, and regulations governing its implementation. The intention is to understand the institutional and social contexts emerging when water reclamation is introduced, as well as regulations governing its use in South Africa.
- **Chapter 5: Drivers and conditions of institutional decisions to implement water reclamation schemes** - This chapter outlines specific conditions (social, institutional and financial) that contribute to the choice of reclaimed water as alternative water augmentation option, focusing on institutional processes.
- **Chapter 6: Factors influencing public perceptions and governing people's decisions** - This chapter covers the application of social theories so as to identify factors that influence public perceptions and govern people's decisions concerning the potable use of reclaimed water. The intention of understanding specific factors influencing public perceptions is to pinpoint the essential elements in public acceptance, and the social networks that are activated in the process.
- **Chapter 7: Addressing public perceptions: Comparative analysis across case studies** - This chapter transparently unpacks the effects of public resistance in relation to the logical unfolding of the institutional process. The intention is to understand the social implications as elements in the outcomes of an institutional approach to addressing public perceptions in a South African municipal context.
- **Chapter 9: Conclusions and recommendations** - Key findings and recommendations for further research are summarised in this chapter.

[2] Refers to a situational context in which a real-life problem is being investigated. In this research, public resistance to potable use of reclaimed water is considered as an observed phenomenon that can best be captured and understood through a case study approach.

CHAPTER 2: RESEARCH FRAMEWOK AND METHODS

2.1 INTRODUCTION

The main aim of this research was to understand the institutional and social factors influencing the acceptance or rejection of water reuse, as well as the implications thereof. The purpose was to develop strategies and tools with which to address public resistance to using reclaimed water for portable applications through improved public knowledge acquisition and information flows, and deliberate engagement. While the literature suggests that the "yuck" factor is the main trigger for negative public perceptions, this study explored the extent to which disgust is a result of deficiencies in public knowledge and public engagement. If knowledge deficits and the absence of public engagement are remedied, many factors prompting public resistance may be overcome. This section of the report deals with the research framework and details of the research methodology.

2.2 RESEARCH FRAMEWORK

2.2.1 Approach

A qualitative approach was adopted to gain insights into public perceptions of water reclamation, to identify public knowledge requirements, and to ascertain the implications for institutional processes of public participation. The research team intentionally decided not to duplicate surveys such as those previously conducted by Hartley et al. (2006) and other scholars, which would presumably have produced similar outcomes. It was hoped that examining the actual empirical phenomenon in a context would lead to the discovery of ways in which public knowledge and public engagement might be improved to address negative public perceptions.

This research made use of two social theories – the Capability Approach (CA) and Social Network Theory (SNT) – which place emphasis on choice, opportunity and social capital. The CA is a broad normative framework for evaluating individual well-being and social arrangements, policy designs and proposals for social change (Robeyns, 2003). The CA was pioneered by Sen in the 1980s to explore the opportunities or capabilities that people have, to lead the kind of life they want to lead, to do what they want to do and to be the person they want to be (Robeyns, 2003).

Social theories underlying questions of choice, opportunity, organisation and networks were invoked to gain insight into public perceptions in a context of integrated water resources management (IWRM), in which participation is essential. The freedom to live a disease-free life and to be able to participate in public life is an essential right, but where there is a lack of agency, people are unable to make or influence decisions that affect their everyday living (Goldin, 2010).

Although public participation is at the core of integrated water resources management (IWRM), it may be difficult to accomplish if the public is burdened with a sense of shame, a lack of self-esteem, distrust, a sense of social exclusion and a lack of agency. The social theoretical lens contributed to shaping an analytical framework for testing the hypothesis in selected local cases. Guided by these underlying social theories, the research set out to identify the extent to which institutions accommodate both social and technical concerns in sharing their knowledge of the advantages and benefits of reclaimed water, so as to enable public acceptance.

2.2.2 Research questions

Table 2-1 outlines the aims of this research, key research questions, data collection methods and related tools.

Table 2-1:Research framewok

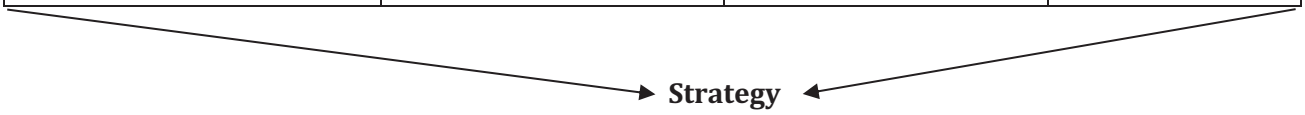
Aims	Questions	Data collection methods	Tools
Document international and local knowledge on reclaimed water and its implications for the society, institutions and economy, and the regulations that govern the potable use of reclaimed water	What are the social and institutional issues hindering the potable use of reclaimed water and regulations governing it?	- Desktop study (literature review)	Literature review framework
Investigate enabling factors, drivers and conditions that contribute to the use of reclaimed water for portable applications	What factors and conditions are contributing to the potable use of reclaimed water?	- Desktop study (literature review) - Case study visits - Interviews with officials - Workshops	Interview guide (questionnaire)
Investigate and document the range of factors influencing public perceptions and governing people's decisions regarding the potable use of reclaimed water	What factors influence public perceptions regarding the potable use of reclaimed water?	- Desktop study (literature review) - Social theory (CA and SNT) - Workshops (focus group)	- Questionnaire - Venn Diagram - Knowledge mapping - SWAG - Emoticons
Investigate, identify, measure and test major factors that govern people's attitude towards potable applications of reclaimed water	What factors govern people's perceptions regarding the potable application of reclaimed water?	- Desktop study (literature review) - Social theory (CA and SNT) - Interviews - Workshop (focus group & validation)	- Interview guide - Questionnaire - Continuum of acceptance - SWAG
Develop strategies that can be used to influence public opinion towards potable use of reclaimed water	What strategies can be used to influence the public's perception regarding the potable use of reclaimed water?	- Desktop analysis - Workshop (validation)	- Assessment matrix - User views analysis - Weighed preferences - Pair wise comparison
Develop an institutional framework for addressing public perceptions when introducing reclaimed water	How should public perception be addressed and water reclamation introduced in water stressed areas?	- Workshop - Focus group discussion	- User views analysis - Pair wise comparison
Develop a tool that will allow planners and water utilities to predicts potential public behaviour in relation to the proposed water reclamation schemes	What is the best way for water institutions avert negative public perceptions towards potable use of reclaimed water in a municipal context?	- Interviews - Focus group discussion	- Questionnaire - Ranking analysis

2.2.3 Analytical framework

The analytical framework (Table 2-2) accommodated strategies to empower public and institutional networks at the interface between civil society and water services institutions. This framework was applied to identify the essential components of strategies that can be used to empower the public through networks established at each stage of the institutional decision-making, implementation and post-implementation processes.

Table 2-2: Analytical framework

	Knowledge	Social Capital	Emotions
Planning (water scarcity)	Public consultation	Public consultation	Denial Doubt
Reconciliation study	Choice Public consultation Benefit/necessity	Public consultation	Doubt
Feasibility study **Reuse decision**	Choice Public consultation Cost of the option	Public consultation Safety/health concerns	Fear Mistrust
Implementation **Post implementation**	Choice Safety Public consultation	Public consultation Cost implications Media	Safety Trust



2.3 CASE STUDY APPROACH

2.3.1 Rationale

The case study approach is justified in that the provision of reclaimed water involves a range of different stakeholders, including users who interact in situations where individual behaviour cannot be controlled. This approach set out to engage a wide range of respondents in individual and focus group interviews, making use of multi-vocality and participant reflections in validating data and inferences. Meaningful interconnections between the research literature, questions, findings and inferences from the case study research are organised coherently to shape a strategy that is applicable at various stages in the process of introducing reclaimed water, on a range of scales and in a variety of locations in South Africa.

Water reclamation has been implemented in several areas in South Africa. Many more municipalities are tempted to introduce this alternative, for many reasons. The study initially examined potential case studies including George, the City of Cape Town, Emalahleni, Beaufort West, eThekwini and Overstrand municipalities. Beaufort West (BW) (inland), eThekwini (metro and coastal) and Overstrand (OV) (coastal) municipalities were selected for detailed investigations because of their differences in stages of implementation, variability of scale provided by the municipalities, and their topography and geographical position, namely an inland, a coastal and a metro site (Table 2-3). Beaufort West has already implemented water reclamation and is currently monitoring water quality and supplying water to the public. eThekwini has decided on implementation and Overstrand is at an advanced planning stage. The profiles of the individual case study areas are detailed in the section that follows.

Table 2-3: Case study selection criteria

	Beaufort West (BW)	eThekwini (EWS)	Overstrand (OV)
Population	37,101 people in 2010 - estimated growth rate of 1.4%.	3,442,361 people in 2013/14 (IDP).	80,432 people (Stats SA, 2012) estimated growth rate of 3.1% per annum
Location	Inland town located in central Karoo district which covers 16,330.10 km^2 and seven towns 460km north-east of Cape Town.	eThekwini is a coastal town which covers 2,297 Km^2. It is located in the south-east of South Africa	Overberg is located on south-eastern coastline district bordering the City of Cape Town, covers approximately 2,125 km^2
Features	Lies on national highway from Johannesburg to Cape Town. First municipal entity to be established in South Africa.	Third largest city in South Africa, a primary commercial hub. Biodiversity hotspot.	200km coastline of popular tourist villages. Whale coast
Factors	Severe drought, lack of reliable water resources, limited ground water, high cost of alternative options (e.g. desalination), water restriction by DWS	Population growth, immigration. economic growth, predicted water shortage, growing discharge of wastewater effluent, water restriction by DWS, ecological balance, minimising risks to health and environmental pollution, augment water availability	Recurrent drought, depletion of surface water limited ground water, high cost of alternative options (desalination), water restriction by DWS
Water reclamation stage	Water reclamation has been implemented and is operational	Water reclamation has been selected as an alternative. eThekwini is between the decision and implementation phases.	Reclamation has been identified as an alternative; The municipality is at an advanced planning stage.

2.3.2 Beaufort-West municipality

Beaufort West is 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^2 and is structured into seven Wards with a population of 37,598 inhabitants. Because of a long period of drought (2009 -2012), lack of reliable water resources and high cost of other alternative, the municipality relied on ground water that is currently under intense pressure. However, due to abstraction restriction by the state and high costs of options such as desalination and water transfer, water reclamation to augment water supply was suggested as suitable option in this context. In this tense context, Beaufort West becomes the first municipality in South Africa to implement a water reclamation scheme for potable application.

Despite a range of municipal efforts to inform the public, there appears to have been insufficient circulation. Not all the public had access to forms of communication in use, which reduced opportunities to acquire knowledge. Notices and local newspaper reports were minimal and many residents do not buy newspapers. Findings will assist in highlighting gaps in the operational process to determine an appropriate strategy to address implementation challenges. Hence, findings from Beaufort West were expected to assist in highlighting gaps in the implementation process to determine an appropriate strategy to address implementation challenges.

2.3.3 eThekwini municipality

eThekwini Municipality is a city located on the east coast of South Africa's KwaZulu-Natal Province. This metro covers an area of 2,297 km^2 with a population of about 3, 442,361. Water demand of approximately 1,200 ML exceeds reliable yields from local water resources, particularly during dry years. Due to host of reasons including population and economic growth, predicted water shortage, growing discharge of wastewater effluent, water restriction by DWS, need for ecological balance and minimisation of health & environmental risks and augmentation of water availability, eThekwini municipality explored various other alternatives for water supply.

Alternatives explored included construction of new dams, desalination, water reclamation and rainwater harvesting. Advantages and disadvantages of each of these alternatives were investigated. After a thorough assessment, water reclamation was selected because as economically reliable, environmentally responsible, technically feasible and short terms implementable compared to the other alternatives (Golder & Associates, 2012). However, studies undertaken to assess social acceptance of reclaimed water reuse reveal that the public is reluctant and not ready to accept the water use for portable applications for number of reasons (Wilson and Pfaff, 2008). Hence, eThekwini Municipality became an important case study to investigate the reasons for negative public perceptions.

2.3.4 Overstrand municipality

Overstrand Local Municipality is located within Overberg District Municipal area bordering the City of Cape Town, along the south-eastern coastline. A land area of approximately 2,125 km^2 has a coastline of about 200 km of popular tourist destinations, such as Hermanus. According to 2011 census, apart from seasonal influx, the municipal population was 80,432 people living in 28,010 households (Stats SA, 2012). According the reconciliation study, Overstrand Municipality is a water scarce area, which experienced below average rainfall over past years. Drought conditions experienced in Hermanus over a period of 2 to 3 years, contributed to the depletion of surface water, limiting volume of ground water and led to the implementation of water restriction by DWS.

As a result, the Overstrand Municipality decided to diversify its water sources by considering available alternative including water reclamation. Water reclamation and desalination were the two options envisaged (Overstrand Municipality, 2012). However, due to the cost of desalination and energy requirement, the municipality opted for water reclamation soon. Investigating the processes Overstrand Municipality plan to ensure successful implementation contributes to developing an approach covering this stage of water reclamation schemes.

2.4 SELECTION OF RESEARCH PARTICIPANTS

2.4.1 Research participants

The qualitative research approach accommodated multiple voices of individuals and collectives by identifying respondents in the public realm holding a variety of points of view and convening focus group workshops for them. Contact was made with social networks comprising civil society organisations and individuals, as well as practitioners at the cusp between institutions and the public, since the interface between water institutions and the public remains crucial to the focus of this study. For the field-based research in the case studies, purposive sampling methods were employed to identify research participants, allowing scope for snowballing (Morgan, 2008) to add further respondents for focus group and individual interviews.

In this research, participants were not merely respondents but co-researchers in a form of action research. Their role was not limited to providing information but extended to assisting the research team in the development of strategies and tools to influence public perceptions. Selected research participants included:

- Municipal officials (managers, engineers and community liaison officers) – for their involvement in the decision-making process, operation and provision of services;
- Activists – for their work as a public proxy; they are perceived as the eyes of the public;
- Non-governmental organisations – for their level of advocacy and activism;
- Political organisations – for their proximity to the public as formal representatives;
- Schools (primary and secondary; learners and teachers) – as learning organisations, they can both easily disseminate information and represent the youth;
- Public Health and educational outreach officials, for engagement in public health concerns;
- Media – for their proximity to the public and information dissemination;
- Religious organisation representatives – for their ability to mobilise and convey messages;
- Traditional leaders – for their influence and role in mobilising the community.

Stakeholder perspectives were concerned with water service delivery (i.e., water supply) and related issues at national, provincial, local governance and community levels. It should be noted that participation in the workshop was not limited to this target group, but was open to any individual willing and able to provide appropriate information. These participants were chosen so that we could capture data from the public, from institutions (on various levels) and, importantly, from what we identified as the cusp – the interface between the institutions and the public. Given the methods used to gather information, participants are essentially to be co-researchers.

In all three cases point of entry to public and institutional samples was through municipal engineering services. Protocol was observed by following up on initial interviews and engaging with samples of institutional respondents in individual and focus group interviews. Use was made of multi-vocality and member reflection to validate data and the researchers' inferences. The range of institutional perspectives encompassed water sector practitioners and professionals at the interface between users and municipal service providers, including representative structures.

Added value for this study was gained by including municipal structures that mobilise public participation, as well as outreach and public education officials, in generating data and verifying data analysis from their diverse perspectives. As municipal officials, representatives, public fora and NGOs made use of their public participation and outreach capabilities, qualitative data production served to verify previously reported public participation practices.

2.4.2 Purposive sampling

An initial set of stakeholders was identified during the preliminary field work conducted at the various case study municipalities (institutional visits) and in interaction with the public. Purposive sampling was employed: that is, the study participants were strategically selected as those most likely to meet the informational needs of the study (Bernard, 1995; De Vos, 1998; Patton, 2002). A purposive sample of participants who were available, knowledgeable and experienced in the field of study was thus drawn from the public and the institutions within the three case studies (see profile of participants in Appendix C).

The criteria for selecting stakeholders included being resident in the case study area, being affected by water scarcity or interested to know more about the planned provision of reclaimed water, and being willing to participate in the research. For institutional stakeholders, the criteria included knowledge of water service in

the case study, involvement in the provision or promotion of water services, and involvement in the daily operation of water treatment. Identified stakeholders were recruited and categorised according to their positions, interests, rights, responsibilities, relationships and levels of influence, using the stakeholders' power tool (Mayers, 2005; Reed et al., 2009) in order understand their level of participation and the extent to which they might meet the information needs of the research.

2.4.3 Snowball sampling

Once the sample of initial participants was established, a snowball sampling method (Morgan, 2008) was used to expand the network from initial contacts and ensure that all categories of participants were represented. Depending on the number of nominated stakeholders, the number of workshop participants ranged between twenty and fifty (Morse, 1994; Creswell, 1998; Kuzel, 1992), limited to those who were able to provide information for the study. Access to respondents was constrained by ethical, political and institutional networking capabilities, which manifested as the number of people brought together in particular focus groups or workshops.

To obtain permission, co-operation and support, the rationale, aims of the research and outcomes were described and discussed with participants. This involved telephone calls and the mailing of relevant documents. Subsequently, a letter of invitation to participate in the research workshop was sent to all identified participants, and follow-up calls were made to confirm attendance. Those who had agreed to participate were invited officially to the workshop and asked to bring any person whom they felt could contribute to the research by providing information.

2.5 DATA COLLECTION METHODS

2.5.1 Desktop study

International and local literature was reviewed to benefit from research relating to water reclamation, and to identify gaps. A variety of sources was used, including academic published and unpublished research, scholarly articles, government documents, books and the internet.

2.5.2 Participatory action research methods

This study applied qualitative research methods to gain insight into knowledge sharing and public engagement processes at various stages in processes of municipal decision-making and implementation in the three case studies (See Table 2.2 and Appendix E).

Focus group interviews (Appendices A and B) were held to produce a wider range of information, ideas and insights than that obtainable from individual responses secured separately (Barbie & Mouton, 2002). This allowed for one participant's inputs to trigger a chain reaction from other participants, prompting the sharing of ideas (ibid.). The focus group discussion was concluded by using guiding questions (See Appendix A). Responses were examined and clustered into themes that were further expanded into sub-themes relevant to the research aims (Appendix F).

Participatory methods were applied in focus group workshops to collect data required for initial field-based study. These methods involved mixed focus groups in workshops designed to provide opportunities to

generate and validate data from a range of perspectives. As part of an action-research approach, the validation of inferences based on collated data creates a bridge for co-analysis of the effects and implications of factors.

Questions across different sites were designed to capture varied public perceptions as primary data that could be organised in terms of four identified themes. Semi-structured questions led individual and focus group interviews that prompted responses regarding public knowledge and ways in which social networks were activated within each case study setting. Understanding whether and in what ways norms and values were changed by dialogues between people and institutions informed opportunities for remedying knowledge deficits and meeting public engagement challenges.

Further field investigation suggested the value of considering the effects of factors along a continuum. Rather than confining the effects of factors to polarities of Rejection or Acceptance, a Continuum of Acceptance was designed to move validated factors collated as data between Rejection, where doubts and uncertainty manifest as levels of resistance, through factors related to conditional acceptance to the Promotion of reclaimed water.

Participatory action research methodology was applied to data validation by engaging in problem-focused research to respond to local priorities in each case study. As a basis for considering the implications for institutions of engaging with their public, differentiation between technical/institutional and social/public types of actions preceded suggestions relating to priorities from a range of respondent perspectives in each case, as follows:

- Validation of collated factors influencing public perceptions might accept, qualify, reject, or add questions to our inferences in collated data summaries (see Appendix F);
- Effects of validated factors were considered, and those that exert influence on public responses were selected, using a Continuum of Acceptance;
- Implications of the factors were separated into institutional (technical/scientific) and public (social) types, before being placed in an initial sequence to integrate various types of action;
- Before finalising a sequence of steps, possible hindrances and benefits to progress were considered, and allowance made for additional steps to be incorporated at each stage of the institutional process.

Validation workshops reflected on the effects of public perception factors, before suggestions were made regarding different types of action to be arranged as a sequence of integrated steps to influence public responses to the institutional decision-making process for reclaimed water schemes. Steps were arranged in sequence to integrate different types of actions.

2.6 DATA COLLECTION TOOLS

2.6.1 Interviews guide

A semi-structured interview guide incorporating certain questions provided an anchor for the interviews. The guide is a flexible enough tool to adjust to a respondent's ability (or willingness) to supply information during the interview. As such it is a guide and not a structured instrument, which meant that it could be adapted during face-to-face interviews within and across cases. The semi-structured interview guide was also used for follow-up telephonic interviews with key informants.

2.6.2 Questionnaire (focus group discussion and validation workshops guides)

A focus group provides a closed space where key informants gather together to discuss a issue that is of concern or interest to all of them. The focus group is moderated by a facilitator who pays careful attention to giving all participants an opportunity to express diverse or similar feelings or concerns about the topic at hand.

- Focus group interviews: a set of questions defining the participatory methods used for responses to specific themes
  - profile stakeholder perspectives and how many of them
  - institutional roles were differentiated as line management perspectives;
- Focus group workshops: using participatory methods with user groups.

2.6.3 Venn Diagrams

Venn diagrams allowed each group to discuss and reflect on their responses to questions about social networks as institutional capital for addressing public responses to water issues. Diagrams were used in a number of ways: different sized circles or squares are used by participants/respondents to identify and show the relative importance of institutions or people, the relationships between them and/or resources, or problems and opportunities in relation to the subject at hand.

2.6.4 Participatory knowledge mapping

Mapping of focus group knowledge of the subject at hand was complemented by spontaneous sketching by senior municipal managers and consultants to illustrate reclaimed water systems and distribution.

2.6.5 Story with a gap

This tool demonstrates how a collective can be engaged in planning water, sanitation and health activities using a story (with a gap) to depict or conceptualise a “before” scene (problem situation) and an “after” scene (a greatly improved situation or solution to the problem), showing the steps to be taken to get from problem to solution.

2.6.6 Emoticons

Emoticons are participatory materials used to allow respondents to choose or depict freely the emoticons that related to their feeing. Emoticons were used to describe and represent the feelings of participants, including pride, anger, shame, trust, esteem, disgust and dignity. Seventeen emoticons were selected to disaggregate the feelings identified in the seven attributes above. These included hope/fear, engagement/apathy, doubt/confidence, energy/lethargy, pride/shame, enthusiasm/despair, clarity/confusion, calmness/anger, and sadness.

2.6.7 Continuum of acceptance

A Resistance to Change Continuum was adapted to design a Continuum of Acceptance to facilitate reflection on the effects of validated factors on public perceptions. The modes of public feeling were not confined to polarities, but located on a continuum between Rejection (most negative point of resistance) and Promotion (most positive point of acceptance). Validated factors placed along the continuum suggested appropriate

institutional and public actions to move public perceptions up the continuum created by respondents. The extent of resistance and acceptance prompted possible actions to move from resistance, up through degrees of acceptance, to promotion. Data production considered whether and in what ways various factors influenced public responses, decisions and actions, depending on the context and the stage of the institutional process.

2.7 DATA ANALYSIS

The questions and responses – in the form of the collective and individual narrative texts generated using the above tools (qualitative data) – were organised under three key themes, Knowledge, Social Capital, and Emotions. A distinction was made between factors that inform public perceptions and the consequences of these factors for choices, decisions and actions. In other words, the analysis inferred that perceptions were formed because of certain processes that were – or were not – followed. Because of these perceptions, there was rejection, degrees of resistance to or acceptance of, or promotion of reclaimed water for drinking purposes.

The factors and the subsequent emotions, perceptions and actions were placed in the analytical framework representing the institutional process for implementing water augmentation schemes to secure an understanding of what was happening at each stage. Thus, to each factor was attached an emotion(s) suggested/felt by respondents, a consequence and a proposed action to address the emotion(s). Emotions relating to each stage were clustered into primary and subset according to their impact on and consequences for the public, using weighted preference analysis. Actions suggested by individuals or focus groups within each of the three case studies were compared and grouped according to their occurrence (using pairwise comparison).

Suggested actions were later translated into a generic guideline by indicating stepwise what is required at each stage of the institutional process in terms of knowledge or information sharing and public engagement. The guideline was developed by combining the comparative analysis from data collected in the case studies and content analysis using data from the literature.

2.8 ETHICAL CONSIDERATIONS

The nature of the research required ethical aspects to be taken into consideration (Munhall, 1988; Field & Morse, 1985). The research was introduced to relevant authorities within and outside the case study areas to obtain their cooperation and support. Permission was obtained from respondents in the form of verbal and written consent which outlined all the rights to which they were entitled. It was further agreed that opinions expressed by respondents would be interpreted to the best ability of the researcher and that the data collected would be used only for the purposes of this research. This section of the research has outlined the methodology and tools used to collect data, as well as the theoretical and analytical framework of the research. The next chapter offers a review of the relevant literature and preliminary research findings pertaining to the use of reclaimed water for domestic applications.

CHAPTER 3: WATER REUSE – A REVIEW

3.1 INTRODUCTION

The need for more water for the growing population in the new century is generally assumed, without due consideration of whether available water resources could meet these needs in a sustainable manner. South Africa is no exception to the predicament, and some parts of the country, such as the Northern and Western Cape provinces, have semi-arid climate where drought is a normal recurrent feature (de Ronde et al., 1999; Rouault & Richard, 2003). Recent projections of water demand outstripping supply by 2019 have considered the economic impacts of growing urban development, increased pollution and predicted dryer climatic conditions (GreenCape, 2016). It is predicted that South Africa will face extreme water scarcity in the next 20-25 years if water is not used wisely. Numerous scientific studies have shown the increasing intensity, duration and spatial extent of droughts, associated with higher temperatures, warmer sea surface temperatures, changes in precipitation patterns and diminishing glaciers and snowpack (Morrison et al*.,* 2009). This will have significant social, environmental and economic impacts on the population.

The question of where the extra water might be sourced has led to scrutiny of present water-use strategies. This had led to recognition of the importance of making rational use of already available water, which if used sensibly could be enough for all. A new focus on existing resources shows that the recycling and reuse of wastewater effluent is being increasingly considered due to the rapid growth of populations and related developmental activities, including agriculture and industrial production (Vigneswaran & Sundaravadivel, 2004). Water conservation and demand management, desalination and water reclamation are some of the strategies that have been proposed in the South Africa National Water Strategy (2013) to supplement dwindling water sources.

This chapter offers a review of relevant local and international literature. Themes covered include the use of reclaimed water, drivers and conditions contributing to the use of reclaimed water, factors influencing public perceptions and governing people's decisions, strategies for influencing public attitudes towards using reclaimed water, and institutional approaches for introducing reclaimed water. Many international case studies were reviewed to assess the institutional aspects (ie, the institutions involved and institutional arrangements) and social aspects associated with the implementation of water reuse.

3.2 WATER REUSE APPLICATIONS

Among water use and conservation options, water reclamation for portable applications emerges as one potential alternative. In Africa (including South Africa) cities located on the coast have the possibility of opting for desalination, whereas inland cities may explore water reclamation as a last resort for direct potable use (Aravinthan, 2006). This latter alternative requires water institutions to take the public seriously and engage with them to influence their perceptions (Po et al., 2005; Beck, 2009). Water reclamation is particularly attractive where available water sources are already over-committed and cannot meet expanding water demands (Dishman et al., 1989). GreenCape (2016) notes that broad social and ecological values in respect of water are pertinent to water reclamation. Water reuse for potable purposes can either be direct or indirect (Table 3-1). Direct potable water reuse means adding treated wastewater directly into the normal drinking water distribution system (Cain, 2011). Indirect reuse comprises the reuse of treated or untreated wastewater from a surface water or groundwater body where it was discharged with the intention of reuse, before being abstracted for reuse at a new or different site of beneficial application (Cain, 2011).

Table 3-1: Reclaimed water applications (Adapted from Lazarova et al., 2013)

Reuse method	Type of use	Application	Constraints
Direct		Pipe to pipe blending of purified water and potable water	Health concerns and presence of unknown chemicals Public acceptance
Indirect	Replenishment of aquifers	Groundwater replenishment (by means of infiltration, direct recharge or injection)	Contamination of groundwater Salt and mineral build up Toxicological effects Public acceptance
	Replenishment of dams	Surface dam augmentation Blending of public dams	Health concerns Public acceptance

3.3 DRIVERS AND CONDITIONS FOR WATER REUSE

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 raise major concerns in many parts of the world which must be addressed (Cain, 2011). Furthermore, water resources are unevenly distributed, leading to dramatic regional and local water shortages. The problems are often exacerbated by surface and groundwater pollution and unsustainable water resources management (EIB, 2008). Because of these and other factors, the necessity for available and sustainable alternatives means that water reclamation becomes an option for augmenting water supplies. The factors prompting the introduction of reclaimed water for water augmentation may well differ from one country or area or context to another. Scholars have identified many drivers that have led water institutions to envisage or implement water reclamation for potable purposes.

A study by Cain (2011) points out the following factors:

- The global water situation: exponential economic and population growth and agricultural irrigation have significantly increased global water use; this is exacerbated by the uneven distribution of water resources;
- water scarcity and water stressed areas are predicted to increase over the coming years because of the growing demand for water for various needs;
- The right to water: access to water as a human right.

According to Vigneswaran and Sundaravadivel (2004), the major motivational factors for reclaiming water are:

- the opportunity to augment limited primary water sources;
- prevention of excessive diversion of water from alternative uses, including the natural environment;
- possibilities to manage in-situ water sources;
- reduction and elimination of discharges of wastewater (treated or untreated) into the environment;
- scope to overcome political, community and institutional constraints;
- Environmental impacts: poor effluent quality and stringent policies for wastewater discharge, as a factor triggering reuse.

In Australia, Po et al. (2003) reveal that water reclamation was introduced for many reasons including:

- experience of drought and prediction of further droughts from climate change;
- demand for greener water supply and conservation strategies from the public;
- conservation of higher quality water for suitable uses;
- Heightened awareness of benefits and advantages of recycling wastewater.

Scholars and water practitioners have diverging views on what constitute drivers for water reclamation. Cain (2011) claims that water scarcity, depletion of surface and groundwater resources, the global water situation (due to population and economic growth) and the right to water are key drivers for water reclamation. In

contrast, Vigneswaran and Sundaravadivel (2004) point out the comparative cost of water treatment, costs associated with water supply or wastewater disposal, prevention of excessive diversion from alternatives uses and reduction of wastewater effluent discharge, on-site water management, and consideration of reuse as a method of water resources management.

Other scholars consider looming water scarcity, water pollution control measures and protection of the aquatic environment (Kamizoulis et al., undated), and the need to obtain alternative water resources for a growing population (Asano & Bahri, undated). Water institutions consider alternatives to ensure a continuous water supply to the public, regardless of the circumstances. Other factors indicated are drought, lack of alternative water resources (e.g. Windhoek), a limited supply of fresh water (UNESCO, 2003), limited surface water sources (Tchobanoglous et al., 2011), and decreasing and irregular rainfall patterns. Tchobanoglous et al. (2011) claim that overdraft of groundwater, a lack of available alternatives in the proximity of the demand, and the cost effectiveness of reuse compared to other non-conventional alternatives (e.g. desalination) are contributing factors for introducing water reclamation. When they are placed in context, the drivers of water reclamation vary from region to region, as shown in Table 3-2.

Table 3-2: Drivers for water reclamation: International case studies[3]

Australia	**USA**				**Namibia**
	New Mexico	**California**	**Colorado**	**Texas**	
Droughts lack of potential water resources	Drought Need for long- term alternative	Semi-arid climate Limited local water sources No large ground water basins, Increasing costs of imported water Cost of pipelines Reduced snowpack and runoff	Construction of advanced water treatment plant	Severe drought Reduction in reservoir yields Growing water demand Increase in population	Desert conditions Water shortages Repeated periods of erratic rainfall Droughts Cost importing water High population growth Increasing water demand Reduced water quantity

Although scholars have pointed out various drivers, the predominant ones are a limited supply of fresh water (Unesco, 2003) or of conventional water sources (Tchobanoglous et al., 2011) coupled with a lack of alternative sources; on different levels, climate change and the cost of importing water from other sources and countries are also factors (Piao et al., 2010). Given the various drivers and diverging opinions amongst scholars, the research team undertook an analysis to understand the context in which these drivers are located. The outcomes of the analysis suggest that drivers for water reclamation can be categorised as natural, human induced, institutional, technical, economic/financial and motivational (Table 3-3).

- Natural drivers refer to those occurring naturally, such as drought or flood. Motivations stress the importance of reclaimed water reuse in extreme conditions in each context, such as drought or flooding, during which other alternatives may be less feasible.

- Human-induced and anthropogenic influences, such as the pollution of water sources, construction, increased population growth and development, etc., stress the importance of using reclaimed water when alternative options are not available or too costly.

[3]From sources including: AWR (2013), Steirer & Thorsen (2013), Schroeder et al. (2012), Menge (undated); Du Pisani (2005); Central Areas JV Consultants, 2004); Plummer Associates (2011)

Table 3-3: Clustering of triggers for water reclamation for potable applications

Natural	Human induced	Institutional	Technical	Economic	Motivational
Drought Lack of alternative water resources Limited traditional surface water sources Decreasing and irregular rainfall patterns	Increases in population growth in urban areas Agricultural irrigation has significantly increased global water use – uneven distribution of water resources Water scarcity and increasing water demand, leading to water stressed areas Contamination of ground and surface water Heterogenic distribution of water resources Reduction of catchment volumes because of population growth Overdraft of groundwater Lack of available alternative in the proximity of the demand	Government's duty to fulfil its constitutional mandate (right to water) Lack of effective conservation of available or existing sources of water Avoidance of environmental problems arising due to discharge of treated/ untreated wastewater	Types of wastewater to be treated Treatment technologies available and cost Energy requirements Extent of operational requirements Availability of sound treatment technology in compliance international water quality standards	Costs associated with water supply Reuse is frequently practiced as a method of water resources management Water tariffs	Opportunity to augment limited primary water sources; Prevention of excessive diversion of water from alternative uses, including natural environment; Possibility of managing in-situ water sources; Reduction and elimination of discharges of wastewater into receiving environment; Scope to overcome political, community and institutional constraints. Ensure continuous water supply

- Institutional drivers include prompts that have led water institutions to find alternatives sources in order to fulfill their institutional mandate, including municipal services provision and decision-making at the political level.

- Technical drivers comprise the treatment technology, operation and maintenance, monitoring and evaluation, water quality monitoring and compliance with regulations. These are prompts that determine technical feasibility, of concern to engineers and technical staff.

- Economic drivers encompass the consequences for the economy when water reclamation is envisaged or implemented, and include the cost of construction of the plant, operation and maintenance, water tariffs, affordability and willingness to pay, etc.

- Motivational drivers refer mainly to the triggers for decision-making that demonstrate the importance of water reclamation and ensure the public are aware of the necessity.

Scholars including Po et al. (2003), Vigneswaran and Sundaravadivel (2004) and many others have indicated that water institutions often cite these drivers in a certain sequence to obtain public buy-in for water reclamation. The sequence used often starts with natural drivers, followed by institutional and motivational ones. In many cases, technical drivers are embedded in institutional considerations, while natural and economic drivers are often reckoned to be motivational drivers. All these drivers are used to justify the decision to introduce water reclamation as an alternative water augmentation option.

3.4 INSTITUTIONAL ASPECTS

3.4.1 Overview

The provision of water services remains a function of the government in many countries. In these countries, governments have constitutional obligations to provide water to citizens regardless of the conditions and circumstances (e.g. droughts and increasing water demand). While roles and responsibilities may vary, it is generally agreed that public institutions play a key role in decision making regarding service provision and levels of service. Very often, institutions play a regulatory and service provider role while the public is involved in other aspects, including water resource planning, implementation and monitoring. Both institutional and public roles are intended to ensure adequate and successful service provision.

3.4.2 Governance dimensions to water reuse implementation

Reclaimed water reuse is a viable alternative for water augmentation, for various reasons discussed in previous sections of this report. Governance dimensions for water reuse implementation includes; policies and regulatory frameworks that guide water reuse implementation, as well as other activities related to public involvement and stakeholder collaboration. These aspects are vital as they can either ease or hinder the wider adoption of water reuse (Frijns et al., 2016).

3.4.2.1 Health based regulations governing water reuse

Standards and criteria governing water reclamation for direct potable purposes are well established in regions where water reclamation is commonly practised (City of Alberta, 2002), and there is much to be learned from their experience. Regions where reuse is practised have many years of experience in regulating the use of reclaimed water and have revised their regulations over the years to account for development in reuse applications, treatment processes and analytical capabilities. Florida, California and New South Wales (Australia) are good examples of such areas (City of Alberta, 2002). There is a comprehensive list of regulations governing water reuse in many countries where water reclamation is effective (Table 3-4), although not many of these are directly related to direct potable reuse.

New Mexico has the highest number of instruments and committees, including Guidelines for Water Reuse and the Drinking Water Strategy (DWS). All three case studies also have health regulations covering drinking water standards. Australia, Singapore and Namibia are guided by the World Health Organisation guidelines (WHO, 2006).

Windhoek uses a combination of local and international regulations to implement and monitor water reuse and ascertain the safety and quality of final water, the main ones being the *World Health Organisation guidelines* (1993), *Rand Water (South Africa) potable water quality criteria* (1996) and the Namibian *Guidelines* for Group A water (NamWater, 1998). The monitoring regulations for Windhoek are based on monitoring of water quality levels in terms of physical, chemical and other parameters (City of Windhoek, 2005).

Table 3-4: Regulations governing wastewater reuse for potable purposes

	Australia	**Singapore**	**New Mexico**	**Namibia**
Health regulations	Australian Drinking Water Standards World Health Organisation (WHO) Guidelines (2006)	Environmental Public Health (EPH) Quality of Piped Drinking Water Regulations (2008) World Health Organisation guidelines Water safety planning (WSP)	US Environmental Protection Agency Guidelines for Water Reuse Health and Human Services (HHS)	World Health Organisation Guidelines Rand Water NamWater
Monitoring regulations	Australian Guidelines for water recycling	Water Safety Plan	Guidelines for Water Reuse	Water quality monitoring

3.4.2.2 Frameworks guiding water reuse implementation

Deciding to reclaim water for reuse may be an issue if the public is not adequately consulted, or the funding necessary for the construction, operation and maintenance of the plant, as well as for water quality monitoring, is not available. Where these pre-requisites are met, the implementation of such an initiative remains of utmost importance and adequate strategies should be in place to ensure its success. Many theories have been applied to develop strategies for implementing new technological initiatives in a community context, one of these being social marketing. Social marketing is a concept that was developed in the 1950s by Wiebe to increase acceptance of new technology. Nowadays, this concept is applicable to many issues of public importance, including acceptance of the potable use of recycled water.

The approach applies marketing concepts and techniques to successfully promote social objectives such as pollution control or a healthy lifestyle (Kotler & Zaltman, 1971), and can be used effectively to increase acceptance of recycled water use (Dishman et al., 1989). It has been used to encourage water use efficiency (McKenzie-Mohr, 2000). Despite its claimed strengths, social marketing does face critics and problems with implementation. Andreasen (2002) highlights various obstacles to social marketing, including a lack of appreciation at top management levels, perceived undesirable traits, inadequate documentation and publicity of successes, and lack of academic structure. Po et al. (2003) claim (without substantiating their opinions) that social marketing is ineffective in increasing acceptance of the potable use of recycled water.

Reclaimed water reuse initiatives have been implemented predominantly by engineers, who decide, announce and defend based on technical considerations only. This approach is seen by many as inadequate (Baggett et al., 2004) because it fails to consider any related issues, including social and economic ones. The most important strategy for the implementation of a project to reuse reclaimed wastewater is to conduct a risk assessment (Jhansi & Mishra, 2013). Proper consideration of health risks and quality restrictions must be part of the assessment (ibid.). A crucially important part of the risk assessment is to engage and involve the public in every step of the process. This is because it would a waste of time and money to introduce the reuse of reclaimed wastewater for domestic application only to find out that the public will not accept the water.

Public engagement also helps to improve the chances of the public accepting the reuse of reclaimed water. This is because by engaging the public in this process the public gains a clear understanding of the water situation and of the benefits of using reclaimed water (Jhansi & Mishra, 2013). It is important to note that, for the promotion of new technology, strategies must include local participation as well as municipal action (Jhansi & Mishra, 2013). This has been characterised by Pestoff (2006) as co-production. Local communities can contribute valid indigenous ideas to a project. Agreement on key issues between institutions and the public is vital in the early stages of the project (Jhansi & Mishra, 2013).

States and municipalities where reclaimed water reuse is planned or has been implemented have used or are planning to use strategies of engagement that vary significantly according to the local situation (Table 3-5). The most widely used strategy is social marketing, which involves public education about the water resources in that specific area and the whole idea of the wastewater reuse process (Lahnsteiner & Lempert, 2007; Boucher et al., 2012). Each water institution educates the public in different ways; for example, in Windhoek the municipality collaborates with other institutions such as education, so that students are taught about water reuse in schools (Lahnsteiner & Lempert, 2007). The municipality also collaborates with 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 (Boucher et al., 2012).

Table 3-5: Strategies used to implement reclaimed water (International experience)

Tchobanoglous et al. (2011)	Jhansi & Mishra (2013)	Weeramanthri (2011) – AWR (2013)
- Technical issues - Social issues (user acceptance)	- Appropriate technologies - Promotion of technology - Risk assessment - Public engagement	- Community involvement - Public & media communication - User surveys

In Australia, strategies used have included community involvement (to obtain public support prior to implementation) (Recycled Water Task Force, 2003) and a public and media communication strategy (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 reuse initiative (AWR, 2013). The survey covers the broad public, including industry bodies, academic organisations, state government departments and agencies, health regulators, drinking water service providers/managers, local government and its related associations, Commonwealth Government departments and agencies, interested individuals, and private companies.

In the USA, Tchobanoglous et al. (2011), citing Livingstone (2008), identify public meetings (at various levels, ranging from a village committee to municipal officials), radio interviews, and media articles as strategies that emerged from the social marketing approach as developed by Wiebe. Steirer and Thorsen (2013) mention public education and information programmes, media coverage of the process, tours and presentations. All these strategies are institutional processes in which institutions engage with the public with a view to achieving social objectives.

Despite having outlined various strategies recommended for introducing reclaimed water reuse, there is no evidence of a documented approach to guide the implementation of reclaimed water reuse in the literature so far. At the international level, for example (referring to Australia, Namibia and USA), the strategies were implemented randomly as occasion arose. The only document being available is the best practices in reclaimed water reuse (Lazorova et al., 2013) that covers case studies' best practices in reclaimed water reuse.

3.4.3 Institutional arrangements – international case studies

Smith (2013) argues that different institutions involved directly or indirectly in reclaimed water reuse can play different roles, depending on their powers and influence on the public. In general, the institutions involved include governments (national and provincial) through different departments and support services, private (consultants, contractors), non-government organisations, community-based organisations, civil society and the public. According to McKay and Halanaik (2003), six types of institutional arrangements exist, including statutory authorities, local governments, government-owned corporations, private entities, revised cooperatives and companies under the corporation laws. Each of these institutions plays specific roles to achieve social objectives, especially when mandated by law. In most instances, national government is the only stakeholder that can appoint other institutions to fulfil specific roles.

Four international case studies were reviewed to assess the institutional aspects of introducing water reclamation to the public (ie, the institutions involved and institutional arrangements).

3.4.3.1 Australia

Six institutions including statutory authorities, local government, and government-owned corporations, private entities, revised co-operatives and companies under the Corporations Law, were found to be involved in water reclamation projects. In most cases, the state government is the only shareholder and appoints directors in new water who are not public servants. In view of the wide diversity of the organisational and managerial structures of the newly created water utilities both within and across states, the qualification, selection process and the conditions of appointment of the directors of these utilities and enterprises are neither uniform nor entirely transparent (McKay & Halanaik, 2003).

The National Competition Council (NCC), an independent body, is responsible for assessing each jurisdiction's performance in implementing a framework to achieve an efficient and sustainable water industry. The required reforms and assessment constitute the basis for determining eligibility for payment (Australian Government, 2007). 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).

According to the 2011 Australia Guidelines for Water Recycling (ADWG, 2011), strategies developed to inform the public about water services in the municipalities should provide detailed policies for planning and implementation. The policies should be clear and succinct, and should address broad issues and the consequences of the organisation's commitment and approach to drinking water quality management. The policy may cover issues such as commitment to drinking water quality management, the level of service provided, the involvement of employees, compliance with relevant regulations and other requirements, liaison and cooperation with relevant agencies (including health departments and other regulators), communication with employees and the public, intention to adopt best practice management, possible obstacles, and a commitment to continual improvement in the management of drinking water quality.

Community consultation might include briefings targeted at specific groups with interests or responsibilities, workshops or seminars on key issues or for special groups, focus groups, and market research or surveys to determine community views, knowledge and attitudes; customer councils or customer panels, informative media programmes targeting print media, radio and television; community education or information exchange programmes, school programmes, preparation of technical issues papers, media advertising of activities and available papers, and public hearings for major and controversial initiatives.

Several aspects of the management of drinking water quality required involvement with other agencies. For example, collaboration with the appropriate agency was necessary where catchments and source waters were beyond the drinking water supplier's jurisdiction. Similarly, consultation with relevant health and other regulatory authorities was necessary for establishing many elements of drinking water quality management, such as monitoring and reporting requirements, emergency response plans and communication strategies (ADWG, 2011). The range of agencies involved in individual water supply systems could vary, depending on local organisational and institutional arrangements. Agencies in Australia include health and environment protection authorities, catchment and water resource management agencies, local government and planning authorities, non-government organisations, community-based groups and industry associations (ADWG, 2011).

The Australian case study illustrates the involvement of different institutions in reclaimed water projects. The National Competition Council (an independent body) was allocated a responsibility to assess the performance of other institutions in implementing a framework to establish an efficient and sustainable water industry, while the council of Australian governments (a body that regroups the provincial governments) was tasked to monitor community participation at each phase of the reclaimed water reuse project (McKay, 2005). The City Council (for instance, Toowoomba City) was responsible for a public awareness campaign using various media (such as leaflets).

3.4.3.2 Singapore

The first initiative for using recycled water for drinking purpose was organised by an inter-sectoral committee headed by the Health Minister. This was probably one of the earliest examples of governmental inter-agency collaboration, which later on became a normal practice. The agencies involved included the Ministry of Health, local authorities and community-based organisations (Bartram et al., 2009). Among the major factors contributing to Singapore's water management success were public education and major stakeholder involvement in sustaining water resources. To ease public anxiety around the recycled water project, the expert panel and local government declared NEWater to be purer than tap water.

3.4.3.3 New Mexico

In New Mexico, reuse projects are generally funded through State Revolving Funding (SRF), USDA grant/loan funds, 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 address their utility and economic development infrastructure needs (Western States Water Council, 2011). The state's Ground Water Storage and Recovery Act was enacted in 1999 and allowed governmental and quasi-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 (Western States Water Council, 2011).

The New Mexico Environment Department (NMED) routinely highlights the benefits of reuse and promotes reuse projects. It also attempts to instruct the public on the rationale for reuse and a reasonable reuse standard aimed at ensuring public safety, through public meetings, hearings, presentations, and other outlets (Western States Water Council, 2011). The 2008 legislation Senate Bill 1069 (S.B. 1069) directed Oregon Water Resources Department (OWRD) to provide grants for studying the feasibility of water conservation, reuse and storage projects, including the analysis of long-term environmental consequences.

The Department of Environmental Quality (IDEQ) in New Mexico hosts an annual reuse conference that includes representatives from cities, the state, federal agencies, consultants, developers, etc. to discuss reuse. IDEQ provides grants and loan opportunities for wastewater treatment facilities (Western States Water Council, 2011). The New Mexico (NM) Environment Department has participated in the Water Reuse Committee, which is affiliated with the Rocky Mountain Section of the Water Environment Federation. The Department of Environment and Natural Resource has worked with industries and communities to address individual concerns and provide water quality testing, to demonstrate the effectiveness of wastewater treatment and land application (Lee, 2011).

The New Mexico Water Quality Control Commission (WQCC) is the water pollution control agency for the purposes of the federal Clean Water Act, and for the wellhead protection and sole source aquifer programmes of the federal Safe Drinking Water Act. The WQCC also administers and enforces the New Mexico Utility Operator Certification Act. The duties and powers of the WQCC include: adoption of a comprehensive water quality management programme, development of a continuing planning process, administration of loans and grants from the federal government, adoption of water quality standards, adoption of regulations to prevent or abate water pollution; serving as a forum to facilitate and advance a state wide policy dialogue on important water quality topics, playing a role in quasi-judicial administrative hearings concerning appeals of certain agency decisions, such as permitting actions and adoption of regulations (Malkin, 2003).

These findings suggest that institutional aspects of water reclamation are mainly related to the roles of institutions. These roles vary from one country to another and include but are not limited to:

i) conducting a reconciliation study (Hay et al. 2011) to determine the availability of water, service provision and water quality monitoring;
ii) development of an Integrated Water Resource Management (IWRM) Action Plan to guide water resources-related activities (Western Cape IWRM Action Plan, 2011);
iii) funding, liaison with the public/users and other institutions, water quality assurance, and adherence to regulations (Crook, 2010) and
iv) the development of a water sector plan for water resource use, conservation and management (DWS, 2013).

3.4.3.4 Namibia

In Windhoek reconciliation strategy studies were undertaken, which aimed at increasing public awareness about the 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. Water institutions have been involved in public awareness and school programmes. These were achieved through publishing information about the state of water in the City through the media including radio, television and local newspapers (Lahnsteiner & Lempert, 2007; Boucher et al., 2012). The Integrated Water Resources Management Plan (IWRMP) helped in facilitating information sharing between government institutions, the private sector, the public and all interested and affected parties. A wide range of strategies was used to communicate with and involve the public in water issues, including the media, community meetings and one-on-one interviews.

Water reclamation was initiated and funded by the central government of Namibia (Menge, undated). The funding was intended for the feasibility studies that looked at alternative options, project initiation, construction (implementation), monitoring and continuous public awareness (Menge, undated, citing City of Windhoek). The regulatory roles here involve water quality monitoring and compliance with local and international standards (e.g., WHO). The city of Windhoek plays the institutional role of water service and quality assurance provider in Namibia. This role entails the treatment of reclaimed water to potable quality standards and distribution to industry and the public (City of Windhoek, undated).

3.4.3.5 Summary

These examples highlight the need for different kinds of institutional arrangements (Table 3-6) that should be in place to ensure the successful implementation of a reclaimed water project. The arrangements can vary from one government to another depending on the local situation.

In the context of this study, institutional arrangements identified include (see Lagardien, Muanda and Benjamin, 2012):

- The initiation phase: during this phase, various government departments and services consult to undertake reconciliation and feasibility studies to identify the water security status and treatment technology applicable. It is important at this stage to outline funding requirements for all phases of the project.
- The implementation phase: here, other organisations such as contractors and consultants become involved to provide their expertise in terms of design, construction and monitoring of the plant; while the former organisations continue to provide support in terms of funding and control.
- The post-implementation phase: here, reference is made to technical capacity to operate and monitor the reclaimed water plant. In many cases, a level of service agreement is concluded that allows for a private consultant to be contracted to operate and maintain the plant while training municipal staff.

Table 3-6: Institutions involved in the implementation of water reuse

Australia	**Singapore**	**New Mexico**	**Namibia**
Statutory authorities	Dept. of Health	Water quality control commission	City of Windhoek
Private entities	Local authorities	New Mexico Environment Dept.	Central government
Government-owned corporations	Community-based organisations	Dept. of Environmental Quality	Department of Health
Local governments	Panel of experts	Water Environment Federation	
Co-operatives	Local government	Dept. of Environment & Natural Resources	
Corporations Law companies		USDA	
National Competition Council		Environmental Protection Agency	
Council of Governments		State Revolving Funding	
Health & environment protection authorities			
Planning authorities			
NGOs and CBO groups			
Industry associations			

It should be noted that institutional arrangements (as indicated above) are meant to assign specific roles to the various departments, organisations and services involved in the reclaimed water reuse project. The role of institutions in water reuse can vary significantly from one country to another depending on local conditions. In most of cases, the central government plays an important role in funding the project and enacting regulations. Other roles, such as water treatment and quality monitoring, and public liaison, are allocated to local government, municipalities and community organisations.

3.5 SOCIAL ASPECTS

3.5.1 Background and experience

The first planned use of reclaimed water for portable applications dates to the 1950s, but it was only twenty years later that researchers began to consider public perceptions and acceptance of water reuse (Po et al., 2003). Potable applications of reclaimed water remain relatively uncommon because many people are repelled by the thought of water that has been in toilets going to taps. But although the idea of water reuse may be repugnant to the public, the use of reclaimed water for portable applications has been technically feasible for many years (Menge, undated). Most significant developments in water reclamation have occurred in Australia, Singapore, the Middle East and the United States (Tchobanoglous et al., 2011), Namibia (Menge, undated), and more recently, in South Africa.

The (direct and indirect) use of reclaimed water for portable applications, however, is less common, largely because many people are repelled by the thought of drinking water that has been in toilets. In a few countries, including Australia, Namibia, and the United States of America (states such as California, Texas, Kansas, Colorado and New Mexico) people are already drinking reclaimed water, demonstrating that such water can be safe and clean, and help ease water shortages (Asano & Bahri, undated; Crook, 2010).

Due to extreme drought conditions, the city of Windhoek in Namibia embarked on extensive research on direct potable water reuse technology, and an epidemiological study was conducted to assess the health effects of reclaimed water consumption. The city of Windhoek initiated the direct potable reuse of reclaimed water scheme in 1968 as the city approached the limits of its conventional drinking water sources during the 1960s when groundwater and surface water sources for the city had already been fully harnessed (Di Pisani, 2005). The water reclamation scheme from domestic wastewater was adopted to supplement potable water to the city (Vigneswaran & Sundaravadivel, 2004). The Namibian water reclamation plant provides a working example of a successful scheme, which has shown that reclaiming water is a possibility solution to water shortage and a viable water augmentation option.

3.5.2 Public perceptions and acceptance of water reuse

Since at least 1970, potable application has consistently been one of the least popular uses of reclaimed water (Kemp et al., 2012). The literature notes many social issues associated with water reclamation, for human consumption. In Orange County (California, USA), the public feeling was that reclaimed water was still wastewater (Lawrence, 2000); in the United Kingdom, people preferred to use their own recycled wastewater than any from a common public source (Jeffrey, 2001); and in Australia (city of Toowoomba), members of the community voted against reuse (Christen, 2005; Hurlimann and McKay, 2004). Although water reclamation has been hailed for its potential and is gaining momentum worldwide, there are numerous examples, both nationally and internationally, of public resistance to the potable application of reclaimed water (Wilson and Pfaff, 2008; Hurlimann and Dolnicar, 2010).

A study by Alhumoud and Madzikanda (2010) of people's attitudes in Kuwait found that only 5.26% of respondents accepted the idea of drinking reclaimed water (versus 77.91% against it). The majority of respondents suggested that reclaimed water could be used for other purposes including agriculture (75.3%), car washing (66.8%), house cleaning (55.60%), and laundry (20.9%), showering (15.2%) and cooking (8.33%). This indicates that the use of reclaimed water for portable applications can be contentious despite its potential. Reasons for resisting the potable use of reclaimed water are mainly health (69%), psychological (54%), beliefs

(29%), mistrust of workers (referring to their technical capacity) (25%), mistrust of the technology (machine breakdowns etc.) (19%) and other minor issues (7%) (Alhumoud and Madzikanda, 2010).

The introduction of water reclamation is often met with public resistance. Experts have found that reclaimed water is cleaner for direct potable reuse than conventionally treated water, which has unknown risks of exposure to contaminants that are not fully treated (Asano et al., 2006; Tchobanoglous et al., 2011). But despite the technical know-how and the 'science' around reclaimed water, the gaps between layperson and expert knowledge continue to perpetuate public mistrust. Authorities tend to become defensive when faced with public opposition (Beck, 2009). The tensions between the 'science of the experts' and what Thompson (2002) in Goldin (2005) has called 'the science of the people*'* notwithstanding, there is growing acknowledgement by water services institutions that reclaiming water for domestic applications is an option worth pursuing. It remains an option requiring sensitivity when engaging with individuals, households and communities. Understanding the social aspects of the matter is therefore a key determinant of whether water reclamation will become a viable solution for ensuring an adequate, reliable and safe alternative for domestic water supplies.

A study by Alhumoud and Madzikanda (2010) regarding people's attitude towards drinking reclaimed water in Kuwait revealed that only 5.26% of respondents (against 77.91% not in favour) accepted reclaimed water for portable applications. These findings underscore public perceptions of the potable use of reclaimed water and provide an indication of public disgust and resistance. Public resistance is mainly attributable to health and water quality concerns (Hartley, 2001; 2006; Marks, 2002) and a general unwillingness to use reclaimed water (Olson, 1979; Marks et al., 2004; Po et al., 2005). Other factors suggested in the literature include people's age (Hurlimann and McKay, 2003), gender (Tsagarakis et al., 2007), and education level (Olson et al., 1979). However, Marks (2004) suggests that apart from gender, there is no demographic or social factor that predicts acceptance of reclaimed water. This implies that the problem lies in public perceptions of reclaimed water, often expressed as the "yuck" factor[4] or repugnance.

Other factors may include understanding water reclamation (purpose and treatment process), the level of involvement of the public in the choice of reclamation, willingness to pay (Hartley, 2001), and a level of superstition. eThekwini Municipality is the most recent South African example where religious leaders appear to have rejected a water reclamation proposal (Wilson and Pfaff, 2008). Addressing this question, Adewumi et al. (2011) used trust, attitudes and control as measures for predicting the inclination of the public to reject or accept non-potable and non-domestic uses of reclaimed water in South Africa. This study found that the key factors underlying public perceptions are knowledge of the advantages, degree of control over sources, and trust in the service provider (in addition to subjective norms). Although assessing the subjective norms of respondents lacked a reliable scale, it was found overall that in South Africa water reclamation would profit from addressing factors underlying public resistance prior to implementation (ibid.).

3.5.3 Factors influencing public perceptions and governing people's decisions

The public is a major stakeholder in water management decisions. As with any water project, the success or failure of a proposed water reclamation scheme may depend on public perceptions as far as public health, safety, water quality (taste and aesthetics), land use, environmental protection, and economic growth and public finance are concerned (Dolnicar & Schafer, 2009). The question of how the public may play a role in institutional decision-making processes ought to be addressed, as reliable access to potable water clearly affects their wellbeing. Both international and local research has shown that the decision to introduce water reclamation as a water augmentation option has often ignored public concerns. It is thus unsurprising that negative public perceptions regarding reclaimed water hinge on distrust of the service provider (Po et al., 2003;

[4] a general discomfort from the thought of consuming recycled water and risks associated with such use

Ilemobade et al., 2011) and public knowledge deficits, just as – on the contrary – cost and technical considerations dominate conventional engineering professionals' concerns.

Public perceptions remain one of the key obstacles to succeeding with a reclaimed water initiative. Several studies have identified the sorts of factors that influence public perceptions. According to Po et al. (2003), they include the disgust factor, health risks associated with using recycled water, specific uses and sources of water to be recycled, the issue of choice, trust in the authorities and scientific knowledge, attitudes toward the environment, environmental justice, the cost of recycled water and certain socio-demographic factors. These factors are expanded upon, below.

3.5.3.1 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 emotion of disgust provoked by the thought of using recycled water. This emotion has been defined as "the emotional discomfort generated from close contact with certain unpleasant stimuli" (Angyal, 1941, cited in Po et al., 2003:15). The disgust reaction to using recycled water is generated by the perceived dirtiness of the water and the fear of being contaminated by it.

3.5.3.2 Perceptions of risks associated with using recycled water

Another factor overlapping with the above and influencing public acceptance is the perceived health risk of using recycled water (an example was apparent in the Sydney Water Study of 1999, for instance, where respondents were asked about the disadvantages of using recycled water). Despite constant reassurance by experts as to the quality of recycled water, the public still perceives a risk associated with recycled water. Perceptions of acceptable risk differ between the experts and the lay person. Slovic (1998) notes that the public tends to inflate its concept of risk with emotional factors such as uncertainty, dread, catastrophic potential, etc. On the other hand, the experts define risk in terms of event probabilities and treat subjective factors as incidental and not material. Experts consider a one in a million risk of getting sick as acceptable, whereas this could be totally unacceptable to members of the public because that one case could be themselves or one of their children.

3.5.3.3 The specific uses of recycled water

The way recycled water is used affects people's perceptions and acceptance of the water. Recycled water for purposes other than the potable has been generally accepted. When the water is closer to human contact or ingestion, people tend to oppose its use (Alhumoud and Madzikanda, 2010).

3.5.3.4 The sources of water to be recycled

The "use history" of the water was found to be a factor affecting the acceptability of recycled water (Jeffrey & Jefferson, 2002; Nancarrow et al., 2002, cited in Po et al., 2003). The reuse of grey water from one's own household was more acceptable than water obtained from other public sources (Jeffrey & Jefferson, 2002; Nancarrow et al., 2002, cited in Po et al., 2003). Kaercher et al. (2003) (cited in Po et al., 2003) also found that the public preferred using recycled water from their own sources, rather even than those of their neighbourhood. Two underlying factors could be responsible for these differences: the perceived quality of the recycled water and the perceived control over its quality.

3.5.3.5 The issue of choice

Some studies have shown that where there is a water shortage, people readily accept the use of recycled water because they are aware of the need to conserve water (although this does not necessarily guarantee public acceptance). When there is an alternative water source available, people question the need for reuse (Wilson and Pfaff, 2008). For example, the Melbourne study by Po et al. (2003) indicated that there had to be genuine need for using recycled water, and that it should only be considered if other solutions were not practical or economically feasible.

3.5.3.6 Trust in the authorities and scientific knowledge

Trust both in the authorities to provide safe recycled water and in the scientific processes and technologies that produce it, have an impact on perceptions. Syme and Williams (1993) suggest that trust in the water authorities is the main indicator of how acceptable people perceive the quality of their drinking water to be. Yet despite public trust in certain institutions, Jeffrey and Jefferson (2002), cited in Po et al. (2003), found that people may remain unwilling to use recycled water. They found that people usually relied on their impressions of the water quality to decide as to whether they could accept using recycled water (ibid.).

3.5.3.7 Attitudes toward the environment

Jeffrey and Jefferson (2002) note that reviews of conservation in general indicate a need to look at specific attitudes around issues rather than broad general environmental concerns. People might have strong environmental values but choose to show these in different contexts. For instance, some people may respond more strongly to wildlife conservation, and others to water conservation.

3.5.3.8 Environmental justice issues

These issues can influence how people perceive recycled water. The low- and medium-income communities who were the major recipients of recycled water in San Diego opposed the re-purification project due to perceived injustice (Recycled Water Task Force, 2003, cited in Po et al., 2003). This perception resulted in strong community resentment which subsequently led to the failure of the project. In Sydney, water users expressed aesthetic concerns over neighbourhood treatment plants (Kaercher et al., 2003). They were less opposed to neighbourhood-based treatment plants if they were located away from the main residential areas.

3.5.3.9 The cost of recycled water

The cost of recycled water 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 public expects to pay less for using recycled water because of the water quality and because of restrictions on its use. Some users considered that a lower price was a way to encourage both acceptance and investment in the up-front costs.

3.5.3.10 Socio-demographic factors

Socio-demographic factors have been identified as prominent in public perceptions of water reuse. McKay and Hurlimann (2003) noted that people aged fifty years and over have the greatest opposition to recycled water. Hartley (2003), also cited in Po et al. (2003), found that elder women were less supportive of potable water reuse. In contrast, Jeffrey and Jefferson (2002) found no significant difference in the public support of grey water reuse across gender, age or socio-economic groups.

3.5.3.11 Others

Although factors influencing perceptions may be context-specific, Menge (undated) and Boucher et al. (2012) added droughts, population growth, the lack of alternative resources and the depletion of existing resources to the many factors that may impact on public acceptance. Tchobanoglous et al. (2011) maintain that factors influencing users' acceptance may evolve when: (i) alternative water sources are poor, altered or expensive; (ii) there is a reduction in conventional water resources; (iii) wastewater effluent is available and the cost of reclaimed water is low compared to other options; and (iv) the lack of suitable hydrogeology for groundwater recharge is apparent.

Other studies have linked knowledge deficit to negative perceptions of reclaimed water and health concerns (Dolnicar & Saunders, 2006), to the quality of reclaimed water (Hurlimann & McKay, 2007) and tariffs (Hurlimann, 2009). A study conducted in Kuwait by Alhumoud and Madzikanda (2010) on public perceptions of and attitudes towards reclaimed water revealed that the main reasons for resisting potable use are health (69%), psychological (54%), beliefs (29%), mistrust in workers – referring to technical capacity (25%), technical mistrust (machine breakdown) (19%) and other minor issues (7%).

3.5.4 Addressing public perceptions and acceptance - a review

It is widely understood that public acceptance of reclaimed water requires engagement, constructive consultation and the active involvement of the public to arrive at sustainable solutions before decision-making (Beck, 2009). Reclaiming water for potable re-use involves water services institutions taking the public seriously (ibid.). Factors associated with the mistrust of water institutions are aggravated by making decisions first and then defending these against public expressions of opposition. This has been described as a Decide-Announce-Defend (DAD) approach (Beck, 2009).

While it is acknowledged that much research has been conducted into the use of reclaimed water and public acceptance, etc., very few studies (e.g. Kemp et al.; 2012; Alhumoud and Madzikanda, 2010; USFDA, 2009; Dolnicar & Saunders, 2006) have succinctly addressed the question of strategies for improving public perceptions and enhancing acceptance. The studies cited above focus mainly on informing institutions about strategies and approaches to deal with negative public perceptions. These strategies are important as they may provide a platform from which institutions can respond to public concerns and mistrust about reclaimed water.

The frequent media portrayal of noxious wastewater is said to have a negative impact on perceptions of reclaimed water. The media often point to the failure of municipalities to produce drinking water and wastewater effluent that meet quality standards for drinking and discharge respectively. If municipalities are struggling to comply with discharge standards, how can wastewater be treated to meet drinking standards? This perception is shared by many people and needs to be addressed if reclaimed water is to be envisioned as a viable water augmentation option.

Many scholars believe that addressing, measuring and managing perceptions are challenging exercises that require an in-depth understanding of what is at stake. Over recent decades, scholars and social scientists (Kemp et al., 2012; Boucher et al, 2012; Martin et al., 2010; Lahnsteiner & Lempert, 2007; Dolnicar & Saunders, 2006; Po et al., 2004, etc.), noting that public perceptions cover a range of issues from drinking water to youth behaviour and food choices, have suggested that an approach should be developed based on the particular problem to be addressed. Studies by Beck (2009), Po et al. (2003), and Po and Nancarrow (2004) have revealed that the public acceptance of reclaimed water is a product of attitude and emotion.

Responding to some of the negative perceptions, scholars have identified strategies that, if adequately framed, may improve public acceptance. Hartley (2003), cited in AWR (2013), maintains that public acceptance of reclaimed water is higher when the following are evident:

(i) minimal contact with humans;
(ii) clear protection of public health and environment;
(iii) clear benefit of reclamation as a form of water conservation;
(iv) reasonable cost of treatment and distribution technologies and systems;
(v) minimal perception of wastewater as the source of reclaimed water;
(vi) high awareness of water supply problems in the community;
(vii) clarity on the role of water reclamation in the overall water supply scheme;
(viii) favourable perception of the quality of reclaimed water; and
(ix) high confidence in the local management of public utilities and technologies.

Studies by Hurlimann (2009) and Alhumoud and Madzikanda, (2010) reveal that perceptions can be changed when the public is involved in the process of determining suitable water management options. Thus, a lack of knowledge of water management options can be a hindrance unless adequately addressed (Dolnicar & Schafer, 2009). People who are aware of the quality of wastewater treatment processes have a more positive attitude towards reclaimed water. They believe that reclaimed water is a more environmentally friendly option than desalination, though the latter is considered less risky from a health point of view (Alhumoud & Madzikanda, 2010). The study by Alhumoud and Madzikanda (2010) on public attitudes towards reclaimed water revealed that only 14% of respondents have adequate knowledge of the water treatment process and quality standards.

Education to enhance public awareness is therefore a necessary strategy to promote the use of reclaimed water and change public perceptions (McKay, 2003). Alhumoud and Madzikanda (2010) suggest a public relations directorate at ministerial level to take charge of public awareness and education, soliciting political buy-in and getting political leaders to campaign through public meetings and seminars, together with tools such as information flyers, booklets and guides. Education programmes should place more emphasis on the negative health and environmental impacts associated with the discharge of wastewater, while pointing to reclamation as a viable and available alternative (Hurlimann & McKay, 2007; Alhumoud & Madzikanda, 2010).

Dolnicar and Saunders (2006) suggest a behavioural modification approach which recommends the use of volunteers to drink recycled water to decrease the level of prejudice. Po et al. (2003) recommend community involvement and an accurate and complete information policy in order to ensure public acceptance, but do not indicate how and when the community should be involved or empowered, or what information, and on what level of accuracy, should be presented.

Kemp et al. (2012) suggest that communication and effective marketing to provide information to the public and increase trust are key to improving public perceptions. In Toowoomba (Australia) Donaghey (2006) reported that an information campaign using a water futures booklet containing explanations about the water cycle, the current level of water supply as well as possible water alternatives, was used to address public perceptions. The notion of water alternatives was a central theme taken up in public forums. Importance was placed on public participation to achieve optimal social outcomes in decision-making (Lockie & Rockloff, 2005).

Martin et al. (2010) claim that to influence perceptions, there must be clarity of purpose, with effective use being made of local intelligence to understand context-specific problems, in order to devise appropriate solutions. Perceptions can be addressed if peoples' voices are heard and issues and concerns are audited, with ongoing communication and reactive response to negativities (Martin et al., 2010). In other fields (e.g. food and beverages, products and services etc.), communication and engagement (Martin et al., 2010),

information control, information sharing and dissemination, media and public control measures such as surveys and opinion polls (USFDA, 2009), are regularly used to address public perceptions.

Hartley (2006) provides many tips for the use of informational materials and public presentations of health and safety evaluations. These include promoting users' participation in the decision-making process, and labelling to denote recycled water. Hartley (2006) insists on the value of information management, the commitment and willingness of the service providers to embrace public participation, the use of existing communication channels, and the fairness of decision-making processes.

In the case of Windhoek, at the beginning of the water reclamation project in 1968 public was not well informed. There was little in the way of an information campaign and insufficient marketing (Di Pisani, 2005), but the water institution managed to shift public perceptions in a positive direction. Only years later, further engagement including public awareness was achieved by providing brochures for the public and a school's programme, accompanied by publishing information on the state of the water in the city through media such as radio, television and local newspapers (Lahnsteiner & Lempert, 2007; Boucher et al., 2012). The Integrated Water Resources Management Plan (IWRMP) helped to facilitate information sharing between government institutions, the private sector, the public, and all other interested and affected parties. This approach significantly changed perceptions, as many people were proud to be citizens of the first world city where the potable use of reclaimed water has been operational.

3.5.5 Strategies for addressing public perceptions

Public perceptions can change in the direction of the most recent information campaign they are exposed to (Kemp et al., 2012). This implies that frequent or continual information campaigns promoting the benefits of reclaimed water are necessary. It is important that such campaigned are correctly targeted at the audience. Perception is defined as a process by which individuals select, organise, and interpret the input from their senses to give meaning and order to their environment (Jennifer, undated). The review above has shown that negative perceptions can be addressed using various strategies and mechanisms appropriate to the context. Some of the pillars relating to this strategy are covered in the sub-sections that follow.

3.5.5.1 Public coverage

Coverage refers to the way in which information is disseminated to the public. Information dissemination is often viewed as a process of public participation. Three elements – knowledge, attitudes, and participation – are tightly connected to public perception. These three elements are elaborated on, below.

a) Knowledge

One important element in determining success or failure in introducing water reclamation is knowledge dissemination (Po et al., 2003). There are multiple sources of knowledge pertaining to the advantages, benefits and risks of portable applications of reclaimed water. Public acceptance or rejection of reclaimed water relies on the co-production of knowledge and knowledge sharing. Pestoff (2006: 506) argues that co-production is distinct from traditional models of public service production that make public officials responsible for "designing and providing services to citizens, who in turn only demand, consume and evaluate them". The co-production model is centred on the assumption that there is an active and participative cohort of consumers. According to Pestoff (2006), co-production is an option for improving municipal productivity. It can reduce costs, improve the quality of services and expand citizens' participation in decision-making processes in respect of public services (Pestoff, 2006, citing Warren et al., 1982). Co-production implies that "citizens can play an active role in producing public goods and services of consequence to them" (Ostrom, 1999). Co-production attempts to bridge the divide between 'development experts' and community members by mobilising knowledge; it draws

on local expertise, not just as a means for collecting technical information but also as a way to raise the capacity of the public to make claims on the institutions.

The dissemination and sharing of knowledge (from both the top down and the bottom up) is a process that is designed to enhance communication at the interface between public service institutions and civil society (Goldin, 2010). It is this process that builds trust, the essential ingredient or 'glue'. Trust is that "glue" or "fabric of society" that creates an enabling space, in which people can debate, discuss and disagree with one another – the cornerstone of any democratic society (Goldin, 2005). Opportunities created by public service institutions for generating mutual understanding and the building of trust through constructive consultation and participative planning, require a reciprocal two-way dialogue between water institutions and the public (Beck, 2009). Beck cautions that there is often institutional reluctance to embrace the uncertainty that often accompanies engaging with the public.

b) Attitudes

Public attitudes must be considered if recycled water projects are to succeed (Bruvold et al., 1981). Water institutions should be sensitive to public attitudes and allocate funds, time and expertise to assess public opinion objectively regarding proposed recycled water projects (ibid.). Opinion surveys on reclaimed water have been conducted in many countries including USA, Australia, Western Europe and the Middle East. Since the introduction of reclaimed water is context-specific, various methods can be used (Friedler et al., 2006).

c) Public engagement

Saxena (1998) proposes that the essence of participation is exercising voice and choice and developing human, organisational and management capacity to solve problems as they arise. Lundqvist and Gleick (1997) claim that major decisions that are made without involving local communities and those affected by the decisions are more likely to fail. Institutional programmes may engage the public using participatory methods at different stages of the project: i) the conceptual phase where there is planning and design, ii) the implementation phase where the technology is applied, and then iii) the monitoring and evaluation phase (ibid.). In the context of water reclamation, the value of public engagement is undermined in instances where institutions inhibit the role of the public in active deliberation and close off those spaces that allow ideas to flow and solutions to emerge (Goldin et al., 2005).

3.5.5.2 Public coverage tools

Public coverage refers to the way in which the public is informed or involved in a situation. It may vary from one country or region to another depending on the extent of the problem being addressed or the degree of public understanding (see Table 3-7).

In Australia, for example, several tools were used for engaging the public on water reuse, and these include;

- participation in surveys and opinion polls,
- obtaining values and advice about science, technology, and legal aspects, protection of public health,
- community consultation, collaboration with the appropriate agency.

In the United States, the first direct water reclamation for potable purposes occurred in the 1950s in the town of Chanute, Kansas, due to 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.). The regulations suggest that public coverage with regard to reclaimed water should be undertaken through public meetings, establishment of data sharing, memorandum of understanding, development of an Environmental Protection Agency (EPA) document, formation of an EPA work group, and a public involvement campaign.

Regulations in Namibia suggest that the public should be covered through public meetings and an awareness campaign, talk shows, brochures, school programmes, regular publication of water quality (in the media), and an integrated water resources management plan (IWRMP).

Table 3-7: Public coverage tools in selected countries

Process	Australia	United States of America	Namibia
Public consultation	• Preliminary survey questionnaires and opinion polls • Community consultation • Collaboration with the appropriate agencies and community	• Public Meetings • Establishment of a Data Sharing Memorandum of Understanding (MOU) • Formation of EPA work group • Public involvement campaign	• Community meetings • One-on-one interviews
Information sharing with the public	• Public dialogue • Educational activities • Media programmes	• Information, knowledge, local context, and education • Re-purified Water Review Committee (RWRC) reports	• Media • School programmes • Brochures
Strategies used to inform the public	• Social marketing • Standing national committee • Electronic networking • Workshops or seminars on key issues or for special groups	• Annual reuse conference • State grant programmes • Establishment of Planning Committee(PC) • Framework Development Team (FDT) • Legislative session	Information sharing via: • media • IWRMP • Plant visits

The literature shows that the choice of public coverage tools or methods depends on the profile of the targeted public. This implies that prior to selecting a given tool it is important to understand the profile of the public. This profile should comprise gender, culture, education level, income level, access to media (radio, television, newspaper, and internet), and level of involvement in public meetings and organisation.

3.5.5.3 Measurements and information sources for indicating perception change

Strategies and approaches for improving public perceptions are intended to ensure that changes in these perceptions are affected. The key question is to understand how perception should be measured. Many scholars are of opinion that perception change is difficult to measure. One methods used is to conduct a survey before and after the intervention (Kemp et al., 2012). Surveys can address many themes including satisfaction, acceptance, etc. to register people's concerns. Other methods include focus groups, house-to-house visits and neighbourhood consultations. Informal, observable changes and feedback can also be used to measure perceptions (Martin et al., 2010). The choice of should be made according to the profile of the public.

According to Martin et al. (2010), improvement in perceptions is measured when there is:

- A change in attitude – meaning that people who have had radical views become more flexible;
- Improvements in relationships – where relations were tense, these become more relaxed;
- A sense of being given respect;
- Positive feedback from the public;
- A change in behaviour amongst the public.

Kemp et al. (2012) argue that perception change amongst the targeted population can be observed from the following:

- Observable greater engagement;
- Improved self-esteem, self-confidence, self-awareness, ambition and respect;
- Noted decreases in negative behaviours;
- Greater understanding of people's behaviours;
- Wider promotion and improved profile of service provider by the public.

Martin et al. (2010) note that measuring perceptions is not easy because of a number of hindrances including variation between population groups (with regard to the level and nature of their concerns, age being the most consistent determinant), urbanisation and deprivation. The biggest challenges include the unstable nature of perceptions and the range of influences acting upon them (ibid.). Drawing on these suggestions, it appears that perception change can be measured only through behavioural and attitude change: greater public engagement, positive feedback and improvement in relationships between the public and the service provider. However, there is a range of challenges inherent in any attempt to improve perceptions.

According to Martin et al. (2010), improving perceptions is particularly challenging

- Where a large proportion of the local population is made up of the older generation, and, in rural areas, where residents are geographically isolated and strongly influenced by hearsay and local media;
- Because the tendency on the part of the media to favour bad news stories is seen as unhelpful;
- Because some professionals have limited skills in and experience of communicating and publicising work to improve perceptions.

3.6 SUMMARY

Water reclamation is considered an available and reliable source of water, used successfully in countries such as Namibia, USA and Singapore for many years, and most recently in South Africa. Yet despite this reliable evidence of successful implementation, water reclamation remains a subject of contention. While scholars and water authorities express varying opinions of the implications of water reclamation, they are all clearly related to the institutional role of introducing water reclamation to the public, which entails the communication of technical and scientific information associated with water cycles. The social implications are linked to public perceptions generally resulting from knowledge deficits and public engagement challenges. Economic implications pertain to water tariffs, willingness to pay and availability of water sources. These implications can have positive or negative impacts on the introduction and implementation of water reclamation schemes in each municipal context. Understanding the social implications enables useful insights into what is entailed in developing an institutional framework for introducing water reclamation as a backdrop to in-depth case study research.

There are many factors influencing public perceptions, the most common being the "yuck" factor, and doubt about the safety of drinking reclaimed water. These negative perceptions can be addressed using various strategies such as communication, public engagement/consultation, media coverage, etc. And these strategies can be implemented by employing a range of coverage tools including media, flyers, public meetings, notice boards, etc. Lastly, measuring perceptions is a difficult exercise given their changing nature and the range of factors that may influence them. Nonetheless, perception can be measured, from observed behaviour changes, greater public engagement, positive feedback, and a decrease in negative behaviour.

The next chapter documents the use of reclaimed water for portable applications in South Africa. The findings presented are those obtained from the three case studies that were selected to conduct this research. They are mainly associated with the institutional, social and regulatory issues surrounding the use of reclaimed water.

CHAPTER 4: GOVERNANCE DIMENSIONS OF POTABLE WATER REUSE IMPLEMENTATION IN SOUTH AFRICA

4.1 INTRODUCTION

Since South Africa is a water-scarce country, finding alternative water sources has become important to ensure a continuous water supply. Water reclamation has been practised in South Africa for many years, but its use has been restricted to non-potable applications including irrigation, dust suppression, cooling boilers, etc. Nowadays, with the increasingly harsh weather conditions (the lack of regular rainfall) and technological development, treating wastewater effluent to drinking water quality standards has become a reality. Based on this, the National Water Strategy has identified water reclamation as one of the potential water resources that should be considered. In South Africa, the idea of reclaiming water for both potable and non-potable applications emerged because of many issues including drought (e.g. Beaufort West and George), population growth and increasing water demand (e.g. eThekwini), and the constant depletion of surface and ground water sources, coupled with the high cost of treating sea water (e.g. Overstrand municipality). Since then, several other municipalities are considering water reclamation as an option for augmenting their water supply to meet the rising demand.

The first direct potable reclamation plant was established in Beaufort West. This municipality relies heavily on rainfall (surface runoff that is captured in the Gamka and Springfontein Dams) and borehole water. Due to infrequent and erratic rainfall patterns, available water resources were depleted in the Beaufort West municipality. Several attempts were made to obtain water from other areas but this was found to be expensive. Other strategies included water demand management (detecting and managing water losses, installing pre-paid water meters, redeveloping existing boreholes, drilling additional boreholes and implementing water restrictions. The municipality even had to resort to the use of water tankers, intermittent water supply and water shading. All these strategies and methods failed to relieve the water shortage. In this tense context, the municipality had no choice but to switch to water reclamation. This decision led to the construction and commissioning of the first direct potable water reclamation plant in South Africa and the second in the Southern Africa region. The plant has been completed and is fully operational, delivering water compliant with the SANS 241.

In George, indirect water reclamation plant has been constructed and is functional. However, water from this plant is currently being used for non-potable purpose. In eThekwini, water reclamation was proposed as an option to address increasing water demand. To date, it has not been implemented, but the formal proposal is nearing completion. Overstrand municipality has decided on direct potable water reclamation as part of its medium-term plan to address the water shortage. But due to a recent change in weather conditions (frequent rainfall and increasing ground water yield), the initiative has been frozen, despite being at advanced stage. In Emalahleni, growing population and a climate change-induced reduction in annual rainfall has increased pressure on the drinking water supply. The municipality has struggled to meet the demand for water by extracting 120m^3/day from the local Witbank Dam, exceeding the licensed withdrawal volume of 75 m^3/day. Mine water effluent is therefore being treated to drinking water standards.

Like many other public service issues, the idea of using reclaimed water for portable applications has supporters and opponents. In South Africa, supporters of the idea are convinced by factors and conditions identified in each case study, while opponents are sceptical about the quality of water that will be produced and about the capacity of municipalities to ensure adequate water quality standards.

The extent of support or opposition varies from one area to another. The idea has more supporters than opponents in Beaufort West, George and Overstrand, compared to eThekwini, where it was rejected (Golder & Associates, 2012). A study by Wilson and Pfaff (2008) to determine whether there were groups with specific religious or philosophical objections to drinking reclaimed water concluded that people are generally not comfortable with the idea. There is, however, a lack of empirical research in South Africa to confirm or refute this supposition (Adewumi et al., 2011). Although a recent study on Muslim jurisprudence revealed that the potable use of reclaimed water was not an issue, it remains a contentious and emotive issue. This research found that the extent of support or opposition is a function of public understanding of the local water status and the way in which water institutions justify their decision to introduce water reclamation. In South Africa, the potable use of reclaimed water has potential, if users' perceptions are addressed. Although water reclamation has emerged as a pre-eminent option; but it must be regulated and properly implemented to prevent social dissatisfaction. Through a case study approach, this chapter outlines the institutional issues and regulations pertaining to the implementation of potable water reuse in South Africa.

4.2 GOVERNANCE ASPECTS OF POTABLE WATER REUSE

4.2.1 Regulations governing the use of reclaimed water

Regulations governing the use of reclaimed water are necessary to ensure that there are no negative impacts on public health. Common regulatory requirements entail performance standards for the reuse system, using treatment levels or numerical standards for the 'finished' water. The findings of this research suggest that South African water institutions are covered by national standards which pertain to the quality of both effluent for discharge and drinking water. The recently published National Water Resources Strategy 2nd edition (2013) contains a large annexure on reuse. This revised strategy recognises the "associated risk if water re-use is unplanned, unregulated and/or results in unintended or undesirable consequences." The strategy therefore advocates a "considered approach to implementation of water re-use projects that is consistent with the National Water Resource Strategy and national water policy and legislation", a step in the right direction for the country.

Looking at the first South African water reclamation plant in Beaufort West, this research found that the project was approved because of evidence that the selected treatment technology would produce water complying with SANS 241 standards. Approval was also subject to the commitment by the municipality to comply with the regulatory and statutory requirements stipulated by the DWS, including the Blue and Green Drop certification processes, health assessment and environmental regulations. Water quality produced by the Beaufort West wastewater treatment plant should meet the South African National Standards for discharge (DWAF, 1998) and when effluent is treated for potable purposes, final water quality should comply with drinking water quality standards (viz. SANS 241) (Ivarsson & Olander, 2011).

This research also found that all the case studies involved in this research were governed by national regulations pertaining to drinking water quality, reuse and the discharge of effluent. Wastewater effluent discharge is regulated in accordance with DWAF (1998) standards and South African National Standards (SANS 241) for drinking water. The SANS 241 has strict regulations in place for drinking water that specify all the physical, microbial and chemical aspects that plants must comply with. In addition to these, incentive regulations (Blue and Green Drops instituted by the department of Water and Sanitation) are applied to both drinking water and wastewater effluent.

The Blue Drop is a national benchmark in the potable water business that extends to potable water quality. The standards were devised by and are strictly monitored, by the Department of Water and Sanitation (DWS).

The Green Drop Certification programme was introduced by the Department of Water Affairs in 2009. It is an incentive-based regulation that recognises excellence in the field of wastewater treatment. This not only encompasses actual compliance with discharge standards but also measures a treatment system's ability to cope with and reduce risk as well as provide responsible treatment. The Green Drop certificate is there to ensure a high standard is maintained to minimise risks to public health. Despite the availability of water quality regulatory documents, this research regrettably found that there are no available, documented regulations governing the introduction and implementation of water reclamation for portable applications in South Africa. There is a need for specific regulations to guide water institutions within the context in which alternative water resources (e.g. water reclamation) are decided upon, implemented and monitored.

The reviewed international case studies and Namibia use a combination of instruments, regulations and committees to monitor direct water reclamation. South Africa is still in the early stages of the implementation of water reclamation. This research project (and others: e.g. Swartz et al., 2015) comes at the right time and is expected to assist water institutions to shape regulations. The Water Reuse Strategy recognises that:
different categories/types of water re-use will require quantitative standards to define and manage fitness for use. The standards must be developed to address aspects of:

(i) Water quality variables of concern in a specific water re-use application
(ii) Quantification of risk and acceptable risk levels, and
(iii) Monitoring requirements in terms of water quality variables, frequency and location of sampling/analysis.

If these recommendations are implemented in conjunction with public participation, South Africa should be able to successfully implement water reclamation. The Water Reuse Strategy lists many potential sites for such projects.

4.2.2 Institutional roles and responsibilities for potable water reuse implementation

4.2.2.1 Overview

Worldwide, institutions are responsible for the provision of water services to the public. While roles and responsibilities may vary, it is generally agreed that public institutions play a key role in making decisions about service provision and levels of service. The international literature shows that the roles of institutions in water reclamation vary from one country to another as context requires. At the global level, the World Health Organisation (WHO) is tasked with the establishment of international norms to protect human health. WHO developed and published several editions of its International Standards for drinking water since 1958. These are guidelines for drinking water quality that have been the basis for long-standing normative publications by the World Health Organisation, and they provide an evidence-based point of departure for standard-setting and regulation.

In South Africa, this research found that various institutions pay a role in respect of water reclamation (Table 4-1). This trend was observed at the case study municipalities, where the introduction of water reclamation appeared to require many partners, whose roles may be different depending on their attributes and contribution to the process (refer to Turner et al., 2015). Key partners identified here include:

- Department of Water and Sanitation – as a regulatory and quality assurance body (Beaufort West, Overstrand and George), and responsible for initiating a reconciliation study (eThekwini). DWS also supports municipalities in the implementation of reclaimed water schemes;
- Department of Health (George) – water quality compliance with standards;
- Department of Education (George) – public awareness;

- Department of Environmental Affairs (George) – monitoring of the quality of effluent discharged or reused;
- Provincial disaster unit (George) – coordination role during drought to handle issues related to water distribution;
- Treasury (Beaufort West, eThekwini, George and Overstrand) – funding of the project.

Table 4-1: Stakeholders involved in water reclamation projects

Beaufort West	eThekwini	George	Overstrand
DWS	DWS	DWS	DWS
Prov. Disaster Man.	Dept. of Envir. Affairs	Dept. of Health	Dept. of Envir. Affairs
Treasury	Treasury	Dept. of Education	Prov. Disaster Man.
		Dept. of Envir. Affairs	Treasury
		Prov. Disaster Man.	
		Treasury	

The Department of Water Affairs (DWA) 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 powers 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 the DWA is to manage water resources in the interest of the public, to provide sufficient water of acceptable quality to the citizens, and to conserve the aquatic environment.

National health authorities lead and participate in both the formulation and implementation of policy to ensure access to a reliable, safe drinking-water supply. National public health authorities evaluate the role of water as a risk factor in public health, while local environmental health authorities have a role to play in educating consumers regarding water treatment at household level (Collins, 2003).

4.2.2.2 Challenges identified

Roles relating to planning include water risk management, initiation and undertaking of water reconciliation, feasibility studies to decide on alternatives, selection and implementation of alternatives/viable options, and water quality monitoring. These roles are scattered amongst the Department of Water and Sanitation, the Department of Environmental Affairs, municipalities and non-government organisations, yet all form part of the institutional process that has been used to introduce water augmentation schemes, including reclamation.

Regulations covering reclaimed water emphasise public coverage with implicit public engagement processes, health, and environmental protection and monitoring, but they are not adequately framed nor implemented in practice, due to a lack of enforcement. The introduction of reclaimed water for portable applications is not the sole responsibility of government departments or municipalities. Its success is subject to the involvement of other partners, including the public. Various institutions involved directly or indirectly in reclaimed water can play different roles depending on their powers and influence on the public. In general, institutions involved include governments (national, provincial and local) – through different departments and support services – private individuals or firms (consultants, contractors), non-government organisations, community-based organisations, civil society and the public. Among the challenges identified was a lack of coordination among the institutions involved in water reclamation, and the absence of clear guidelines for its implementation.

Although the institutions mentioned in Table 4-1 play different roles, this research found that institutional arrangements, responsibilities, etc., were nowhere documented. Each institution worked as a stand-alone entity. There were no guidelines for the implementation of water reclamation except those of the NWRS. Another challenge arises from the way in which institutions engage the public to address their concerns. The current strategy used was the EIA, which in many cases was not adequately applied. The EIA tended to be rushed, lacking in consideration of public inputs, partly because of a flawed engagement process that suggested a lack of interest among the public. Despite these issues, this research acknowledges the contribution of various institutions to the project of water reclamation. It is just that the roles of these institutions should be well defined, with a mechanism for coordination. Regulations should be enforced, even if strategies and approaches are revised and adapted to the local context. There is a need to develop an approach to assist water institutions to introduce water reclamation and address public concerns.

4.3 DRIVERS AND CONDITIONS FOR WATER REUSE IMPLEMENTATION

4.3.1 Overview

The Beaufort West, George and Emalahleni Municipalities in the Western Cape have already implemented direct and indirect water reclamation. In George, for example, the reclamation plant is intended to produce water for both non- and portable applications. The plant will only supply water for drinking during periods of dire need. The Overstrand Municipality envisages implementing the reclamation scheme soon. In the eThekwini Municipality, despite public resistance, and like the other municipalities mentioned, there were several factors that forced the Municipality to think of reclaimed water for portable applications as a viable option to augment the supply of water. This section presents certain drivers – causative factors – and conditions that have contributed or may contribute to the potable use of reclaimed water in South Africa. Themes covered include drivers for introducing water reclamation, most influential drivers, impacts and public understanding of drivers, the decision-making process and an approach to introducing water reclamation in a municipal context.

4.3.2 Drivers for the institutional decision to reclaim water for portable applications

The reasons for choosing water reclamation vary from one municipality to another and are to some extent a function of local conditions (Table 4-2).

Table 4-2: Reasons for choosing water reclamation as alternative water augmentation option

Beaufort West	eThekwini	Overstrand	George
• Drought • Lack of reliable water resources • Limited ground water • High cost of alternative options (e.g. desalination & water transfer) • Water restriction by DWS • Right to water	• Population growth • Economic growth • Predicted water shortage • Growing discharge of wastewater effluent • Water restrictions by DWS • Ecological balance • Reduction of health & environmental risks • Augment water availability	• Increasing water demand • Effects of droughts • Depletion of surface water • Limited ground water • High cost of alternative options (e.g. desalination) • Water restriction by DWS	• Drought • Decrease in dam level • Water shortages • Water restrictions by DWS

The main reasons identified include droughts (Beaufort West and George), population and economic growth, water balance, minimisation of environmental pollution, the growing discharge of large volume of wastewater (eThekwini) and depletion of available water resources, the cost of alternative options and water restrictions imposed by the DWS (Overstrand). In other cases, the urgency of the need for water and a lack of choice (no other sources in the area being available) were identified as drivers. These findings suggest that factors driving decision-making are mainly responsive to specific conditions within the case study area. In many cases, drought and the absence of available and sufficient water resources have been cited as the reasons for introducing water reclamation. In Emalahleni, for example, the growing population, climate change and a decline in annual rainfall are the main reasons for introducing water reclamation.

Drawing on these findings, this research establishes that drivers for water reclamation in South Africa fall within the five main categories; natural, human-induced, institutional/technical and economic factors (as depicted in Table 4-3). These factors (natural and human-induced) lead to institutional factors that are driven by risk management in terms of water security status. Technical and economic factors are embedded in institutional factors, as they inform decision-making regarding reclaimed water use, the choice of technology, and implementation. In South Africa, it was found that social issues (viz. perceptions relating to the "yuck factor" and health concerns) have a negative impact on the introduction of water reclamation. It should be noted that the institutional consideration of options and subsequent decision-making stress the importance of water reclamation in a context. The rationale for the decisions made by different water stakeholders, such as engineers, politicians and consumers, is discussed further in this section of the report.

Table 4-3: Clustering of triggers for water reclamation in South Africa

	Natural	Human induced	Institutional	Technical	Economic
Beaufort West Municipality	Drought Lack of reliable water resources Limited ground water	Population growth	Water restriction by DWS	High cost of alternative options (referring to desalination)	Cost of water Affordability
Overstrand Municipality	Depletion of surface water Limited ground water	Population growth Urbanisation	Water restriction by DWS	High cost of alternative options (e.g. desalination)	Cost of water Affordability
eThekwini Municipality	Predicted water shortage Ecological balance	Population growth Growing discharge of wastewater effluent Urban building and development	Water restriction by DWS		Economic growth

The main reasons for water reclamation relate directly to the water service providers' quest for viable and cost-effective options to ensure a continuous water supply to the public. Municipalities as per their constitutional mandate have an obligation to ensure continuous service provision, regardless of the conditions (indication of water supply risk continuum). In the South African context, reclaimed water has been introduced or envisaged mainly because of population and economic growth, depletion of available water resources, drought and water scarcity, change in lifestyle and the lack of available and sufficient water resources. Given the imperatives of the drivers outlined above and the context in which they occur, the need for alternative water sources is urgent. The main drivers in this category include water quality, health concerns, and knowledge of water sources, treatment and quality. During the research, respondents were asked to cluster drivers for water reclamation in order of influence and explain how they contribute to the decision (Table 4-4).

Table 4-4: Most influential drivers and the extent of influence on reuse decision

Drivers	Contribution to reuse decision
Drought	• Water shortage (reduction of dam level through evaporation), thus changing the conditions of ecosystems, hence prompting the need to use alternative means of supplying water (e.g. tank system) • Water restrictions - hence need to continuously supply water
Decreasing rainfall	• Depletion of available water sources • Water authority to manage risk by ensuring water supply
Unavailability of other sources	• Right to water – prompting water authorities to find alternatives
Population and economic growth	• Right to water • Water demand exceeding supply

The findings suggest that drought, decreasing rainfall, the unavailability of other water sources, as well as population and economic growth, are the main drivers for water reclamation. To exemplify this, respondents indicated that, when drought occurs, water institutions are obliged to manage risk by ensuring that available water is used sparingly and measures are in place to ensure such use. Therefore, risk management considerations may trigger a decision to switch to an alternative such as reuse. In South Africa, many municipalities rely on rainfall, but the increasing effects of climate change have resulted in erratic rainfall patterns. This situation has forced water institutions to seek alternative sources, and in many cases the most readily available is water reclamation. In summary, despite the unavailability of water resources, water institutions are obliged to ensure a continuous water supply to their consumers. By deciding on reuse, authorities will use apparent drivers to justify their choice of this option. An understanding of these drivers and their impacts on the part of the public may have a bearing on the decision to introduce water reclamation.

4.3.3 Public understanding of triggers contributing to water reclamation

Generally, reasons for the implementation of water reclamation (as clustered in Section 4.3.2, above) are always not clear across stakeholders, including the public. Public understanding of the triggers is vital to the success of water reclamation initiatives. Stakeholders from the case study municipalities exhibited a variety of views: for some these triggers were convincing enough to introduce water reclamation, while for others they seemed to lack substance. Public understanding of triggers for water reclamation may depend on personal knowledge of the water situation, educational level, evidence, and the way facts are presented. The following were the findings obtained from case studies undertaken in this study:

- In Beaufort West and Overstrand, natural drivers such as drought and flooding were mainly used to stress the importance of water reclamation in a difficult context in which other alternatives were not feasible.
- In all three case studies, human-induced drivers including urbanisation and population growth, environmental pollution, over-exploitation, etc. often impact on the institutional process intended to introduce alternative water augmentation schemes. These factors are cited to point out potential water scarcity risks and measures and the need to change water use behaviour.
- Institutional drivers such as the right to water were used by all three case study municipalities as a reminder of their responsibility to ensure access to water for all. This duty entails finding an alternative water supply and ensuring a reliable and continuous water supply to the public.
- Technical drivers including the availability of the treatment technology, the ability to meet operational requirements, and the assurance that water of acceptable drinking quality would be produced, were used in both Overstrand and Beaufort West. They were used to convince the public about the efficiency of the water treatment process to address their concerns about water quality and health.

- The use of financial drivers in all three case study areas was intended to demonstrate that introducing reclaimed water would reduce water tariffs and increase water security.
- In Beaufort West and Overstrand, motivational drivers were often used to stress the importance of water reclamation. These drivers were intended to convince the public about the benefits of water reclamation.

4.3.4 Impacts of public understanding on drivers on public attitudes and decision making

Public understanding has led to some extent of resistance, acceptance or rejection of water reclamation. This research investigated the impacts of these triggers on the public at each of the case study sites.

4.3.4.1 Beaufort West

Although water reclamation was predominantly driven by natural factors (viz. drought), the public was not ready to accept the idea. Obvious signs of drought (e.g. dried-up dams, dying animals, dry taps, etc.) were not sufficient to convince the public about water reclamation. The public remained resolute not to accept water reclamation.

4.3.4.2 eThekwini

Reasons for introducing water reclamation in eThekwini were found to be inadequate to convince the general public. In many cases, respondents indicated that “there is enough water at the sea” and “we don’t see why we should use dirty water for drinking purpose when the sea is just close to us”. This shows that despite the prospect of water scarcity in the face of the growing demand for water, the public was not convinced about the necessity of reclaiming water for portable applications.

4.3.4.3 Overstrand

Contrary to the two case studies above, the public in Overstrand showed a degree of understanding of the drivers for water reclamation. This positive attitude has been attributed to the good relationship and frequent communication between the municipality and the public. The public was made aware of water scarcity before the situation could worsen further. The municipality used billboards, notice boards, water bills, etc. to convey messages.

As outlined above, these impacts provide an opportunity for each water institution to understand the responses of the public within their own context to envisaging or implementing water reclamation. The evidence is that the drivers will vary according to the extent to which a crisis – such as severe droughts and water restrictions – is visible and tangible to the public. The more apparent the crisis, the more acceptable to the public the notion of reclaimed water. The impacts of drivers may therefore vary in terms of their extent and occurrence, and hence water institutions are advised to identify, examine and select only those that are relevant to their context. These findings imply that:

- Acceptance of water reclamation is often subject to visible signs of water shortage, the effects of droughts, apparent dryness, empty dams and dying vegetation. The public is more willing to accept water reclamation when:
- The collective water shortage has made everyone aware of the situation, which has in turn led the (majority of the) public to understand and accept the situation.
- The effects of drought are sufficiently apparent to serve as convincing evidence of the urgency of the situation.

- Resistance occurs when drivers such as population and economic growth, or the high costs of alternative options, or restrictions, are presented without visible or tangible evidence. They are then not regarded by the public as convincing enough to incline them to accept the idea of reclaimed water.
- Public understanding of the triggers for water reclamation appears to be subject to public knowledge and the way evidence of triggers is presented to the public by decision makers.

4.4 INSTITUTIONAL APPROACHES TO POTABLE WATER REUSE IMPLEMENTATION

4.4.1 Decision-making process

The decision-making process leading to the introduction of reclaimed water was found to vary from one municipality to another. In general, it was found that the municipal council (a decision-making authority) has the final say regarding service provision matters, including water reclamation. The case studies revealed the following processes towards decision making:

4.4.1.1 Beaufort West

Prior to decision making the following process was used:

- A feasibility study was undertaken to identify potential resources
- 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 approval
- A report including financial requirements was submitted to DWA
- Project initiation (tender process)
- Final council decision (and incorporation of the proposal/project into the IDP)

It can be seen from the above that no public engagement was undertaken during this phase. This was justified by the urgency of the situation and the timeframe allowable for consultation.

4.4.1.2 eThekwini

The concept is still being explored and compared to other alternatives, such as increasing dam depths and abstracting water from other areas situated far from the municipality. In general, the idea of introducing water reclamation was initiated when several droughts and increasing water demand (for various reasons) were identified in the area. This was followed by the findings of reconciliation studies which triggered the initiation of an EIA to determine the impacts of water reclamation. This process shows that there was no template for the process used to arrive at the decision to introduce water reclamation.

4.4.1.3 George

The proposal was first presented to the council and section 80 of the municipality (that incorporates engineers and other decision-makers), followed by presentation to the mayoral committee, council decision and approval, project initiation and the final mayoral decision (based on technical reports and public acceptance).

4.4.1.4 Overstrand

The decision-making process included:

- Feasibility study to determine available water (based on the outcomes of the provincial reconciliation study)
- Engineering studies: preliminary design (abstraction and treatment technologies)
- Presentation and discussion at mayoral committee level
- Public information through ward councillors and public representatives
- Media release
- Mayoral decision (based on technical feasibility report and public acceptance).

These findings show that the decision-making process to introduce water reclamation differs from one area to another. The variance is attributed to the different settings in which municipalities are located, institutional processes and the context in which water reclamation is to be implemented. The commonalities observed across the case studies are related to stakeholders' engagement. Interested and affected parties were consulted and messages conveyed. However, the way in which this process of engagement unfolded has been described by many respondents as unfair, inconsiderate and inadequate. They point to the lack of consultation with the public and consideration of their concerns.

4.4.2 Implementation approaches

In all the case study areas, it was found that water reclamation was introduced sequentially following a type of institutional process. The process varied from one case study to another and there was no clear guidance on how reclaimed water was or should be introduced. Rather, municipal respondents suggested an institutional process that made sense to them that had to be followed.

4.4.2.1 Beaufort West

In Beaufort West, water reclamation was introduced and implemented in an ad hoc manner based on the municipal council decision. The council was informed about the depletion of available water resources and the unavailability of other alternatives as well as the cost of transporting water from other areas. After careful discussion and consideration of all the facts, the decision to introduce water reclamation was made, despite reluctance on the part of many councillors/political leaders.

4.4.2.2 Overstrand

In Overstrand the institutional process prescribed by the DWS was used to some extent, as the conditions that led to envisaging water reclamation have improved. After experiencing water scarcity, the engineering services used the results of the reconciliation to decide on available water resources. The outcomes of their study suggested water reclamation as a suitable and available alternative to address the water scarcity being experienced in the area. Further to these findings, the municipality initiated an EIA and feasibility study. The outcomes confirmed both water reclamation as a feasible water augmentation option and the availability of reliable water technologies that can treat water to meet standards. Having all this evidence to hand, the engineering services presented the facts to the municipal management, and the decision was made to introduce water reclamation.

4.4.2.3 eThekwini

In eThekwini, the final decision has not yet been made, but the concept was explored through the EIA process and compared to other alternatives such as increasing dam levels or abstracting water from other areas distant from the municipality. Environmental Impact Assessment (EIA) and Interested and Affected Parties (I&AP's) processes were applied.

These findings suggest that in the three study areas, after formal identification of water scarcity, the establishment of risk management strategies and the outcome of reconciliation studies, feasibility studies were initiated to determine suitable technology for the treatment of effluent, to support the decision to introduce water reclamation. The various processes of decision-making are outlined in Table 4-5.

Table 4-5: Process for introducing water reclamation

Step	Beaufort West	Overstrand
1	A feasibility study was undertaken to identify potential resources	Feasibility study to determine available water (reconciliation study)
2	The outcomes and proposals were submitted to the council	Engineering studies: preliminary design (abstraction and treatment technologies)
3	The outcomes were also presented and registered with disaster management (for funding and support purposes)	Presentation and discussion at mayoral committee level
4	Municipal council approval	Public information through ward councilors and public representative
5	A report including financial requirements was submitted to DWA	Media release
6	Project initiation (tender process)	Mayoral decision (based on technical feasibility report and public acceptance)
7	Final council decision (and incorporation of the proposal/project into the IDP)	

4.5 SUMMARY

The findings of this study suggest that the drivers of the decision to turn to reclaiming water mainly arise from the specific conditions occurring within an area. In South Africa, the main drivers identified include drought, population growth, growing discharge of wastewater effluent and the right to water, which have put pressure on municipalities to fulfil their constitutional mandate. The ways in which these drivers have impacted on the public depend on the severity of the situation. In some cases, intermittent water supply (also known as water shedding) was adopted, while in others, water was distributed on a house-to-house basis. This situation affected the public, as they had to adjust their lifestyle to cope with the absence of a continuous water supply.

In general, these drivers were perceived differently by the various water stakeholders, including the public. For some, these drivers were not convincing enough, others saw the need rather for pressurising the public to reduce their water consumption; while yet others believed these drivers were real enough as the facts (such as dryness, dying animals, depletion of water resources, depreciation of water quality, etc.) were apparent and called for urgent intervention. Water reclamation was then decided upon as the most feasible option to alleviate the water shortage. Decisions were made based on facts that were presented at an institutional level. Although reclaiming water for drinking purposes is a sensitive issue (despite being established as far back as 1968 in Namibia), this research found no documented evidence of strategies for its introduction and implementation in

a municipal context. This has confirmed the need to develop protocols to enable water institutions to introduce and successfully implement water reclamation schemes.

The decision to introduce water reclamation is sequential: the general approach emerging from the review of available documents begins with an initial planning phase where water scarcity conditions are established. Risk management strategies are then considered and implemented, reconciliation studies are undertaken to determine water availability, and feasibility studies to determine available and feasible options. Reuse decisions are made after the available options have been reviewed, followed by implementation and post-implementation. This study has found that the drivers for water reclamation and their impacts are not well understood by the public and certain officials (mainly politicians), nor are they convincing enough for many water users. This confirms that a lack of appropriate knowledge may have a negative impact on public acceptance of water reclamation. The multiple origins of drivers require combined and sometimes complementary interventions in different contexts.

With regards to the implementation approach, findings from this research suggest that reclaimed water is being introduced on an ad hoc basis in South Africa. The ad hoc manner (in Beaufort West) was justified by the severity of the situation, as the drought was rapidly worsening. Environmental Impact Assessments were conducted by municipalities, in the hope that engaging Interested and Affected Parties (IAPs) would build public confidence and thereby influence reluctant political leadership. However, it became evident across the cases that reliance on processes associated with media and/or consultancy norms and practices did not suffice for the wider public engagement in knowledge sharing opportunities envisaged by municipal professionals. Whereas EIAs appear to legitimise institutional decisions across case studies, notifying IAPs through the medium of print to register for participation provides just one of many opportunities for public engagement. Municipal practitioners concurred that EIA and associated I&AP processes, conventionally conducted via print, were insufficient.

Despite commonalities such as representative ward structures and the use of print media, the consultative processes promoted by the public participation concepts of local developmental government are interpreted differently in different municipal settings. The case studies suggest that the processes might generally be improved by a focus on two main components: knowledge requirements and public engagement. Each of these components may be linked to specific emotions underlying public perception at each stage of the institutional process. The findings suggest that the decision-making process regarding the introduction of reclaimed water should be more ordered and sequential. Where water reclamation was envisaged, planned or implemented, the process was random and lacked documented planning. Nevertheless, the decisions reached were not taken spontaneously, but followed certain processes that are established at institutional level (but often not understood by the public). For instance, the decision regarding the potable use of reclaimed water generally starts with the outcomes of a reconciliation study, followed by a feasibility study and, finally, implementation.

Each stage of the decision-making process addressed specific issues, for example, the reconciliation study informed decision-making regarding reuse, while the feasibility study led to the choice of technology; at the stage of implementation decisions were made about the operation and maintenance procedures. Yet the current processes are not sufficient to ensure the successful implementation of water reclamation schemes: there appears to be a need for a common guideline to facilitate water institutions' introduction and implementation of water reclamation.

Although water reclamation is a potential water resource in South Africa, many institutional and social issues have emerged as hindrances to its implementation. Furthermore, regulations governing its implementation are not yet well established. These findings suggest the need to develop regulations to govern water reclamation, enforcement mechanisms as well as strategies to enable institutions to address public concerns.

CHAPTER 5: PUBLIC PERCEPTIONS AND ACCEPTANCE OF POTABLE WATER REUSE IN SOUTH AFRICA

5.1 INTRODUCTION

Since the democratisation of South Africa in 1994, considerable space has been given to citizens to express their voice through the so-called "right to know" and the "Batho Pele principles". Despite these rights, information is often relayed by hearsay and subject to misinterpretation, thus creating (possibly misguided) expectations and perceptions amongst the public. Public perceptions refer to the conscious understanding that people have of issues pertaining to their wellbeing. The provision of water services is intended to ensure that people receive water of adequate quality and quantity to sustain their lives. The use of reclaimed water for drinking purposes is one of the issues that have raised public concerns for many reasons. Most of these reasons arise from shared perceptions. In South Africa, the research team undertook to document and understand the social issues surrounding the introduction of reclaimed water for potable usage in selected case studies. Thus, this chapter outlines factors influencing public perceptions of water reclamation, discusses the extent to which public perceptions govern people's decisions, and considers strategies to address public perceptions. Themes covered include factors that influence public perceptions and govern people's decision to accept or reject water reclamation, factors influencing public perceptions of institutional processes, proposed actions for addressing public perceptions, and emerging strategies.

5.2 PUBLIC PERCEPTIONS ON POTABLE WATER REUSE – CASE STUDIES

Water reclamation is an alternative water resource in South Africa. In all cases, public perceptions factors were investigated. Findings across the case study sites show that the disgust or 'yuck' factor, the safety or quality of the water, water use, choice, trust in municipal services, equity, cost implications, socio-demographical/cultural factors, benefits and necessity, public consultation and media, all have the potential to influence public perceptions (Table 5-1).

Table 5-1: Public perceptions: factors

Public perception factors	Case study		
	Beaufort West	eThekwini	Overstrand
Yuck factor	√	√	√
Safety – health concerns	√	√	√
Water use			√
Choice/preference	√	√	√
Right to decide			√
Trust in municipal officials	√	√	
Equity – supply areas	√	√	√
Cost – water tariff	√	√	√
Culture and religion		√	√
Socio-demography (age, gender, income)	√	√	√
Benefits and necessity	√	√	√
Public consultation	√	√	√
Media (coverage/sensation)	√	√	

These perceptions were expressed in various ways, as illustrated below:

- Disgust or "yuck" expresses emotional discomfort at the thought of ingesting human excreta in dirty water. Some respondents felt uncomfortable drinking reclaimed water because they perceived that the recycling plant smelled bad.

  > *"My mind went to the part of dirty water like the biogas production from human excreta. I had negative perception and will never drink reclaimed water"* (Imam, Hermanus, Overstrand).

- The safety or quality of reclaimed water relates to the fear of health risks from drinking such water. Respondents suggested that evidence of water quality should be disclosed, that there should be guided plant visits to view the treatment operations, and public involvement generally. Respondents had a variety of opinions, for example:

  > *"Because the quality may not be adequate as long such water comes from dirty water that may contain chemical…hence detrimental for my health"* (Imam, in Overstrand). Another respondent claimed that its use may be possible *"provided that the quality complies with standards"* (Principal, Camphill school).

- Respondents indicated a preference for using reclaimed water for other purposes, including bathing, but not for drinking and cooking.

  > *"I prefer bottle water than reclaimed water, because I don't know if it is adequately treated and suitable for drinking purposes" (*Water user*).*

- A general feeling of lack of choice, due to decisions about water reclamation being made at municipal level without public input. Hence, the public do not feel valued and are likely only to accept reclaimed water if they have no choice. This is exemplified in the case of Beaufort West, where those who could not afford to buy bottled water had no choice but to accept reclaimed water. In general, the public prefer other options, such as desalination, treated rainwater, water transfer schemes, bottled water, soft drinks and a wind pump system.

  > *"Yes, other options such as desalination, water transfer scheme can be explored but the cost may be higher than reuse"* (Teacher, Qhayiya Secondary school).

  > *"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 every day"* (Principal, St. Matthew's Primary School).

- Public respondents conveyed a general sense of trust in municipal services to provide good quality water, but expressed fear and doubts about the safety of the reclaimed water plant and the health risks associated with sub-standard water quality. Hence, they would trust the municipal services on condition of proof of sustainable water quality, as well as proof that current water resources are insufficient.

  > *"Some people do not trust the safety and buy in water"* (Gamkaland radio).

- Public respondents expressed concerns about equity, as their perception was that wealthier segments of the population were better serviced, while reclaimed water was for the relatively less well-off. This has an impact on the acceptance of reclaimed water for portable applications. The extract below reflects issues of equity:

  "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" (Deputy principal, Qhayiya secondary school).

- Public respondents did not have clear information on the costs of reclaiming water and water tariffs. However, some admitted that having low tariffs would be a benefit that might trigger acceptance. The analysis of respondents' views shows that the question of cost does not influence public perceptions as much as safety and health concerns.

  "I don't mind paying more…I am more interested by the quality – as long the quality is good I will go for it" (Campus manager, Curro High school).

- Culture and religion were found to influence public perceptions. According to a Muslim leader, water that has not been treated in the conventional way poses problems for spirituality. Literature from eThekwini shows that a Muslim group expressed resistance to reclaimed water as they perceived it to be 'bad luck', while another study on Muslim jurisprudence did not reveal any reasons for resistance to reclaimed water. Age influences perceptions, too: some respondents claimed they would not give reclaimed water to an infant, whilst others maintained that if reclaimed water is proved safe, then it is safe for children too.

  "Not if I have an option of borehole water…because the quality can be a concern" (Environmental NGO).

- Respondents conceded the benefits of reclaimed water as a solution to water scarcity, but insisted that all other options should be exhausted before reclaimed water was decided upon. A resistant group of respondents claimed that drinking reclaimed water might have unsuspected long-term health risks. The following extracts reflect how some members of the public perceived the benefits and risks associated with reclaimed water:

  "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" (Imam).

  "Yes, it's a necessity as long the technology is installed, personnel trained adequately and sufficient assurance regarding the quality of water. No extra benefits to the current water. Also, standards are far better, then it's good. Benefits for sanitation" (Environmental NGO).
  "Water security, no water cut off, reduced water cost…will be cheaper, access to water…and enhancing water supply" (Teacher, Qhayiya Secondary School).

- The lack of public consultation and inefficient communication from the municipality to the public was remarked upon. The lack of community engagement, implying the absence of the public from decision making, was labelled as "unfair" and a hindrance to acceptance. It was recommended that the public be involved at every stage of the water reclamation scheme. Most respondents find the process of public consultation to be unfair:

"*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*" (Imam).

"*It's not fair, just unfortunate it does things this way…doesn't hold to its heart public consultation*" (Programme Co-ordinator, Environmental NGO).

"*Wasn't fair, because I wasn't asked, it was a statement of fact"* (Manager, Environmental NGO).

- The media influence perceptions, as was shown across the case studies. In eThekwini, the use of inappropriate terminology such as "toilet to tap" had a negative impact on public perceptions. In Beaufort West and Overstrand municipalities, respondents indicated that the media could influence public perceptions negatively if the term "reclaimed water" and what it entails was not properly explained.

"*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." Balanced, informative vs. sensational – it's about trust in the safety. There is a history with Durban with the press – independent newspapers"* (Municipality, Technical services).

These findings demonstrate that factors influencing public perceptions depend on internal feelings and external factors. Internal feelings relate to doubts, mistrust and misgivings about safety, while external factors pertain to media portrayals (e.g. "from toilet to tap"), communication, engagement, hearsay and gossip.

5.3 EMERGING TRENDS FROM PUBLIC PERCEPTIONS – CASE STUDIES

Perceptions were expressed differently in each of the study areas. The section below summarises the emerging trends from the most influential public perception factors. These trends provide an indication of the way public identify their perceptions.

5.3.1 Disgust or 'yuck' factor

According to Po et al. (2003), the disgust factor is associated with discomfort occasioned by (the idea of) drinking reclaimed water. Below are the perceptions that emerged regarding the disgust factor in the case study sites.

- In **Overstrand Municipality,** public respondents perceived the disgust or 'yuck' factor in various ways. Numbers of them believed that it is an emotional discomfort at the thought of human excreta, while others reckoned it was generated by the thought that dirty water and its smell would affect their health. In terms of addressing the "yuck" factor, respondents suggested that decision-makers should drink the water to build trust, and present relevant facts to allay the public's anxiety.

- In **eThekwini Municipality**, public respondents did not express any feelings on the disgust or 'yuck' factor because they perceived that scientists would purify the water. Municipal officials, on the other hand, maintained that the disgust or 'yuck' factor was a result of misgivings about the water quality. The public would make an issue of it because of the emotional discomfort they were experiencing.

- In **Beaufort West Municipality,** some public respondents responded to the disgust or 'yuck' factor by saying that the water would have a bad taste and objectionable smell.

Hence, according to these respondents, they could not drink reclaimed water and preferred to buy bottled water. Meanwhile, at the level of decision-making, the perception is that the public will resist reclaimed water because of the 'yuck' factor, despite being equipped with knowledge about the quality of the water.

5.3.2 Safety

This research considers 'safety' to be a measure of the perceived risks associated with using reclaimed water, especially health-related risks (see, e.g., Po et al., 2003; Hartley, 2003). With this understanding of safety in mind, respondents were requested to express their perceptions of safety as far as reclaimed water is concerned.

- In **Overstrand Municipality**, trends emerging from stakeholders' perceptions can be summarised as follows: the public believe that safety is dependent on knowledge; doubts over water quality and associated health risks raise questions about the safety of reclaimed water, hence prompting the public to seek alternative sources of water (e.g. bottled water). However, evidence of the safety of reclaimed water can significantly reduce safety concerns and enhance public acceptance.

  "I can't drink this water because it comes from toilets and contains germs that are harmful to my health" (Resident of informal settlement).

- In **eThekwini Municipality**, public respondents noted that safety concerns are subject to knowledge of water safety precautions and regulations (in terms of quality control). Safety concerns can be overcome by disseminating knowledge about safety, conducting plant visits to demonstrate the water treatment process, and involving the public (in water quality monitoring and control) to allay their fears.

- In **Beaufort West Municipality**, emerging trends show that safety concerns appeared when the safety measures pertaining to water quality were not disclosed and there was no communication (e.g. of water quality test results). Safety concerns can also be triggered by a sense of a lack of accountability on the part of water service providers. At the level of decision-making, it emerged that safety concerns can be addressed if water quality results are published in the local newspaper, the public is informed about 'fail-safes' at the plant, wastewater effluent is blended, and water quality is frequently monitored.

At all case study sites, respondents from the public placed emphasis on acquiring knowledge about safety precautions and standards in order to allay such fears as were occasioned by drinking reclaimed water.

5.3.3 Water use

The issue of 'water use' was not broached directly during our interviews, but emerged during an interview with a respondent in **Overstrand Municipality**. The respondent from the public noted that their views on the use of reclaimed water would change if it were to be used for bathing purposes only and not for drinking or cooking.

5.3.4 Choice

Choice emerged as one of the issues that drive public perceptions, though expressed in various ways:

- In **Overstrand Municipality**, it emerged that the notion of choice entails consideration of other options, such as desalination, rainwater, a water transfer scheme, buying bottled water and soft

drinks, seen as more appealing than reclaimed water. Members of the public were unaware that options such as desalination and water transfer schemes may be cost-ineffective. The public felt that decisions like this were made at municipal level without their consent, hence leaving them with no alternative. They perceived value in deciding for themselves what solution there should be to the problem of scarcity.

Municipal officials at decision-making level noted that they had no other reliable alternatives – and hence no real choice. The right to decide or choose is subject to knowledge and information sharing. This implies that when information is available and the people are informed about a process or event, for them to contribute to decision making is a realistic option.

- In **eThekwini Municipality**, public respondents expressed the need for other alternatives and suggested the wind-pump system. At the level of decision-making, municipal officials observed that reclaimed water is the cheaper option compared to other alternatives.

- In **Beaufort West Municipality**, public respondents perceived alternative options such as water transfer, desalination, groundwater or buying bottled water as preferable. Yet they felt that using reclaimed water was inevitable because some people lacked the means to buy bottled water. At the decision-making level, it was noted that reclaimed water was the cheapest option to address water scarcity, making it a fair solution to the problem of growing water demand.

"I can't afford to buy bottled water, so have no choice than accepting what has been provided by the municipality… I will drink this water against my will" (Resident of Beaufort West).

It therefore emerged in all the case studies that the public would prefer an alternative to reclaiming water for potable purposes. In the absence of available alternatives, the public expressed dissatisfaction but reluctant acceptance of reclaimed water for potable purposes.

5.3.5 Trust in municipal services

Public respondents perceived trust in municipal services in various ways, as illustrated below:

- In **Overstrand Municipality**, respondents suggested that trust in municipal services was forthcoming if there was proof that reclaimed water was a sustainable alternative, and proof that current water resources were insufficient. This would improve the acceptability of reclaimed water. At the decision-making level, the perception was that the public had trust in the municipal competency to provide potable water from reclaimed water.

- In **eThekwini Municipality**, public respondents perceived trust in municipal services to be automatic, given the status of municipal government locally and globally. However, regarding water reclamation, while the public had trust in the municipality's capacity to deal with it, they still harboured fears and confusion regarding the safety of reclaimed water and safety measures to deal with plant failure.

- In **Beaufort West Municipality**, many public respondents admitted that they trusted municipal services to provide good quality water. At the same time, many respondents (especially those from a low-income background) had no trust in municipal competencies as they believed that water from recycled effluent might not be fit for consumption.

It emerged at all the sites that the public in general trusts the municipality in the matter of water provision, but not completely when it came to provision of reclaimed water for potable applications. This diminishing trust is attributed to the fear of drinking water of poor quality.

5.3.6 Equity

Equity emerged as one of the issues driving public perceptions.

- In **Overstrand Municipality**, the public's perception on equity is that there are certain communities that have been better serviced than others. This is based on the perception that the white community had and would have access to better quality water than the black community. At the level of decision-making, municipal officials responded that the equity issue was triggered by a lack of information. Water produced at the plant would be distributed to everyone, regardless of their background or status.

- In **eThekwini Municipality**, the issue of equity was not expressed by public respondents. However, at the decision-making level, distributing water equitably has been considered.

- In **Beaufort West Municipality**, public respondents believed that reclaimed water was another initiative by white people to kill blacks. They claimed that municipal officials who proposed water reclamation did not drink it themselves. At the level of decision-making, the perception around the alleged racial bias was attributed to a lack of understanding among the public. The issue was addressed through a public meeting during which the layout of the main water distribution pipeline and supply reservoir were presented.

In all three case studies, it emerged that municipalities are aware of equity issues, as equity carries with it the promise to redress the inequalities of the past. Ordinary people's perceptions of equity were found to be totally different from those of municipal officials. The difference was attributed to hearsay, but traceable to certain politicians and media. Lack of communication and inadequate public engagement emerged as triggers for perceptions of inequity.

5.3.7 Cost

Cost is one of the factors that may have a positive or negative influence on acceptance of reclaimed water.

- In **Overstrand Municipality**, the public perceived that the introduction of reclaimed water would increase the tariff because of the treatment process and operating costs. Yet they thought that the costs would decrease in the long run, meaning lower tariffs. Opponents of water reclamation claimed that the cost was not an issue, even if it meant paying more; the issue was rather that of having good quality water. A low cost would be a benefit, but the concern is the quality of the water. The costs associated with health issues could be higher than the actual cost of recycled water. At the level of decision-making, the perception of cost was mainly the expectation of higher water tariffs.

- In **eThekwini Municipality**, respondents perceived the cost issues associated with reclaimed water to mean that money and time would be saved. The public believed that they would pay less than they are currently paying. At the decision-making level, it was felt that the public should be made aware of the tariff implications.

- In **Beaufort West Municipality**, public respondents were not sure about the cost implications. In many cases, they believed that the tariff would remain unchanged because of their water shortage. Reclaimed water would be cheaper than bottled water and water from any other source. At the level of decision-making, consideration of the cost implications tended to focus on maintenance.

Public respondents in all the case studies are aware of the high costs of other alternatives such as desalination. It also emerged from the public that paying lower tariffs for a poorer quality of water (Po et al., 2003) was not a proposition because of health concerns.

5.3.8 Socio-demographic/cultural

The research considered the socio-demographics of the sample of respondents so as to obtain a range of views and perspectives. Data was acquired from both men and women in different socio-economic set ups.

- In **Overstrand Municipality,** religion emerged as an issue. According to respondents, reclaimed water was not fit for before-prayer ablutions because the water had not passed through a natural purification process. Respondents also claimed that reclaimed water was not good for infants as it might cause health complications.
- In **eThekwini Municipality**, public respondents did not express perceptions relating to religious and cultural issues. However, at the level of decision-making, it was noted that the Muslim group expressed resistance because they perceived reclaimed water as bringing 'bad luck'.

- In **Beaufort West**, the public only voiced concerns about racial and income issues. They claimed that reclaimed water was introduced to curb water wastage by black and poor communities. Educated respondents did not see such socio-demographic issues as a problem with reclaimed water. But , regardless of their socio-demographic background, the respondents were not comfortable with the idea of reclaimed water.

In all the case studies, it emerged that the public still has fears about the quality of reclaimed water, regardless of their race, gender, socio-economic class, educational level and age. Younger male respondents were more inclined to accept reclaimed water than their female counterparts.

5.3.9 Benefits/necessity

Guided by Hartley (2003), the question regarding the benefits of reclaimed water was asked to ascertain whether users saw the benefit of/necessity for potable applications.

- In **Overstrand Municipality**, public respondents claimed that there were no benefits to using reclaimed water because of health risks in the long run. They believed that reclaimed water was a solution to alleviate the problem of scarcity that could also help prevent discharge into the sea. However, it became a necessity only if all other options were exhausted. At the level of decision-making, water reclamation was a benefit/necessity because of the water crisis being experienced in the area. Simultaneously reducing waste and augmenting water resources by recycling wastewater was beneficial.

- In **eThekwini Municipality**, public respondents perceived reclaimed water as beneficial because of potential job creation, health security (in terms of a continuous water supply) and improving access to water for all. At the level of decision-making, it was noted that there are benefits in terms of costs and safety.

- In **Beaufort West Municipality,** public respondents perceived the lifting of water restrictions as a benefit of reclaimed water, provided the water was of adequate quality. As an alternative, it responds appropriately to the drought conditions and would assist in dealing with future water crises. At the level of decision-making, municipal officials claimed that water reclamation was beneficial as it was assisting in augmenting water to deal with water shortage, and also generated jobs for local residents.

These findings suggest that public respondents in all the case study sites saw the benefits of reclaimed water as a means of alleviating the problem of water scarcity, minimising costs compared to other alternatives and providing water of adequate quality.

5.3.10 Public consultation

The question of public consultation emerged during the interviews with public respondents in all three case studies. Hartley (2006) calls this factor 'communication and public dialogue', and describes it as crucial in influencing public perceptions.

- In **Overstrand Municipality**, public consultation was perceived as a preferable way of introducing reclaimed water in a municipal environment. The respondents pointed out the lack of adequate consultation and the unfairness of the entire process in their municipality. The consultation process did not include public concerns or inputs. Insufficient or inefficient communication was also highlighted. At the decision-making level, there are plans to engage more with the public during the implementation phase of the project.

- In **eThekwini Municipality**, public consultation was not undertaken properly, except for the EIA that was itself inadequately conducted. The EIA was described as not inclusive and conducted without forewarning. It was suggested that awareness and communication should be developed prior, during and after engaging the public.

- In **Beaufort West Municipality**, public consultation was described as sketchy as many respondents claimed not to have been informed. The process was not fully and fairly explained to the public. However, at the level of decision-making, it became apparent that there were plans to engage more with the public to raise awareness about the safety of the water.

The findings set out above from all the case study sites resonate with the idea of social injustice and perceived unfairness. Perceptions of unfairness are tightly interlocked with protest the process, with repeated allegations that there was no real participation or inclusivity in the decision-making process and that the decision was simply taken and imposed from the top down. Within the context of our theoretical framework, the Capability Approach, where we focus on human development and well-being, the idea of unfairness is of pivotal importance because if something is perceived to be unfair, then it is an impediment to human well-being. Social injustice and unfairness are in fact the antithesis of human development and human well-being. Public consultation is thus seen to be a vital factor to consider when it comes to influencing public perceptions.

5.3.11 Media

The international and local research literature notes that the media is a sensitive issue in several aspects, but particularly when it comes to the potable use of reclaimed water. Guided by the literature and our previous reports in the eThekwini case study on the 'toilet to tap' issue, the media were considered a factor that could influence public perceptions.

- In **Overstrand Municipality**, the media were accused of instigating negative perceptions. Public respondents suggested that media sensationalism influences perceptions. There are consequences if the issue is not properly explained and left to the media to report.

- In **eThekwini Municipality**, respondents from the public perceive the media as a means of informing the public on issues around recycling. Meanwhile, at the level of decision-making, the media were labelled as unbalanced and prone to using inappropriate language (e.g. from toilet to tap). Municipal managers suggested that the thoughts of people could not be controlled but what was said can and should be both true and appropriate. Hence the media should be educated on what should be communicated to the public, especially in terms of the language to be used.

- In **Beaufort West Municipality**, the media were not used sufficiently to inform the public. Not everyone buys the print media and other kinds of media should be employed. The media should be used more to inform the public and should play an important role in telling people the truth. At the level of decision-making, it was claimed that the inflammatory use of language played a role in radicalising negative public perceptions. However, after implementation, there were no nasty questions from the public, as media reporters were briefed to report honestly and not create a sensation.

The impacts of these factors are categorised as negative or positive, according to how they influence public perceptions of reclaimed water schemes for potable application (Table 5-2). At all the case study sites, it emerged that unbalanced/balanced or hostile/receptive media is a factor that can potentially influence public perceptions. The analysis of the findings (Appendix F) shows that the media can affect public perceptions positively or negatively.

Overall, our study reveals that factors influencing public perceptions are closely connected to the three main themes; Knowledge, Social Capital and Emotions. These themes were helpful in structuring the research findings and in understanding the knowledge deficit pertaining to the introduction of water reclamation. Public resistance is largely the result of this knowledge deficit. And the knowledge deficit is largely attributable to inadequate engagement between the public and the municipality. Inadequate engagement perpetuates feelings of despair, anger, shame and sadness, which all go into shaping negative perceptions.

Table 5-2: Overview of factors influencing public perceptions and related indicators

Level	Public perception factors	Positive Indicators	Negative indicators
Institutional	Media sensation	Information sharing and transparency Use of appropriate language/terms Educating media professionals	Lack of access to or delaying information Unbalanced information (media report / use of inappropriate language)
	Public consultation	Public consultation at an early stage Consensual decision making Seeking public and political buy-in	Lack of or inadequate consultation Public concerns not adequately addressed Lack of or inefficient communication Equity issues not adequately addressed
	Political halt	Political support	Lack of knowledge by political representative (lack of support) False promises (to find feasible alternative)
Economic	Cost	lower tariffs No change in tariffs Balancing water tariffs (treatment technology)	Cost associated with health issues may be higher than actual cost of recycled water Increasing water tariffs Lack of communication (about cost)
Social	Disgust		Water quality (reference to wastewater effluent - smell) Health concerns from drinking reclaimed water Fear of drinking water of substandard quality
	Equity	Equitable service provision coverage	Disparity in service provision coverage
	Safety	Knowledge of water treatment	Fear of risks over time Long-term health risks

		Proven evidence of safety (no risks associated) Knowledge & assurance of water quality Communication & awareness Assurance of plant monitoring	Poor water quality Lack of safety awareness
	Trust in municipal services	Confidence in municipal services There is adequate planning	Lack of consultation Low involvement in municipal affairs Unknown capacity of municipal staff
	Choice	Visible signs of scarcity Minimising cost Water conservation	Unilateral decision at municipal level Lack of knowledge of optional water sources Unable to afford to buy water Lack of information sharing
	Benefits	Water security (continuous water supply) No water restrictions Access to water Reduced water tariffs (costs and safety benefits) Employment	Poor water quality No exhaustion of other options
	Socio – demographic/ cultural	Conservationist attitude on the part of youth	Unsuitability of water for infant (age) Poor water quality for spiritual purposes

5.4 FACTORS INFLUENCING PUBLIC PERCEPTIONS AT VARIOUS STAGES OF THE INSTITUTIONAL PROCESS

As indicated in the previous section, many of the factors identified above may manifest at different stages in the institutional process, with ongoing effects on public perceptions, even up to the monitoring stage. Building on the exploratory field research conducted in the case studies, the investigation of public perceptions extended to focusing on why and how certain factors conduced to actions. The findings showed the potential for influencing public perceptions linked to disgust or the 'yuck' factor, such as the safety of the water (its quality), water use, choice, trust in municipal services, equity, costs, socio-demographics, benefits and necessity, public consultation, and the use of the media. The context of the institutional stage that the selected cases had reached (planning to meet a water scarcity threat – Overstrand; decision-making on feasible options – eThekwini; experience of implementation – Beaufort West) was pertinent across the three settings, as follows:

5.4.1 Preliminary stages: Planning

This stage of the institutional process entails the conducting and understanding of water situational analysis, risk management strategies, reconciliation and feasibility studies.

5.4.1.1 Planning (water stress/scarcity and risk management)

At this stage, the public may experience water scarcity because of visible signs like drought and water restrictions (the cases of Beaufort West and Overstrand). In these instances, the public generally feels they have little choice but to accept reclaimed water for portable applications. On the other hand, in the case of

eThekwini where respondents are not experiencing water scarcity, the public can reject reclaimed water for potable applications.

5.4.1.2 Reconciliation study

In this stage, most public respondents across the case study sites reported a lack of information because of inadequate engagement on the part of the municipality. Many people do not understand the reasons for the reconciliation study, and have no access to the outcomes. This lack of access perpetuates indifference and a knowledge deficit. The sense of not being considered or consulted leads to negative perceptions, such as a lack of trust in the water services providers, doubts about the outcomes of the reconciliation study, etc. Such perceptions aggravate public resistance.

5.4.1.3 Feasibility study

The feasibility study led to a decision in favour of reclaimed water for portable applications and corresponding treatment technology, largely based on cost. In most cases, the respondents indicated that they were given no information about water treatment technologies and processes, or of the costs associated with treatment and water distribution (operations, maintenance and tariffs). This lack of knowledge triggers doubt, fear and a feeling of being ignored.

Further analysis of these feelings suggests that:

- The public can reject and resist reclaimed water because of their lack of knowledge about the safety of the technology, treatment and water quality.
- Despite trust issues regarding water service providers, the public is likely to accept and even promote reclaimed water if they are informed and assured of its safety.
- The public fears high tariffs and can accept and promote water reclamation on condition that the tariffs are low. However, across the case studies the question of tariffs appears not to have had as much impact on public perceptions as the safety of the reclaimed water and of the operations of the plant.

5.4.2 Reuse decision

The decision to introduce water reclamation for portable applications is based on the outcomes of the reconciliation and feasibility studies. The factors that can impact on public perceptions and responses at this stage of the institutional processes include:

- Equity concerns: perceptions of unfairness and social discrimination can lead to rejection and resistance. But if these are anticipated and addressed, the result can be conditional acceptance.
- Positive use of the media as a tool for information dissemination may contribute to acceptance, on condition that the questions people ask are addressed.
- The absence of public engagement can make people feel ignored and slighted. Adequate public engagement can lead to conditional acceptance or promotion. Feelings of pride, dignity and
- community may result from consultation and appropriate responses to queries and concerns that are raised.
- The disgust factor contributes to rejection or resistance, but this is ultimately a question of uncertainty over water quality that can be addressed. The use of terms such as ‘reuse’ instead of wastewater or ‘toilet to tap’ is a factor that can influence public perceptions.
- Culture and religion might contribute to resistance to reclaimed water.
- The lack of alternatives may cause resistance, especially if the scarcity of water is not visible (e.g. arising from population and economic growth). However, even where water scarcity and drought were being experienced, some public respondents indicated a preference for other options.

- Lack of trust about the safety of treated water, and of mechanisms to ensure quality and address plant failure, may cause public rejection.

5.4.3 Implementation

Initially, the major public concerns manifested as doubt, fear, and worry about the safety of water quality and operations of the plant. Although equity concerns may have been addressed at an early stage of the planning, continuing public consultation is essential. This may focus on subjects (e.g. safety, cost of operations and maintenance, implications for consumer tariffs). Some respondents indicated that the wealthy could choose to buy bottled water while the poor would have no choice but to accept reclaimed water.

5.4.4 Post-implementation

At this stage, the main concerns which shape perceptions are about safety issues. There is an indication that the water doesn't taste nice and this perpetuates the 'yuck' factor even at this stage. During the validation workshop, respondents indicated that municipal officials did not drink the reclaimed water themselves, and this indicated a lack of trust in reclaimed water. The public also claimed in the validation workshop that they had not been sufficiently engaged regarding the on-going monitoring and safety of the plant and the water. Lack of public consultation at this stage links to knowledge deficits around safety issues, hence public trust in reclaimed water is restricted. Proven water quality and clear evidence of mechanisms for ensuring safety can increase confidence and trust in municipalities, thus promoting the use of reclaimed water. The analysis of these findings suggests that the effect of these factors on public perceptions is largely a result of knowledge deficits stemming from inadequate engagement. The effects of factors on public perceptions at various stages in the institutional process continue to be present in the post-implementation stage.

5.5 ROLE OF PERCEPTIONS IN GOVERNING PEOPLE'S DECISIONS

5.5.1 Overview

Municipal mandates to supply potable water to meet the growing demand informs the institutional management of risks to users, when dealing with both long-term and immediate threats. Although it is widely recognised that authorities should be sensitive to public attitudes, an institutional attitude of "we know what's best for you" prevails. Factors relating to mistrust of water institutions are aggravated by making decisions first and then defending these against public expressions of opposition (described as the DAD approach by Beck, 2009). Understanding how sensitivity to people's values, norms and beliefs may be achieved and maintained in institutional processes and approaches was a key concern of the research.

Across the case studies it was found that public knowledge deficits and inadequate public engagement were drivers of negative public perceptions. As explained in previous chapters the Capability Approach (CA) theory engages with the ideas of opportunity and choices. That is why inadequate knowledge sharing with the public creates uncertainty, to the extent that the municipality may become frustrated by the lack of co-operation from the public. This research explored the specific consequences of people's perceptions and how these led to rejection, acceptance or indifference in respect of water reuse. The data production and analysis enabled scrutiny of whether and in what ways various factors influenced public responses, decisions and actions, differently in each context and at different stages of the institutional processes. It emerged that the public's decisions to reject, resist or accept water reclamation related directly to their knowledge at different stages of the institutional process. When people were engaged and informed about reclaimed water, their trust in the

municipalities appeared to increase. The frequent portrayal of untreated wastewater has a negative impact on perceptions of reclaimed water. The media have often pointed to the failures and incapacities of municipalities to produce drinking water and wastewater effluent that meet quality standards. If they are struggling to comply with discharge standards, the thinking consequently goes, how can municipalities meet the required standards for drinking water? As this perception is shared by many people, it needs to be addressed if reclaimed water is to be a water augmentation option.

5.5.2 The Continuum of Acceptance

With the focus on decision-making, implementation and post-implementation, the factors identified were treated as material for formulating ways to address negative perceptions. The collated data was summarised and placed along a continuum registering the effects of factors on public acceptance. The Continuum of Acceptance (Figures 5-1 and 5-2) illustrates how the effects of factors are not confined to polarities, but move between Rejection (lowest, most negative point of resistance) and Promotion (highest, most positive point of acceptance) in the public realm.

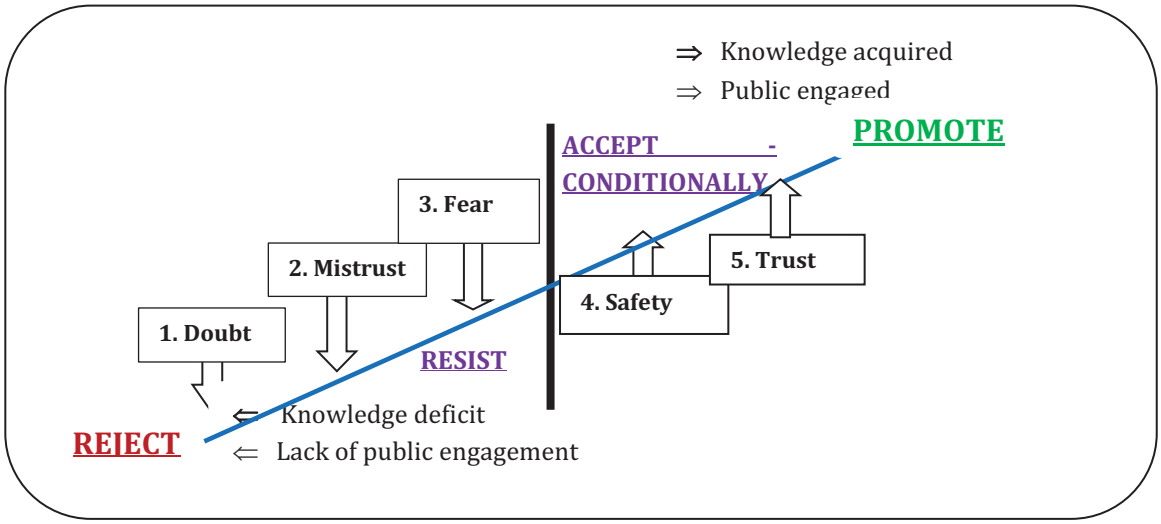


Figure 5-1: Continuum of Acceptance

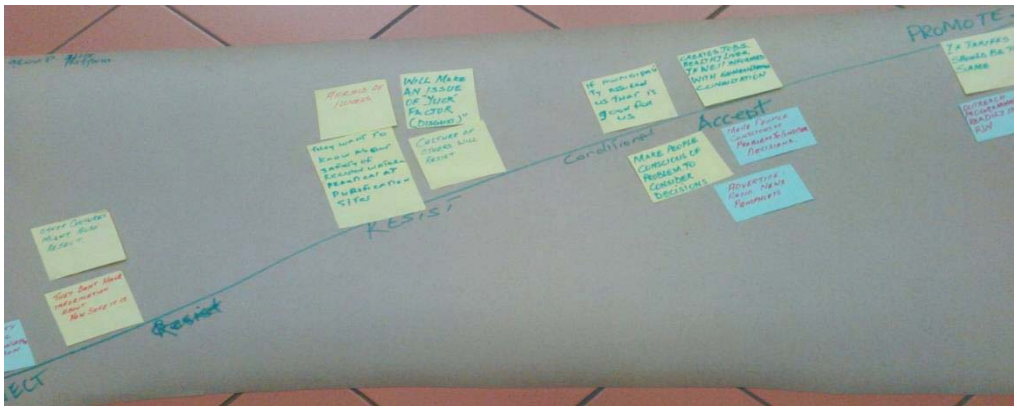


Figure 5-2: Illustration of acceptance continuum

Selected factors were placed on the Acceptance Continuum to show the effects of these factors on public perceptions (Table 5-3).

Table 5-3: Summary of prevalent emotions accompanying the institutional process across the case studies

Stage of institutional process	Emotions prevalent at different stages
1. Planning (water Scarcity)	**Denial or doubt** lack of choice, fear, stress, confusion …
2. Risk Management	**Mistrust, doubts** Stress, confusion …
3. Reconciliation Study	**Doubt** Not being considered, mistrust
4. Feasibility Study	**Mistrust** Neglect, doubt, fear
5. Reuse decision	**Fear** Anger, unfairness, disgust, imposition
6. Implementation	**Safety concerns** Fear, lack of consideration
7. Post-implementation	**Trust** Doubt, fear and worry

5.5.3 Trends emerging from case studies

The general trend emerging across the case studies suggests that the public reception of water reuse begins at the lowest, most negative point of a continuum. This reception can and should be moved up the continuum to willingness to promote the solution, the most positive response. Drawing on the general trends emerging from the case studies, it appears that moving public resistance in stages towards greater public acceptance s relates to underlying public perceptions, as follows:

- ***Stage 1: Denial and doubts*** - Rejection may be due to denial of water scarcity along with a lack of knowledge about possible and proposed solutions to an alleged problem;
- ***Stage 2: Mistrust*** - Public responsibility for problems or contributing to solutions may often be expressed as mistrust of public institutions;
- ***Stage 3: Fear*** –Risks to health and well-being, or threat of loss in the process of change, may be well founded in water quality concerns;
- ***Stage 4: Safety*** - Even when interested in learning more about proposed solutions, openness and the confidence to ask pertinent questions are best encouraged at this stage;
- ***Stage 5: Trust*** – Where learning, knowledge sharing and engagement respond to doubt, mistrust, fear and concerns (about safety, equity, quality, etc.), confidence in the proposed solutions is most likely to increase.

What is apparent from the data is that those who have positive perceptions are, overall, technical experts and members of the public who are better informed than their peers. While the promotion of reclaimed water is a potential outcome that offers greater collective value than conditional acceptance, or a reduction in public resistance to decisions made by others, it was found that a full range of perceptions might continue to co-exist. Conditional acceptance by users (as reflected above) was linked by the respondents to the acquisition of knowledge that addressed their concerns. As in communication, trust appears to result from a two-way process that is dependent on the interfacing of institutional and public perspectives.

Indications from the data confirm that the benefits of knowledge sharing accrue from public engagement processes that involve building trust in public institutions through iterative public consultation. The data

indicates that activating collective pride and a sense of achievement, and aspiring to public promotion, were envisaged as the outcomes of public participation processes that encompass knowledge sharing.

Most notably, when the identified factors were examined to ascertain their effects on public perceptions, the disgust or 'yuck' factor response was associated in varying degrees with each of the negative factors until abating during Stage 4. Qualitative analysis shed light on the transition from Stage 4 to Stage 5, effectively a bridge to increasing openness and confidence in solutions.

When the implications for institutional strategies to share knowledge, and engage with the public were examined, it was necessary to differentiate technical/institutional from social/public types of actions. Respondents participated in shaping improvements in context by the brainstorming of appropriate steps, from a range of respondent perspectives within each case study. Steps were organised in sequence to enable the integration of different types of action to be taken by institutions and/or the public, in relation to the priorities unique to each case. Before finalising a sequence of steps, possible hindrances and aids to progress were considered, allowing additional steps to be incorporated into suggestions for a specific strategy pertinent to each stage of the institutional process in each location.

A range of stakeholders across the cases and stages of the project cycle suggested that the attempt to secure public acceptance would not be wholly successful if it relied on information disseminated in a one-way flow through media, notices and pamphlets. Suggestions focused on site visits and opportunities for two-way communication between the municipality and the public, supplemented by, rather than based on, information dissemination. It became apparent that opportunities for public engagement are under-exploited, as institutions essentially exclude the public from recognising the problem and being part both of the decision-making process and of the design for implementation.

5.6 SUMMARY

Of the many factors influencing public perceptions that have been identified, the most common are the fear of health risk and the safety concerns underlying the "yuck" factor. Perceptions of risks are associated with consuming reclaimed water, sources of wastewater to be recycled, issues of choices, trust in local authorities and scientific knowledge pertaining to water treatment and quality, attitudes towards the environment, environmental justice, the cost of recycled water and socio-demography. Amongst these factors, the "yuck" factor has emerged as dominant because the idea of ingesting reclaimed water is almost universally repugnant when encountered for the first time.

All these factors have effects on water user perceptions, regardless of their magnitude, and tend to prevail at different stages of the institutional process, as outlined below:

- Planning: doubt and denial generate a feeling of lack of choice, fear, stress and confusion;
- Reconciliation study: doubt generates feelings of neglect and mistrust;
- Feasibility study: mistrust generates a feeling of being neglected, doubt and fear;
- Reuse decision: all sort of emotions are culminating here, the chief ones being anger, a feeling of unfairness, disgust and imposition;
- Implementation: safety becomes the main concern, generating fear and a sense that one is being treated with a lack of consideration;
- Post-implementation: trust become an issue that generates doubt, fear and worries about the quality of water and the capacity of municipality to ensure the safety of the public.

The findings of this research suggest that where there is little public knowledge of risk management factors and the feasibility of options that led to an institutional decision, trust in municipal capacity appears to diminish.

Although rooted in knowledge or knowledge deficits, social capital or networks, emotional issues are frequently associated with trust in municipal capacity and a sense of choice. These are key factors that cumulatively contribute to public perceptions of municipal processes, which in turn govern people's responses and decisions.

The effects of factors on public perceptions that manifest across the different natural settings of the case studies have implications for municipal practice. Exploring this trajectory further from the perspective of the public respondents provided a basis for developing strategies to mitigate negative public perceptions. Encouraging public acceptance may be shaped by the co-analysis of the effects of factors in each case study setting.

The findings of this research suggest that water users in South Africa are not comfortable with drinking any water from a recycling plant. The main reasons provided were repugnance, characterised in terms of the "yuck" factor, and suspicion of health risks. In addition, there was a lack of trust in the municipality's capacity to produce drinking water from treated effluent.

People's resistance to water reclamation was also attributable to their ignorance of the water cycle, water scarcity issues, water treatment technologies and scientifically proven processes, and the significance of water quality standards. This lack of knowledge appeared to underlie public resistance, revealing that social issues pertaining to water reclamation is linked to institutional failures in knowledge sharing. It is believed that identifying and addressing these social issues may improve the level of confidence in, and hence acceptance of, portable applications of water reclamation. This in-depth study in South African conditions was thus geared to further explore the extent to which resistance to reclaimed water can be linked to public knowledge deficits and other social issues.

The next chapter presents and discusses the way in which public perceptions have been addressed in the case studies. It outlines emerging trends and provides a summary of suggestions arising from the case study approach for strategies for introducing reclaimed water.

CHAPTER 6: STRATEGIES FOR ADDRESSING PUBLIC PERCEPTIONS AND ACCEPTANCE OF POTABLE WATER REUSE IN SOUTH AFRICA

6.1 INTRODUCTION

This study has confirmed that municipal engagement with the public has significant currency in influencing public perceptions. Before decisions are announced, individuals and groups with representing various interests may want to engage with decision-makers to raise questions for public debate. It appears that municipalities need to improve on their interpretations of 'stakeholder engagement' and 'public participation', when reclaiming water suggests itself as a solution to water scarcity, increasing demand in urban development and environmental degradation. The study explored how public perceptions about the use of reclaimed water have been or are being addressed in each of the three case studies. These findings were drawn upon to formulate suggestions for addressing public perceptions alongside the institutional stages of planning, decision making, implementation and post-implementation. Comparative analysis across the case study sites enabled a comprehensive approach.

This chapter discusses possible actions and practices to address public perceptions. The aim is to provide a guide to how reclaimed water schemes should be introduced in stages corresponding to steps in the institutional process in the South African municipal context. Knowledge gaps are addressed and existing or proposed steps are examined to develop an effective approach to influencing public perceptions of the potable use of reclaimed water. The proposals are based on the evidence of the case studies.

6.2 ADDRESSING PUBLIC PERCEPTIONS

6.2.1 Overview

The application of theories that place emphasis on choice and opportunity (Capability Approach) and on negotiated spaces for public reasoning (Social Network Theory) provided useful insights into understanding public perceptions. The case study research has produced data showing that a range of different public perceptions can be progressively shifted. Furthermore, the qualitative data indicates that this range of perceptions is largely influenced by institutional actions at various stages. This research has provided evidence of how public perceptions of water reclamation have been or may be dealt with in three case studies in South Africa. The case studies, located in Beaufort West, Overstrand and eThekwini, functioned as a pilot project to understand how public perceptions regarding the use of reclaimed water have been or are being addressed. The findings suggest that strategies for addressing public perceptions emerge alongside the institutional process used to introduce or implement reclaimed water schemes. This process includes risk management, reconciliation and feasibility studies, decision making, implementation and post-implementation. An overview of the context of each case study site and suggested strategic actions is presented below (see Appendix D).

6.2.2 Proposed actions for addressing public perceptions

A comparative overview of the case study data (Table 6-1) illustrates recommendations for broaching social issues in decision-making, implementation and planning.

Table 6-1: Comparative overview: suggestions for addressing public perceptions

Stages ***Social issues***	**Beaufort West** ***Post-implementation***	**eThekwini** ***- Decision-making***	**Overstrand** ***- Planning***
Decide **Fear**	**Public meeting** - Address public using existing channels (Councillors). **Schools**, Religious leaders. **Media** - draft message. **Assess** attendance/ complaints	**Content**: Discuss basis for choice openly. **Who is involved,** cost, outcomes, share examples of success. **Communicate necessity** & **benefits**. **Mechanisms**: Radio, print, road shows. **Outreach, workshops:** target groups. **Address Questions -** Face–to–face meetings. **Debate** - clarity for activists. **Assess public perceptions**	**Reasons for reuse.** **Safety – Health** Impact. **Materials for media** and website. **Policy, Regulations**. Cost/implications. **Treatment efficacy –** science & technology.
Implement **Safety**	**Plant visits.** **Schools**, Religious leaders Address public using existing Council channels. **Media**- draft message **Assess** attendance/ complaints.	**Demonstrate safety of reclaimed water consumption** by senior public figures. **Plant Visits: Explain purification,** verify **operational safety**. **Proof of compliance with standards**. **Test supply points–** taps, h/h. **Advertise safety** - billboards, media. **Ongoing Education** outreach. **Debate**: stories, poetry, drama. Water safety as **school subject**.	**Plant visits:** Treatment technology capacity**.** **Target groups** become champions. **Sequence of events** and **Tools -** adapt to profiles of broad public and target groups. **School awareness.**
Monitor **Trust**	**Launch** and **Plant visits**. Address public using existing Council channels. **Schools**, Religious leaders. **Media**- draft message. **Assess** attendance/ complaints.	**Monitoring:** assure **quality control.** **Ongoing awareness** of results. **Understand results** of regular testing. **Education** – Outreach. **2- way communication** - **Convey** and **Clarify** -respond to **Questions.** **Assess public perceptions**.	**Plant and lab visits**: monitoring schedule, sampling and fail-safes. **Communications:** WQ, breakdown, failures. **Billboards** for results. **Certification** shared.

6.2.3 Beaufort West Municipality

Beaufort West is the first municipality in South Africa where a reclaimed water scheme has been implemented and is fully operational. The Beaufort West case presented this study with an opportunity to capture and understand the process used to implement the reclaimed water scheme and the strategies used to address public perceptions. Suggested actions cover each stage of institutional decision-making, as shown below:

6.2.3.1 Water scarcity and risk management

The public was aware of the drought because of the visible signs such as drying dams, drying crops, water restrictions and dying animals, etc. (see Figure 6-1) and their possible consequences. Despite these signs, doubts and denial persisted amongst many water users. Municipal officials attempted to address water scarcity using various means, including a call for prayers to invoke divine intervention. Other strategies included pole-mounted signs, the distribution of pamphlets to each household, use of media (written, radio and television), community meetings and school visits. Proposed actions for addressing doubts and denial included the use of visible signs (notice board, dam level notice), messages on local radio, and information campaigns. It was further suggested that the public should be allowed, even encouraged, to visit various water sources to witness the situation (i.e. the quantity and quality of the water).

Figure 6-1: Dried Gamka Dam (Courtesy: Smit, JCL, Beaufort West 2010 water crisis)

6.2.3.2 Reconciliation study

Given that the reconciliation study was undertaken without involving the public, there was a general feeling that the lack of knowledge sharing and public engagement was likely to perpetuate negative perceptions of reclaimed water and the service provider. Respondents suggested that they would have appreciated being told the rationale for and results of the study.

6.2.3.3 Feasibility study

The public had no knowledge of this study as they were not involved in the process, and were unaware of the criteria used to consider reclaimed water as an option. The lack of consideration of the public voice was pointed to as one of the many issues conducing to rejection of reclaimed water.

6.2.3.4 Reclaimed water decision

People were angry that information about this decision was not adequately disseminated. This was clearly a trigger for negative perceptions, with concerns about equity (which have subsequently been addressed) and safety coming up strongly. Respondents made it clear that the public would resist the use of reclaimed water if there was no consultation. Participants pointed out the necessity of addressing equity concerns, which have a strong influence on public perceptions. The suggestions in this area emerging from the validation workshop included the following:

- Equity concerns should be addressed by informing the public as potential beneficiaries of the water schemes. In this case, the municipality should inform the public that the water is not for one sector of the community but for all, involving all socio-economic groups irrespective of gender, age, race, education etc.

- Conveying the information that the water is supplied from one source in churches, schools, meetings and other government depts.
- The reuse decision, with explanations of its benefits and necessity, should be communicated to the public well in advance of the implementation phase,
- Both the public and the municipality proposed engagement with schools as an effective strategy.
- When public understands the benefits of reclaimed water, they are likely to promote its use.
- When the public feels included in the decision-making, positive emotions such as a sense of dignity, pride and confidence will be boosted.

6.2.3.5 Implementation of reclaimed water scheme

Issues of trust, safety and the cost of the plant emerged, given that most of the public knew nothing about the treatment technology, the costs and the safety of the water produced. Poor communication and inadequate engagement triggered fear and doubts amongst the public, who claimed that they didn't know whether reclaimed water was suitable for potable applications. Doubts about the safety of the water and concerns about the cost implications in terms of tariffs were expressed. People felt that they are being forced to drink reclaimed water against their will. Others said they were confused, because the idea of drinking reclaimed water was mind-boggling and they were uncertain about the entire process, from inception to implementation. Even though some public participants acknowledged the benefits of reclaimed water as a water augmentation option in times of scarcity, they still needed clarity on the processes involved.

Emotions and feelings expressed by the public because of lack of certainty about the safety of reclaimed water and because of inadequate spaces or opportunities to engage have engendered negative perceptions. These are among the factors involved:

- the safety of reclaimed water is one of the main concerns that may influence people's perceptions;
- lack of public consultation is likely to cause rejection of and resistance to reclaimed water;
- lack of choice can force people to accept reclaimed water. This implies that due to their low socio-economic status, some people may not have the choice of buying bottled water;
- reclaimed water is perceived to be expensive because of the several processes required for its treatment. People expect a water tariff hike and fear that water may be not affordable;
- lack of trust in the capability of the municipality to provide adequate services can govern people's decision to reject reclaimed water;
- people will resist reclaimed water because of the general belief that municipal officials do not drink it;
- political affiliations limit engagement between the public and the municipality. Officials engage only with those sharing the same political views;
- inadequate use of the media contributes to the rejection of reclaimed water.

6.2.3.6 Post-implementation

As was the case with previous stages, the public is not aware of the operation and maintenance requirements of the plant or the monitoring mechanisms in place, to ensure that the water produced complies with standards. This stirs up emotions of 'yuck' and doubts about the safety of reclaimed water (even though the public is already drinking it). Despite the municipality's attempts to address public concerns (via the sharing of information about quality standards in the newspapers), the respondents said they wanted more engagement at this stage. The lack of trust in municipal services is perpetuated because there is a perception that municipal officials do not drink the reused water.

The suggestions made include the following:

- The municipality should conduct ongoing and regular monitoring of the water supply, keeping the public informed of the results, communicated to the public via pamphlets;
- The municipality should communicate the results to the public in the official languages. The media (local newspapers, local radio GCIS [Government Communication Information System]) should be used to communicate with the public. Ward meetings are another medium for this;
- Technical information and safety measures should be communicated via churches and schools;
- Public should distribute pamphlets (with information supplied by the municipality) to schools and churches;
- The municipality should inform people so as to change their mindsets through radio, newspapers, pamphlets and meetings;
- The municipality should take pictures of the Mayor, Municipal Officials (MOs) and politicians drinking reclaimed water and publish them in the local newspaper;
- MOs should prove that they consume reclaimed water by putting the water in jugs for drinking during meetings and not use bottled water;
- Community leadership must get involved – church and school leaders etc. must follow the actions of the MOs and politicians and be seen drinking reclaimed water;
- Continuous access to the plant to build trust;
- Promotion initiative by local government to supply stats on how water is conserved;
- No water restrictions;
- Promotion activity on the part of the Provincial Government.

6.2.4 Overstrand Municipality

Due to the severe drought that occurred between 2009 and 2011, Overstrand municipality decided on reclaiming wastewater. The decision triggered negative perceptions which needed to be addressed. The activities that followed each stage of the decision-making process are discussed below.

6.2.4.1 Water scarcity and risk management

Despite visible signs of water scarcity, it appears that the public did not believe the extent of the water scarcity – until water restrictions were implemented. The municipality started its campaign to inform the public using local media (newspaper and radio), and notice boards at shops, the municipal offices and other public places. The persistence of denial and doubt suggests that the public need even more information about water scarcity and risk management plans.

6.2.4.2 Reconciliation study

The outcomes (indicating the status of water demand vs. supply and proposed options for water augmentation) were published in the municipal IDP and WSDP. The public was not aware of the study and was not involved, and hence knew very little about the process. This triggered doubts about the real motive for the study and its outcomes. Due to the predicted negative impact, this might have on the implementation of reclaimed water, the public respondents suggested that they be involved in the process and made aware of the study's outcomes and meaning.

6.2.4.3 Feasibility study

Public respondents did not know about the feasibility study. They were unaware of its purpose, its outcomes and the extent to which its proposal would address the water shortage. This exacerbated existing misgivings. Their fear stemmed from the perception that they might be supplied with water of a sub-standard quality at a high cost. Respondents therefore suggested adequate engagement in order to equip them with knowledge of the study and the reuse scheme. The engagement should address the purpose of the feasibility study and the meaning of its outcomes, water treatment technology, water quality, and the cost implications.

6.2.4.4 Reuse decision

Following the announcement of the decision to adopt water reclamation as a water augmentation option, there were no public objections. Despite this, the respondents expressed concern about the quality of water to be distributed. This concern can trigger fears, disgust, anger, trust and equity issues that, if not addressed, could jeopardise the entire project. In view of these perceptions, the respondents suggested the following as actions as a strategy:

- The reuse decision: its benefits and necessity should be communicated to the public well in advance of the implementation phase;
- Use the media to promote reclaimed water. Involve the media in communicating the idea to the public, e.g. diagrammatic illustrations with easy explanations on a regular basis;
  - There should be:
    - Physical announcements (making it known via talks given to the public);
    - Public information via media such as newsletters, newspapers and radio;
    - An agreement between the municipality and schools to conduct an education campaign, even incorporating reclaimed water in the curriculum;
    - More public meetings and campaigns (to communicate, especially with those who do not have access to media).

- Perception of disgust should be addressed by:
  - Demonstrating that reclaimed water meets standards by showing proof to the public via public meetings and newspapers using the ***right terminology***;
  - Getting celebrities and municipal officials to drink water in public;
  - Training community leaders to educate the public about the water quality;
  - Developing public self-education materials and campaigns;
  - Addressing equity concerns, by showing proof that reclaimed water is for all, regardless of socio-economic group, gender, age, race, or education;
  - Providing public access to the plant, and demonstrating and explaining plant operations (using PowerPoint or a poster if the plant is not yet operational).

6.2.4.5 Implementation of reclaimed water

The public was not aware of when the implementation of reclaimed water will take place. The respondents asked to be informed about the timeline for implementing the scheme, and whether the initiative is still envisaged despite the availability of alternatives (such as rainwater and ground water). Comparing the Beaufort West context, there is a likelihood of the emergence of negative emotions/perceptions at this stage: hence the need for strategies to address perceptions from an early stage of the institutional processes.

6.2.4.6 Post-implementation

Water reclamation in Overstrand municipality is still at the planning stage and its implementation is not yet confirmed. The municipality has plans in place to ensure that the quality of drinking water, whether reclaimed or from other sources, is subject to a monitoring procedure. Water quality results are currently published in the Blue and Green drop reports, and it is intended to continue reporting these results when reclaimed water has been introduced.

Respondents suggested the following actions to be taken to address negative perceptions during this stage:

- Water quality monitoring process, water quality determinants, and monitoring frequency should be communicated to the public;
- Water quality results should be disclosed using available media accessible to the public on a regular basis; disclose Blue Drop and Green Drop certificates;
- Health institutions to introduce a periodic health check as back-up to ensure that people drinking reclaimed water are safe;
- Qualified and trained process controllers to be deployed at the plant.

6.2.5 eThekwini Municipality

eThekwini municipality has opted for water reclamation to supplement dwindling water resources. The process has since stalled because of political complications. Both respondents and officials are frustrated by this, not knowing when the process will unfold. Respondents suggested certain actions and strategies to follow each stage of the institutional process, to address possible negative perceptions:

6.2.5.1 Water scarcity and risk management

The public expressed scepticism about a water shortage in eThekwini, given the continuous water supply. They indicated that there were no visible signs of water scarcity, and that this would serve to perpetuate feelings of doubt around the reuse scheme. The general perception emanating from the discussion was that the lack of knowledge of indicative signs proving water scarcity is likely to cause rejection of and resistance to reclaimed water. Suggestions for addressing doubts included the use of visible signs in information campaigns to demonstrate water scarcity and water resources available (e.g. dam levels).

6.2.5.2 Reconciliation study

The public was not involved in or aware of the outcomes of the reconciliation study, despite its being available and accessible. The respondents had little or no knowledge about the purpose and meaning of the study outcomes, but showed interest in learning about these. The lack of knowledge was expected to generate doubts and mistrust, as many people did not understand the balance between supply and demand. It was suggested that the public be informed prior to and after the study to explain its purpose, outcomes and contributions towards improving water security.

6.2.5.3 Feasibility study

Public respondents were concerned about safety and the cost implications. The effects of lack of knowledge about the safety (treatment process and water quality) and associated costs stemming from inadequate engagement will mean that the public is likely to reject or resist reclaimed water. Acceptance will depend on convincing reassurance by municipal officials regarding the safety of reclaimed water and the cost implications.

Recommendations for strategies included disclosure of treatment technology, process and benefits (in terms of costs and health), water quality and safety.

6.2.5.4 Reuse decision

While eThekwini has not made a final decision on whether reuse will be implemented, there was a general expression of fear and disgust around the safety of reclaimed water which generated rejection of the initiative. Fear was attributable to a lack of transparency in the decision-making process and inadequate engagement with the public. The respondents suggested that adequate public consultation throughout the entire decision-making process would earn the initiative conditional acceptance, which could lead to promotion of the reclaimed water scheme once trust was firmly established. The consultation process should address public concerns responsible for the fear and disgust and allow for two-way communication (question/response).

6.2.5.5 Implementation and post-implementation of reclaimed water

Reclaimed water is still seen by officials as a suitable alternative to address looming water scarcity in the area. Certain challenges were anticipated at these two stages, arising from negative perceptions relating to safety concerns and mistrust. Proposed action to address these perceptions includes ongoing public awareness and education campaigns, ongoing discussion and presentation of the monitoring process and safety measures, and community involvement.

Tables 6-2 presents suggested actions for developing strategies to address negative perceptions.

Table 6-2: Summary of municipal and public actions required to address negative perceptions

Respondents	Actions	
	Municipal	Public
Water practitioners	- Explaining the purification process - Set up team of experts: Government, chiefs, councillors, religious leaders - Use media, public forums and campaigns to ease the fears - Ensure that public figures talk positively - Involve and get buy-in from various influential leaders in communities - Have public demonstration using celebrities - Use success stories of implementation of reclaimed water - Ensure quality control - Present financial benefits - Public engagement through existing structures and channels - Clear information on how reclamation plant works and guarantee of safety - Training of various stakeholders - Evaluate information sharing - Analyses of information received - Identify issues and address them before implementing reclaimed water	- Attend meetings and road shows - Access media (radio, television and newspapers) - Community participation - Community co-operation - Undertake own research and ask for clarity - Get as much good information as possible - Attend/ respond to engagement initiatives in their local areas - Through two-way communication, to get clear information about safety measures - Face-to-face meetings to have opportunity to raise questions with various stakeholders - Public buy-in and take ownership - Evaluation of information shared - School and community inputs

Communities and schools	- Municipality must educate people - include community when making decisions in workshops - Explain the purification process – Municipality must prove safety and quality of water - Ongoing monitoring safety - Advertise the safety of water on the billboards, newspapers etc. - Addition of subject regarding safety and importance of water in schools - Educate the children at school, through debates, stories, poetry and stage plays - Show public benefits of reclaimed water - Clean water from supply for easy access to households	- Attend meetings - Proper testing from the tap and household - Media, pamphlet flyers to convey message - Community outreach - Need to know about result of testing - School visit - Commit themselves to meetings - Access to media - Visit the plant - Learning more about water reuse - Contribute to the decision of water reuse - Take on the role of helping others to understand water recyclying - Use water responsibly to reduce wastage

The findings of this research suggest that across municipal settings and institutional stages, opportunities for public engagement required two-way communication to accommodate questions from users and the broader public (Table 6-3). This appears to involve:

- Understanding, by users and the broad public, of the social and environmental benefits intrinsic to the feasibility of options;
- Two-way communication to improve institutional understanding of public concerns, fears and questions, while sharing institutional scientific and technical knowledge with users;
- Reassuring the public of the trustworthiness of a scheme, during planning and implementation;
- Advising users about risk management precautions and fail-safes, demonstrating commitment to good practice.

The strengthening of social networks (as opposed to a one-way flow of information from experts to the ignorant public) was envisaged for the purpose of active technical and scientific knowledge sharing in each case study setting.

Table 6-3: Implications for actions related to knowledge sharing

Stage of inst. process	Prevailing perceptions	Summary of knowledge requirements
1. Planning Water scarcity	**Denial or doubt** Lack of choice, stress, confusion	Water scarcity and signs to be explained
Risk Management	**Mistrust** Stress, confusion	Measures to address water scarcity to be explained
Reconciliation Study	**Doubt** Not being considered	Purposes, outcomes and impacts to be communicated prior and after
Feasibility Study	**Mistrust** Neglect, doubt, fear	Impacts of the studies in addressing water scarcity to be communicated
2. Reuse decision	**Fear** Anger, unfairness, disgust, imposition	Basis for decision Criteria for selection of water augmentation option & technology
3. Implementation	**Safety concerns** Fear, lack of consideration	Safety measures to be disclosed and ensured Capacity of plant staff to be presented
4. Post-implementation	**Trust** Doubt, fear and worry	Monitoring programme Water quality monitoring and results Safety measures

The data suggests that municipalities may build their social capital considerably by initiating and engaging in public spaces in an open and transparent way, thereby extending their existing institutional networks. The data suggests that an institutional entry point for broader public engagement is the common threat of water scarcity. Based on the literature review and the case study findings, the pro-active assessment of public understanding of water supply risk management is more productive than holding a defensive position. Findings show that public perceptions will be adequately addressed only if the factors that have led to negative perceptions are dealt with. Ways of dealing with negative public perceptions include political buy-in, public awareness campaigns and education. Public concerns should be addressed through adequate responses before negative perceptions spread through communities.

6.3 EMERGING TRENDS TOWARDS ADDRESSING PUBLIC PERCEPTIONS IN STAGES

6.3.1 Overview

Addressing public resistance triggered by negative perceptions (public doubts, trust issues, fears and safety concerns) at each stage of the institutional process means recognising that public concerns and questions require pertinent responses. These responses are intended to move the public's attitude from resistance to reclaimed water towards promotion, regardless of context. Drawing on specific suggestions from the case studies and based on a thorough analysis of the findings, trends for addressing negative perceptions at each stage of the institutional process emerged, and these are covered in the sub-sections below.

6.3.1.1 From planning to decision-making - Overcoming Fear

As water security, risk management, reconciliation and the feasibility of options for augmentation culminate in decision-making, the decision stage was a focal point for final field investigations. However, as few people were aware of the rationale for the decision, although the decision itself was communicated to the public using various media across the case studies, planning was confirmed as a key preliminary stage. Denial or doubt, fear and mistrust amongst the public provoke resistance to municipal decision-making. After public knowledge gaps had been assessed at the preliminary stages of water scarcity, reconciliation and feasibility studies, the last three critical stages were re-examined.

Public **Fear** is directly related to (not) understanding how wastewater effluent may be treated to potable standards. Although existing communication channels (comprising media, councillors and civic organisations) were deemed adequate at the time, hindsight enabled suggestions to be made to address gaps that arose. It emerged that, once assured that the reclaimed water is to be distributed equitably, many people showed a keen interest during implementation in the plant's operational treating of effluent to drinking water standards.

It was found that the use of print media was insufficient as many people were not reached by means of posters, notices and newspaper announcements, nor did they attend public meetings. On the other hand, Beaufort West officials claimed that 90% of the public was covered after representative structures were relied upon to secure public participation. According to municipal in-house norms and current practices, reliance on the media for public communication was a notable deviation from established outreach and education practice in eThekwini. While the awareness of risks derived from municipal educational outreach programmes were included in efforts to share knowledge with the public, the recycling of wastewater called for a topical expansion ahead of decision-making. Despite its amplified misrepresentation in the media, it became apparent that counteracting public resistance could turn local decision-making challenges into opportunities to enhance public understanding of water cycles.

While curiosity leads many people to attend public meetings and undertake site visits to further their own understanding, to shift public attitudes requires municipal communication to reach a very broad public spectrum. Public target groups may also vary depending on the importance of specific issues to groups. Strategic public engagement includes education and awareness campaigns, public meetings and sharing examples of successful projects, to address doubts, fears and trust issues.

6.3.1.2 Implementation: Addressing safety concerns

Safety concerns regarding reclaimed water were found to be generated by a deficit in public knowledge and inadequate public engagement in the run-up to and during implementation. Concerns often express a lack of knowledge about the treatment of wastewater effluent to drinking water standards, so that addressing the safety concerns of the public at this stage focuses on both treatment and water quality standards.

Proof of water quality meeting requisite standards and public understanding of treatment processes are most effectively secured through site visits. This is a suggestion in response to ongoing public concerns in Beaufort West. Proof of the safety of the potable water at supply points was suggested by eThekwini practitioners for effective verification by the public. In anticipation of overcoming the current stalling of the scheme at an advanced planning stage, questions of water quality, health risks and safety standards may be readily addressed in eThekwini's outreach programme. Overstrand has suggested that a planned sequence of events – ranging from public meetings and information-sharing sessions to a launch and planned plant visits – will suffice to address safety concerns. These proposed public engagements should be facilitated by municipal officials (Community Liaison Officer or spokesperson, and councillors), community leaders and media. Celebrities and prominent leaders should be introduced during events to demonstrate their consumption of reclaimed water as proof that water purification is meeting standards.

6.3.1.3 Post-implementation: Building trust

Trust in public water services institutions depends in part upon the nature of information communicated, the frequency, mechanisms, as well as the timing of communications, once a plant is operational. The knowledge required by the public at this stage is about monitoring systems and plant management capabilities. The data indicates that satisfaction with water quality requires a degree of understanding of the results of testing and monitoring systems. This will enhance public acceptance of the water's safety and build trust in public institutions.

eThekwini suggested that greater understanding of the actual risks and the Health Department's responsibility for the quality of potable water could be conveyed by relaying the standards applied in testing. The regularity of the sampling system and the sharing of evidence were linked to informing the public about the municipality's association with national monitoring programmes, including Blue Drop, Green Drop and No Drop. Other suggestions for communication came from Beaufort West, where local radio was highlighted as an underutilised resource for two-way communication, and from Overstrand, where billboards and representative council structures were viewed as the key tools. Making results available alongside those in place for water quality and pollution should include the sharing of both the standards applied and the results of the monitoring for safety at supply points.

6.3.3 Ensuring public participation

Building on their own experience, the **Beaufort West** municipality heightened public awareness through communication and public engagement, as summarised below.

- ***Knowledge required***
  - Profiling of social groups to understand their level of knowledge, and develop appropriate information sharing tools and public engagement processes;
  - Introduction of a school programme to cover the water cycle and water treatment;
  - Community awareness programme (water use, water treatment and water conservation) using a variety of channels, tools and methods;
  - Media coverage to be understandable and accessible by all social groups;
  - Tools and methods should reflect the diversity of social-economic levels across the public;
  - Communication channels to be briefed to convey messages appropriately, without changing of content or context.

- ***Public engagement enhanced***
  - Use of influential and knowledgeable personalities to engage with the public;
  - Provide spaces for the public to raise questions and have their concerns addressed;
  - Develop a public liaison portfolio within the municipality.

In **eThekwini's** Outreach Programmes, while awareness of risks was already included in the knowledge provided through public engagement, recycling wastewater called for the expansion of educational content, ahead of decision-making. The case study respondents referred to ongoing education outreach to target knowledge deficits, with additional surveys conducted before and after promotion campaigns. The role of CSOs and NGOs as intermediary public organisations was highlighted. They could enter into formal partnerships with municipal service providers, via the signing of MOUs. This was envisaged as enhancing the opportunities to clarify, agree or disagree, question, debate and discuss matters with public target groups.

Strengths of the **Overstrand** strategy lay in their extended planning stage that amplifies water scarcity and risk management planning, while introducing the feasibility of potable reclaimed water as an augmentation option. Making use of billboards to promote wider public awareness of changing conditions was affirmed as an effective tool in the planning stages and prior to implementing operations.

Reducing the above to point form, stakeholders provided suggestions for context-specific improvements as follows:

- **Beaufort West**
  - Communication starting at a broad public level should subsequently identify and focus on resistant target groups for further dissemination;
  - Target groups should involve many actors and influential people;
  - Print media should be supplemented by two-way communication opportunities such as those offered by an active community radio station.

- **eThekwini**
  - Reliance on print media should be minimised;
  - Water Services' inter-departmental collaboration for education and outreach programme should be built upon;
  - Resistance of specific groups should be targeted;
  - Partnerships with NGOs and CSOs should be strengthened, to influence resistant politicians.

- **Overstrand**
  - Strategies used to provide services such as sanitation and houses will not be extended to the water reclamation initiative because of its sensitive nature;

An Environmental Impact Assessment (EIA) was evidently likely to be conducted by municipalities, in the hope that engaging Interested and Affected Parties (IAPs) in this way might build public confidence and thereby influence reluctant political leadership. However, it became evident across the cases that reliance on processes governed by media and/or consultancy norms and practices did not suffice for the wider public engagement envisaged by municipal professionals. Municipal practitioners concurred that the EIA and associated IAP processes, conventionally conducted via the media, were insufficient.

In each case, meaningful knowledge sharing and active engagement were suggested as ways to overcome public fears regarding safety, and to build trust between institutions and their public. Proposed improvements emphasised social issues that could dominate public perceptions. An iterative process was suggested for sharing information in response to doubts, uncertainties and questions, a process that kept in step with the logical unfolding of the institutional process. Proposals for knowledge sharing and pubic engagement across the case studies homed in on how to address public denial, doubts, fears and mistrust at each stage of the project cycle of municipal planning, decision-making, implementation and post-implementation. However, as a common trend across the case studies is for municipalities to rely on one-way information dissemination, rather than creating interactive opportunities for questions and debate, there is a need to equip them with guidance and tools for knowledge sharing and public engagement processes that are applicable in various South African settings, and at different stages of the institutional process.

Connecting public perceptions with institutional perspectives intermittently, within spaces at the interface between them, provides productive opportunities to influence public acceptance through knowledge sharing and public engagement processes. Sharing scientific and technical information in two-way communication events and mechanisms will make room for questions and responses at each stage. Engagement between the public and the municipality provides spaces for public questions and municipal responses, debate and discussion. Such spaces also afford people opportunities to exercise choice, an essential ingredient of agency.

6.3.4 Public engagement approaches

Public knowledge deficits and public engagement challenges across the case studies were translated into knowledge sharing and public engagement opportunities for improving public acceptance.

6.3.4.1 Public coverage tools

The international and local literature shows that the public can be reached through a variety of methods ranging from information campaigns to public gatherings, the media, etc. In South Africa, public coverage has been achieved through the means summarised in Table 6-4.

Table 6-4: Public coverage tools in South Africa

Beaufort West*	eThekwini	Overstrand
- Public meetings - Use of flyers - Media - Municipal noticeboard - Notice at shops and attraction areas	- Public presentation - Meetings - Media	- Media release - Public meetings - Noticeboards

The public was engaged differently in the case study areas. In Beaufort West, for example, public meetings and a noticeboard and flyers indicating dam levels were used. In Overstrand, noticeboards (Figure 6-2) were used to alert the public to water scarcity. In eThekwini, public meetings, presentations and the media were used to convey the message.

Figure 6-2: Billboard informing public about water status level

These findings also emphasise that the choice of public coverage tools or methods depends on the profile of the targeted public. This means that prior to the selection of a tool or medium it is important to establish the profile of the public to be covered. This profile should incorporate aspects such as gender, culture, education level, income level, access to media (radio, television, newspaper, and internet), and level of involvement in public meetings and organisations. The perspectives shared by the sample of respondents in each case provided a basis for developing generalised guidance for South African municipalities to help them mitigate negative public perceptions. Suggestions were considered and adopted to help inform a generic guideline that can be applied across all settings and at different stages. Nevertheless, context-appropriate events and materials for encouraging public acceptance may be shaped by institutional understanding of factors settings.

6.3.5 Approaches to influencing public perceptions in context

Prolonged or recurrent droughts, decreasing levels of dams and drying boreholes may prompt water authorities to seek alternative water augmentation sources. Urbanisation and immigration trends are also considered in feasibility studies that inform municipal decisions about cost-effective solutions. The environmental and developmental beneficiation of reclaiming wastewater for potable application is a subject for social learning that municipalities are well placed to enhance. Water scarcity, risk management and investigating the feasibility of options for augmentation culminate in municipal decision-making, which must countenance the following:

- ***Overcoming fear***, fear being the primary feeling underlying public resistance to or rejection of reclaimed water. Sharing examples of successful implementation over time and elsewhere, as well as demonstrating treated water quality and explaining cost-effectiveness, were among the measures suggested.

- ***Addressing safety concerns*** is about understanding the standards for public health and wellbeing that are applied to potable water quality. As a key determinant of resistance or acceptance, comprehending more about the treatment process increases public confidence, as do plant visits and demonstrations of safety.

- ***Building trust*** in the municipal capability to ensure compliance and enforcement of local and international standards, together with the transparent monitoring of water quality and disclosure of water quality data on a regular basis.

After incorporating into it ways in which the monitoring of safety could contribute to the building of public trust in water service providers, the case study data confirmed that knowledge acquisition and public engagement mobilises increasing degrees of acceptance through stages of negative perception towards the most positive response of promotion. This understanding provides a firm foundation for the institution's knowledge to be effectively shared in response to users' concerns and questions, so that:

- Users and the wider public are reassured as to the safety and trustworthiness of a scheme, during the stages of planning, decision-making, implementation and monitoring;
- Users are advised of risk management precautions and fail-safes, demonstrating the institution's commitment to good practice and adherence to health and quality standards.

Suggestions for knowledge sharing and active engagement to build trust between institutions and their public across each case study location and the various institutional process stages were clustered for comparative analysis.

A comparative analysis of respondents' suggestions, insights from the literature review and personal experience, enabled the development of the approach presented in Table 7.5. The analysis reveals that at each stage of the institutional process, there are prevailing perceptions. The most prominent perceptions associated with each stage should be identified and addressed. In addressing these perceptions, one should note that they stem from the two main factors of knowledge deficit and inadequate public engagement.

The approach suggests the following procedures for addressing negative public perceptions at each stage of the institutional process:

- Identify prevailing negative perceptions and related emotions;
- Identify the knowledge required, according to the key issues pertaining to the particular stage in the institutional processes;
- Identify or develop a medium for knowledge sharing;
- Identify public engagement methods suited to the knowledge requirements of the stage in the institutional process;
- Identify or develop a medium for public engagement appropriate to the stage.

Table 6-5 provides guidance regarding what actions should be used. The examples are only generic (based on the experience of the three case studies) and not generalisable, unless the context is similar. It is therefore advised that each water institution should develop its own approach through making use of this guide.

The benefits of knowledge sharing appear to increase considerably through iterative public engagement, when opportunities for two-way communication are made available at every stage of the institutional process. Implications (Figure 6-3) that were found to be of generic relevance are set out below.

The qualitative research confirmed that public engagement can shift progressively from rejection toward promotion. The continuum shown above is based on a generic shift from public resistance through conditional acceptance towards public promotion. Promotion manifests as a desire to demonstrate the safety and efficacy of the solution to others and become an advocate for the proposed changes in the potable water supply.

Table 6-5: Approaches for addressing public resistance to the potable use of reclaimed water

Stages	Emotions/ Perceptions	Approach			
		Knowledge required	Medium	Engagement/Involvement	Medium
Planning **Water scarcity and risk management**	**Doubt** **Denial** Fear Stress Confused Mistrust Imposition	Inform about water scarcity Provide tangible evidence of water scarcity Communicate risk management plans	Information management system Use of signs and boards Use flyers and pamphlets Use media Water bill Brochures	Public awareness Participate in meetings Address issues and concerns Public advisory board	Public relation campaign Presentation (using facts) Posters (with facts) Media Flyers, advert, boards School programme
Reconciliation study	**Doubt** Neglected Unconsidered	Inform public about purposes, outcomes and impacts (before and after)	Information centre Leaflet Use of water bill Use of media	Discussion forums Public meetings/dialogue	Presentations Posters Use of media Use of water bill
Feasibility study	**Mistrust** Neglected Unconsidered Doubtful Fear/Worry	Inform public about purposes, outcomes and impacts (before and after)	Information centre Leaflet Use of water bill Use of media	Discussion forums Public meetings/dialogue Public advisory board	Presentations Posters Use of media Use of water bill
Reuse decision	**Fear/worry** Anger Unfairness Disgust Imposition Unconsidered Despair/ Shame Mistrust	Basis for decision Decision making process Technology selection criteria and effectiveness Treatment process	Information centre Use of media Use municipal notice board and website Use of water bill Demonstration (lab scale model) Use high profile people/celebrity Share previous experiences	Public advisory board Public meetings Discussion forums with public representatives Schools visits	Political marketing Use of councillors to inform Presentations Agenda and themes for discussion
Implementation	**Safety** Fear/worry Unconsidered Confused Shame/Sadness Imposition	Implementation process Safety measures Timeline for implementation Technical information Qualifications of plant working and management staffs	Information centre Use of media Refresher course for plant staffs	Public advisory board Public meetings Public guided plant visits	Presentations Posters

Post-implementation	**Trust** Unsafe Unconsidered Anger Doubtful Fear/Worry	Monitoring programme/schedule Water quality monitoring parameters and frequency/process Water quality results (BD and GD) Safety measures Risk management plan	Information centre Use of media Use of municipal notice board and website Periodic check up by health officials Use of water bill	Guided plant visits Information campaign School visits Road show Information sharing sessions	Plant visit programme Posters & leaflets Banners Booklets Themes for discussion Use of medical experts

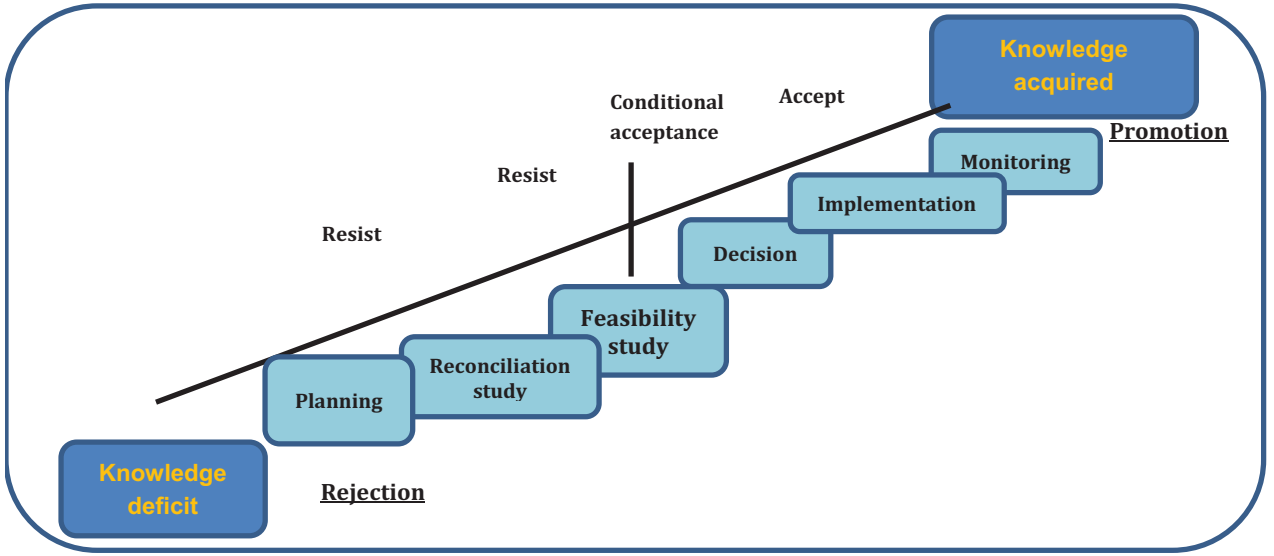


Figure 6-3: A continuum of acceptance aligned with the institutional process

6.3.6 Approaches to implementation of potable water reclamation schemes

Introducing reclaimed water to the public is a challenge that water service authorities must deal with. The key challenge is to ensure that the public understands the comparative benefits. This research found that water reclamation has been implemented on ad-hoc basis, meaning that situations have been dealt with as they have occurred (the case of Beaufort West, for example). But some municipalities are deferring to general documents such as the DWA regulatory impact assessment licensing process (eThekwini), EIA or water demand management strategies (which include reuse) (George municipality). Overstrand municipality is waiting for the guidelines that are (according to the municipal officials) being drafted by the Department of Water Affairs (DWA). Having discussed factors influencing public perceptions and strategies to address them, this section of the report presents the overall strategies for introducing reclaimed water, based on analysis of the findings, as well as relevant international and local experience. This section of the report outlines the approaches to introducing water reclamation employed in each of the three case studies. Beaufort West has completed the full institutional process, while eThekwini and Overstrand are at different stages in it. In these latter cases, completed institutional processes are documented, but for those yet to be completed, respondents were requested to present their vision for the remainder of the process of implementing reclaimed water.

6.3.6.1 Beaufort West Municipality

Beaufort West is the first municipality in South Africa where a reclaimed water scheme has been implemented and is fully operational. The Beaufort West case study presented a prototype for understanding the process of implementing a reclaimed water scheme, as well as of strategies used to address public perceptions. The suggested actions cover each stage of the institutional decision-making process, as shown below.

- ***Water scarcity and risk management***

The district councillor raised the issue of reclaimed water as a water augmentation option (in 2007) before drought was declared, in the face of the absence or shortage of sustainable and available water sources and limited groundwater. The area was declared drought-stricken in 2009/2010 after widespread signs of dryness, lack of rainfall and steadily decreasing levels in the Gamka dam. Ground water was limited and of poor quality, forcing municipal officials to implement water restrictions and impose fines on any user whose water use exceeded 12 Kl per month.

The public was aware of the drought because of the visible signs such as drying dams, dying crops, water restrictions and emaciated and dying animals, etc. Given the severity of the situation, there was a call for prayers to petition the divine grace. In addition, water scarcity was advertised using for example pole-mounted signs, pamphlets delivered to each household, media (written, radio and television), community meetings and schools visits. This implies that the public was aware of the drought situation and its possible consequences.

According to municipal officials, a public engagement process was activated using various means including radio (e.g. Gamka FM) and requests for (bottled) water donations, while the dam level was reported to the public on daily basis. Water restriction measures were communicated to the public. The water shortage really hit home when the public spent hours and even days without water.

- ***Reconciliation study***

The Department of Water and Sanitation (previously the Department of Water Affairs) conducted a reconciliation study. This process was undertaken at department level with the public in the area not being involved. The findings of the study were made available in the municipality IDP (integrated development plan) and WSDP (water service development plan). The outcomes of the study were used to determine available water resource options in the area.

- ***Feasibility study***

The feasibility study was undertaken at municipal level. A private contractor was appointed and tasked with providing the municipality with alternative sources of water to respond to the lack of water in the area. The outcomes of this study were presented to the municipal officials who in turn submitted them to the Department of Water Affairs. The project was approved and the council's decision to introduce reclaimed water was included in the municipal IDP. The public had no knowledge of this, nor of the criteria used by both the Department and the municipality to consider reclaimed water as an option, as they were not involved in the process. The decision-making process and the cost of implementing the water reclamation scheme were not disclosed to the public.

- ***Reclaimed water decision***

The outcomes of the feasibility study were presented and registered with disaster management to secure funding to implement a water reclamation scheme. Upon approval by the municipal council, a complete report covering design and financial requirements was submitted to the Department of Water Affairs. The project was initiated through a tender process, after which the council made a final decision and incorporated the project into the municipal IDP. According to municipal officials, the public was aware of the entire process. But members of the public revealed that they became aware of the decision only when the tender process was launched. They were alerted to the process through the media (newspaper, radio).

- ***Implementation of reclaimed water scheme***

Upon the municipal decision that followed approval by the Department of Water Affairs, the construction of the plant was authorised. The public was formally informed only three months after the water reclamation plant had become operational. The municipality used the EIA (environmental impact assessment) to address public concerns relating to equity and other issues around safety. Strategies used to address the public included public meetings involving water specialists and other experts, the use of flyers, media (radio and print), municipal noticeboards and notices in shops and recreational areas. The engineer who built the plant was pictured with a glass of water; this was intended to persuade the public that water emanating from the plant was safe and drinkable.

- ***Post-implementation***

The post-implementation stages involve plant operations (treatment and water supply), operation and maintenance (O&M) and monitoring. These processes are intended (according to municipal officials) to reassure the public that strict controls are in place to guarantee safety and thus to build their trust. According to municipal officials, water quality monitoring results are published in the local newspaper under the Blue Drop certification section. Similar to the situation in previous stages, the public has not been informed in any detail of the operation and maintenance requirements of the plant, nor of the monitoring mechanisms in place to ensure that the water produced complies with standards.

6.3.6.2 Overstrand Municipality

The Southern Cape area faced severe drought between 2009 and 2011, when available water sources were not sufficient to provide water for many uses, including potable applications. A decision was made to introduce water reclamation, following the processes outlined below.

- ***Water scarcity and risk management***

To address the drought situation, an institutional process was followed that included risk management (water scarcity), reconciliation and feasibility studies, and a reuse decision. Implementation and post-implementation phases are yet to come. The intention was mainly to identify sustainable water sources that might ensure a continuous water supply to the public.

The municipality was facing several challenges caused by drought. Water scarcity forced officials to introduce water restrictions to address the water shortage and manage available water resources. The level of the dam was very low (13% of its capacity), surface water was depleted and ground water was limited. A public information campaign was initiated by the municipality to inform the public using local media (newspaper and radio), billboards, and noticeboards in shops, municipal offices and public places, to make the public aware of the situation. The public, fearing a water supply crisis, responded responsibly by reducing their water use. Municipal officials indicated that public awareness reduced water demand by up to 25%.

- ***Reconciliation study***

According to Hay et al. (2011), the Department of Water Affairs conducted a reconciliation study to establish whether existing water sources corresponded to water demands. Bulk water users and interested stakeholders were involved in the study. The outcomes (indicating the status of water demand vs. supply, and proposed options for water augmentation) were published in the municipal IDP and WSDP. Despite the involvement of bulk water users and interested stakeholders, the public was not aware of the study.

- ***Feasibility study***

Following the reconciliation study, two options – reuse and desalination – emerged as water augmentation options for the area. A feasibility study was carried out to determine which should be selected. The intention of the feasibility study was to determine the type of treatment technology and associated costs. The outcomes of this process were not communicated to the public.

- ***Reuse decision***

The decision to adopt reclaimed water as the water augmentation option was made by municipal officials based on the feasibility study. The decision was communicated to the public via certain media (radio, newsletters and notes on water bills). Following the announcement of this decision, there were no public objections as such. Municipal officials indicated that they responded to 2 or 3 inquiries about the safety of the water.

- ***Implementation of reclaimed water***

Overstrand municipality adopted reclaimed water as a water augmentation option because of the drought experienced in the area in 2010. This plan was put on hold when alternative water resources became available. The public does not know when implementation of the reclaimed water project will take place. They have asked to be informed about the timeline for implementing the scheme, and whether the initiative is still in fact envisaged, given the current availability of other alternatives (such as rainwater and ground water).

- ***Post-implementation***

As indicated in the previous section, reclaimed water in Overstrand municipality is still in the planning stages, with its implementation yet to be confirmed. The municipality has plans in place to ensure that drinking water quality, be it reclaimed or from other sources, is subject to a monitoring procedure. Water quality results are currently published in the Blue and Green drop and it is intended to continue publishing these results when reclaimed water is introduced.

6.3.6.3 eThekwini Municipality

eThekwini municipality has opted for water reclamation as a water augmentation option for portable applications, but the process of implementation has been stalled due to political concerns. The process by which this situation was reached is described below.

- ***Water scarcity and risk management***

Water scarcity in eThekwini has been attributed to many factors, including population and economic growth, increasing discharge of wastewater effluent and the increasing depletion of fresh water sources. These factors have led officials to manage the risk of water scarcity by developing measures to deal with it. The measures include communication via the media (where officials communicate to the public the extent and impacts of water scarcity), the implementation of a water use moratorium and the establishment of public education campaigns.

- ***Reconciliation study***

The Department of Water Affairs conducted a reconciliation study to determine water availability in the area. The outcomes of this study were published in the municipal IDP and WSDP and were accessible there. The general public was not involved or aware of the study, and has little or no knowledge about the purpose and meaning of the study, but respondents showed interest in learning about the study.

- ***Feasibility study***

The reconciliation study was followed by another study to determine the feasibility of water augmentation options, treatment technology and associated costs. The outcomes of this study were intended to provide an indication of available water augmentation options and treatment technologies, so as to guide the selection. The EIA process and information about fail-safes was communicated to the public via print media. Despite this, members of the public indicated that they did not know about the study.

- ***Reuse decision***

The decision to recommend reclaimed water as alternative water augmentation scheme emanated from the feasibility study. The municipality engaged with the public via their networks such as user platforms to communicate its decision. However, there were indications that the public has not been adequately involved in the decision-making. The decision to introduce water reclamation has subsequently been put on hold. According to municipal officials, the implementation and post-implementation stages will follow public participation processes (using EIA or any other available guide) to inform and engage the public.

The divergent approaches to decision making observed in the case study municipalities suggest the need for a consolidated strategy for introducing water reclamation in any municipal context. Drawing on the varying decision-making processes outlined in Table 6-5, above, an approach detailing sequential stages was developed. The approach shows that introducing reclaimed water should be aligned with the institutional process to address specific public emotions/perceptions. The approach also suggests that each stage of the institutional process and any issues arising should be defined and clearly explained to the public. For example, in the first stage, the approach suggests that water scarcity signs and evidence of risk management should be displayed to make the public aware of the status of the water supply.

The three case studies offered different models that have been combined with international experience to develop the approach outlined in Table 6-6. This study has established that strategies should be developed around the various factors that have led to the adoption or envisaging of water reuse, and its subsequent impacts. Strategies are being developed to ensure a water supply risk continuum as a response to natural and human induced factors (drought, for example), or long-term planning (population and economic growth). A decision regarding water reuse emerges from water reconciliation study, while the treatment technology, cost and safety factors are informed by the feasibility study. Trust starts emerging when an adequate monitoring plan is in place.

Table 6-6: Approach to introducing reclaimed water in a municipal context

Stage in sequence	Objectives	Proposed actions

➢ ***Social issues***		
Planning Water scarcity and risk management ➢ ***Denial/Doubt***	Conduct research to establish water scarcity and develop risk management strategies	○ Identify water scarcity signs ○ Inform the public about water scarcity ○ Develop a risk management plan ○ Advise the public of the risk management approach and inform them of the risk management plan
Reconciliation study ➢ ***Doubt***	Conduct a reconciliation study to determine actual water available against demand	○ Inform public of purpose and outcomes of study ○ Engage the public by sharing knowledge and expectations ○ Selected public to be involved in the study
Feasibility study ➢ ***Mistrust***	Conduct a feasibility study to select suitable alternative and treatment technology	○ Identify stakeholders: outline purpose, expected outcomes and impacts of the study ○ Inform the public about the study ○ Conduct the study and publish the study outcomes ○ Explain outcomes to the public
Reuse decision ➢ ***Fear***	Decide on option in terms of feasibility, cost and other related criteria	○ Outline decision-making process ○ Outline criteria used to decide on reuse option ○ Explain the decision-making process and criteria ○ Inform and engage public about the reuse decision
Implementation ➢ ***Safety***	Develop implementation programme for building reclamation scheme	○ Present implementation details and examples ○ Outline the treatment process and standards ○ Discuss the cost implications of the scheme ○ Present, demonstrate and discuss back-up plan
Post-implementation ➢ ***Trust***	Develop a monitoring programme for ensuring water quality standards and safety	○ Develop a list of relevant water quality parameters ○ Develop & present monitoring plan ○ Develop schedule for widely publishing results ○ Present and discuss public issues arising

Drawing on the three case studies, the emerging approach for introducing water reclamation in a municipal context contains three key strategic elements:

Stages of the institutional process and related predominant social issues (perceptions):

- ○ Identify the stage of the institutional process
- ○ Determine predominant perception(s) of the stage
- ○ Identify actions relevant to address predominant perception(s)
- ➢ Definition of the objectives of the stages:
  - ○ Define the objectives of the institutional process stage
  - ○ Unpack predominant perception(s) and root causes
  - ○ Match actions to address perceptions

- ➢ Proposed actions required to address predominant public perceptions emerging at stages:
  - ○ Select actions that are relevant to each stage and predominant perception(s)
  - ○ Select or develop means of engagement and tools
  - ○ Engage the public using available means, allow for questions and response and provide feedback.

6.4 SUMMARY

This chapter has compared the emotions underlying public perceptions at different stages of the institutional process across the case studies. Guidance in influencing public perceptions accompanies the institutional

process used to decide on, plan, implement and monitor reclaimed water schemes. It was found that influencing public perceptions involved both knowledge sharing and public engagement.

Negative perceptions can be addressed using various strategies for communication, public engagement or consultation, media coverage etc. Public coverage may include media, flyers, public meetings, noticeboards, etc. Negative perceptions are indicators of underlying resistance while positive indicators of degrees of acceptance are linked to minimising knowledge deficits and maximising engagement processes. This implies that interventions promoting positive attributes, a sense of agency, empowerment, self-respect and understanding counteract negative feelings of deprivation, exclusion, disgust, shame, anger, or fear. Public rejection, often based on initial disgust, may be pro-actively moved through public resistance to conditional acceptance; fulfilling those conditions for acceptance may even move public perceptions to a peak of promotion.

Public promotion of reclaimed water for potable application is the desired consequence of the suggestions for strategic improvements. Both the quality and nature of information (in the process of its transformation into knowledge) is affected by the way that it is presented, shared, discussed and questioned. It was agreed across the case studies that the way information is shared with the public affects the extent to which knowledge is acquired, which in turn impacts on perceptions and a range of decisions and actions across the public realm.

Opportunities for two-way communication between the public and the municipality have repeatedly been suggested by public respondents. Positive feedback loops in the form of debate and discussion enhance feelings of pride and a sense of choice through opportunities to gain knowledge. In this way, the public can be included in the planning, decision-making, implementation and monitoring processes, which in turn makes people feel good about themselves. Creating spaces of this nature encourages the movement of public perceptions up the continuum of acceptance toward promotion of the potable use of reclaimed water.

It is recommended that current public engagement norms be reconsidered, and that municipalities venture beyond relying on representative structures to fulfil public participation mandates. Certain aspects of the approaches used in Beaufort West and eThekwini should be considered, adapted or replicated. Overstrand respondents suggested that broad public communication strategies, using council structures and local media, are best supplemented by public billboards displaying the status of water supply sources. By comparing suggestions from the various cases across the settings, it has emerged that each municipality should establish the public knowledge needs in context, to create effective means of communication to address public knowledge deficits and improve engagement. This requirement covers all the institutional processes at each stage.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

International and local studies essentially agree that negative public perceptions of reclaimed water relate to factors hinging on public knowledge and trust in the institutions responsible for producing the water. This qualitative study of the social and institutional implications of reclaimed water for potable applications has developed a guideline to enable institutions to address public perceptions so as to ensure the successful implementation of reused water schemes.

The literature review confirmed that addressing negative perceptions in various sectors and environments necessitated communication, using various measures and tools such as the media, meetings, posters and notice boards. The exploratory field research in three case studies, active participative reflection on collated data and analytic inferences culminated in recommendations to public institutions that are mandated to provide water to domestic consumers.

This study considered public[5] perceptions as occurring alongside the institutional process, revealing that the extent of public resistance or acceptance reflects the extent of public knowledge deficits and the efficacy of public engagement as a two-way communication process. Drawing on findings from the literature and comparative local case studies, a guideline for influencing public perceptions was developed.

Building on the monitoring and safety strategies developed by Swartz et al. (2015), this study has expanded on the types of information required, the frequency of communication and the need for public engagement to involve two-way communication. Two-way communication should be built into education and awareness campaigns, incorporating schools, public meetings and events, and guided site visits.

The guideline evolved around the several stages in the institutional process for the implementation of reclaimed water schemes and emphasised two elements, knowledge and public engagement:

- **Planning (water scarcity & risk management; reconciliation & feasibility studies):** the public is informed about water scarcity with tangible evidence and predictor signs through public awareness campaigns and meetings. Then the purpose, outcomes and impacts of the reconciliation and feasibility studies must be explained through public meetings, discussion forums, information centres and media, both before and after the studies have been conducted.

- **Reuse decision:** the municipality's selection of reclaimed water technology should be conveyed, with endorsement of its benefits, the efficacy of the treatment and its cost-effectiveness. Reference should be made to examples of successful implementation, with leaders/celebrities assisting at public gatherings. Information should also be disseminated through discussion forums, school visits, the media and water bills.

- **Implementation:** public knowledge of safety measures, the capabilities of the plant operating staff and management in respect of operating and maintaining the plant, should be shared through public meetings, site visits, information centres, school and general awareness programmes.

[5] Two types of public were identified in this research: 1) the informed/educated public and 2) the layperson (person not adequately informed or lacking knowledge).

- **Post-implementation:** information about the safety of treated water, monitoring programmes, water quality (water quality parameters, frequency of tests and results), safety measures and risk management plan should make use of guided plant visits, information campaigns and road shows.

7.2 RECOMMENDATIONS FOR FURTHER RESEARCH

Now that strategies for influencing public perceptions and an approach to introducing reclaimed water have been developed, the next step is to test the strategies and approach in a municipal setting and analyse the results. Key requirements in the guideline and suggested tools for their application may be refined from this testing with stakeholders in a new study setting. Given the results of the current study, this research team is well positioned to further develop and refine its materials and findings.

Although this research has produced a guideline for municipal application, there remains no guideline or framework for assessing the capacity and readiness of water institutions to implement water reclamation. It is therefore recommended that further research be conducted to understand and evaluate the potential and readiness of water services institutions to introduce water reclamation. Such research will aim at examining the extent to which municipalities are able to address and overcome public concerns to successfully implement water reclamation. The objective is to develop a set of criteria that could be used to predict the capacity and readiness of water institutions to undertake the implementation of water reuse.

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LIST OF APPENDICES

APPENDIX A - INTERVIEW QUESTIONNAIRES: USE OF RECLAIMED WATER AND IMPACTS

Appendix A.1: General public

1. Factors (referring to reasons or motives) contributing to the to the use of reclaimed water for potable purposes

1.1 What types of factors and conditions are contributing to the use of reclaimed water for potable purposes? – can you list these factors for me
1.2 Now, looking at each of the different factors that you have identified, can you tell me in what ways it contributes to the use of reclaimed water for potable purposes?
1.3 Some of these factors would be impacting on the refusal of ……. Whilst others would be contributing to the acceptance of …….. 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 it can impact on the acceptance or refusal of potable use of reclaimed water?
1.4 How are these factors perceived by different water services practitioners (engineers, municipal officials and laboratory technicians)?
1.5 What are the most predominant factors (from the provided list) that can be used as basis for initiating water reclamation?
1.6 I am interested in the way that decisions are being taken around ……. 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 decision has been or is being made regarding the use of reclaimed water for potable purposes?
1.7 How have these factors been addressed to alleviate its impacts?

2. Impacts of factors contributing to the use of reclaimed water 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 that have contributed to the use of reclaimed water on the general public?
2.3 How has the public reacted to water reclamation proposal?
2.4 Were these factors sufficient to convince the public about the usefulness of initiating water reclamation as alternative option?

3. Strategies for implementing reuse of water reclamation for domestic purposes

In your organisation you have a number of strategies that have been designed to further the aims of implementing …….. Can you tell me a little more about these strategies? For instance…

3.1 What strategies are or have been in place for implementing water reclamation?
3.2 Are there any guidelines or framework that has been used to implement water reclamation for potable purposes? Could you give me a copy of these guidelines?
3.3 Are these guidelines in the public domains? Are they readily accessible and if so in what format and in what languages?
3.4 And what are the key guiding principles of the guideline/framework (if existing)?
3.5 Have you engaged with public to discuss these strategies? If yes, how?
3.6 Have you had any feedback from the public on these strategies? How are they being reviewed …. And what type of feedback have you received

3.7 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?
3.8 How are these strategies viewed by various stakeholders involved directly or indirectly in the use of reclaimed water for potable purposes?
3.9 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
3.10 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 implementing reuse of wastewater at domestic level for potable use

4.1 In your opinion, what institutional capacities are required to ensure successful implementation of water reclamation scheme? – 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 use of reclaimed water for domestic purposes?
4.4 Are there other institutions that you partner with regard to developing strategies for implementing water reclamation scheme? What roles are they playing (please provide contact of partner institutions if any)

Appendix A.2: Specific interview questions

1a. Municipal (managerial) officials from institutions point of view

1.1 Can you explain to me why water reclamation has been privileged as alternative viable water augmentation alternative than other options (such as desalination for example?)
1.2 How did water reclamation for potable purposes idea emerge within this municipality?
1.3 Do you think that this idea is supported politically? – What makes you say that? Who do you think supports it?
1.4 Do you think that there are some people who do not support it? – Why do you say this? And how does this affect the implementation of the strategy?
1.5 Has this municipality got sufficient funds to implement a water reclamation scheme?
1.6 In your opinion what kind of funds are we looking at on an annual basis for a) treatment costs b) operational and maintenance costs c)monitoring and evaluation?
1.7 Is the municipality financially capable of successfully implementing water reclamation scheme?
1.8 What are the financial requirements (in terms of treatment cost, O&M, M&E etc.)?
1.9 Are there any additional issues?

1b. Municipal (managerial) officials from public perspectives

1.1 How is water reclamation introduced to the public?
1.2 At what stage of implementation process is the public contacted?
1.3 Who from the Municipality contacts the public and who do you contact from the public?
1.4 How is decision-making arrived at the interface between the Municipality and the public?
1.5 Does the public trust their (institution) competencies? What is your opinion on this?

2. Engineering services officials

2.1 Why has water reclamation been privileged as alternative viable water augmentation alternative than other options (such as desalination for example?)
2.2 What technology is being used so far and what are the operational requirements?
2.3 What are the cost of the treatment, O&M, M&E and related plant operations?
2.4 What human capacities (in terms of technical knowledge, main power etc.) are required to ensure that the treatment process and quality of treated water meet standards quality requirements?
2.5 Are there any additional issues?

3. Water laboratory technician

3.1 Is the water reclamation an alternative to respond to increased water demand?
3.2 What water quality determinants (or parameters) can limit water reclamation for potable purposes?
3.3 To what extent these pollutants impact on human health?
3.4 Does wastewater effluent present potential for reuse given the number of pollutants and potential danger it presents?
3.5 What treatment process should be in place for safe removal of these pollutants and meet drinking water quality standards?
3.6 Are there any issues that you would like to discuss with me that would help us better understand the issues from the perspective of a water laboratory technician?
3.7 Do you disclose water quality results to the public? Explain how.

APPENDIX B - INTERVIEW QUESTIONNAIRE: PUBLIC PERCEPTION FACTORS

B1: Knowledge

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 water reclamation?	P
	6.2 Does your community know about water reclamation?	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 use? *Domestic?*	7.1 What do you understand by potable use of reclaimed water?	P
	7.2 Does your community know about potable use of reclaimed water?	P
	7.3 Have you and your community heard about plans for potable use of reclaimed water?	P
	7.4 How did you and your community hear about plans for potable use of reclaimed water?	P
	7.5 Who do you think opted for potable use of reclaimed water?	P
	7.6 What could be the reasons for potable use 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 extent do you think the public is involved in the EIA process?	P

Key: P: Public, GO: Government officials, CLO: community liaison officer; NGO: Non-government organisations; MO: municipal officials

B2: Social capital

B. Social capital		Respondent
1. Do you know the stakeholders that were involved in water reclamation initiative?		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 corporate 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 water reclamation?		MO, GO & NGO
7. How was reuse introduced to the public?	a. Do you think these steps were adequate?	P, GO & MO
	b. 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 water reclamation?		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

B3: Emotions

C. Emotions		Respondent
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 water reclamation?		P
5. Do you really feel that this is necessary?		P
6. Do you really feel comfortable with the idea of water reclamation?		P
7. Do you think you had a choice regarding water reclamation?		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 the use of reclaimed water?		P
9. When you first heard about the idea of reuse, what was your first reaction?		P
10. When the public first heard about use of reclaimed water, what was their reaction?		MO & GD
11. You probably had your opinion about water reclamation, 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

B4: perceptions

D. Perceptions		Respondent
1. What are the benefits of potable use of reclaimed water to your community?		P
	1.1 What are the benefits of reclaimed water 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 example, 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?		P
	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?		P
	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 reclamation?		All respondents
13. Do you think your perceptions will change in the future?		P
	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 using reclaimed water?		P
15. What is your opinion about the media regarding potable use 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 use of reclaimed water?		P

APPENDIX C - DEMOGRAPHIC INFORMATION ON RESEARCH PARTICIPANTS

Purposive sampling initially selected available, knowledgeable and experienced stakeholders recruited for informational needs (Patton, 2002; De Vos, 1998), including potable water users. Interfaces (at the cusp) between institutions and the public were a crucial lens of study.

Individual interviews with Councilors. Engineers, Municipal Managers, Consultants and levels of management/supervision added value by covering municipal public participation capabilities. Individual interviews and review of local, documented, existing public engagement practice.

Snowball Sampling captured different perspectives across the public realm of civil society, organisations, individuals and business at the cusp between public and municipality. An outline of purposive targets was submitted to municipal officials, as shown below.

Table C1: Outline of Purposive targets across the institutional and public realm

Public	**Intermediary (public & providers)**	**Service providers**
Public interest organisations: NGOs, CSOs, CBOs, User Groups	Public participation functions (IDP, WSDP)	Levels of government linked to water services, CMAs
Religious perspectives (leaders and church groups)	Councillors and Ward Committees	Municipal Decision-makers
Schools (headmaster, teachers and learners)	Municipal CLO's and Field practitioners (e.g. education officers, EHPs)	Water Services department line managers
Media – print and radio		Consultant engineers (service level agreement contracts)
Sector stakeholder fora		Academic partners- advisors

Field-based research allowed scope for snowballing to add respondents to public samples for both focus group and individual interviews. Multiple voices were deliberately accommodated in identifying respondents and focus groups with different perspectives.

Focus groups from different levels of municipal management, practitioners at interfaces between the institution and their public participation mechanisms (such as Councilors) were convened to respond to questions from a range of perspectives.

Divergent Perspectives across the Public realm

1. Public Institutional stakeholders: Municipal Manager; Water Services: Director, Management, Environmental. Health, Consultants, expert Advisors (e.g. academics)
2. Cusp between institution and public: Supervision, of Community Liaison and Education Officers, Councilors and Ward Committee members, Social services, Media (e.g. community radio).
3. **Public samples** consisted of Schools, NGOs, CSOs, public water-related Fora, User Platforms, religious leaders

In all three cases the point of entry to sampling was through municipal engineering protocol.

Table C.2: Overstrand municipality

	Names	Gender	Age	Race	Religion	Education	Affiliation
1	H. Blignaut	M	>50	W	Christian	UG	OV municipality (Eng. services)
2	P. Robinson	M	>40	W	Christian	UG	OV municipality (Eng. services)
3	M. Sapepa	F	<40	B	Christian	UG	OV municipality Councillor
4	M Mzameni	M	>40	B	Christian	UG	OV municipality Councillor
5	Imam	M	>40	B	Islam	UG	Mahjidah Mosque
6	Believer	M	<40	B	Islam	HS	Mahjidah Mosque
7	Participant 1	M	>50	W	Christian	PG	Environmental NGO
8	Participant 2	F	<40	W	Other	PG	Environmental NGO
9	Participant 3	F	>40	W	Other	UG	Environmental NGO
10	Anonymous	F	60	W	Other	HS	House owner
11	Anonymous	M	<60	W	Christian	HS	House owner
12	Anonymous	F	>60	W	Other	UG	Hotel owner
13	Anonymous	M	>60	W	Christian	UG	Hotel owners
14	Principal	M	>60	W	Christian	PG	Camphill School
15	Assistant	F	>30	W	Christian	UG	Camphill School
16	Vice principal	M	>50	C	Islam	PG	Qayiya High School
17	Teacher 1	F	>50	B	Christian	UG	Qayiya High School
18	Teacher 2	F	<40	B	Other	UG	Qayiya High School
19	Teacher 3	M	33	B	Other	UG	Qayiya High School
20	Teacher 4	M	35	C	Christian	UG	Qayiya High School
21	Teacher 5	M	28	B	Christian	UG	Qayiya High School
22	Learner 1	M	16	C	Islam	HS	Qayiya High School
23	Learner 2	M	17	C	Islam	HS	Qayiya High School
24	Learner 3	F	15	B	Christian	HS	Qayiya High School
25	Learner 4	F	14	B	Christian	HS	Qayiya High School
26	Learner 5	M	17	B	Christian	HS	Qayiya High School
27	Learner 6	M	16	B	Other	HS	Qayiya High School
28	Learner 7	M	16	B	Other	HS	Qayiya High School
29	Learner 8	M	16	B	Other	HS	Qayiya High School
30	Vice principal	F	<50	W	Other	PG	Curro School
31	Anonymous	M	>50	W	Christian	HS	Protestant church
32	Anonymous	M	>30	B	Christian	HS	Pentecostal church
33	Anonymous	M	>30	C	Christian	n.d	Pentecostal church
34	Anonymous	M	n.d.	W	Other	UG	Consultant engineer
35	Anonymous	M	n.d.	W	Other	UG	Consultant engineer
36	Andile	M	25	B	Other	UG	Member of community
37	M. Ngubane	F	23	B	Christian	UG	Member of community
38	Amanda	F	24	B	Christina	HS	Member of community
39	Bongekile	F	26	B	Animist	HS	Member of community
40	Nokuthula	F	48	B	Animist	UG	Member of community
41	Ngcobo	F	41	B	Christian	HS	Member of community
42	K. Khala	M	46	B	Christian	UG	Member of community
43	T. Thoyiya	M	34	B	Christina	UG	Member of community

Key: HS: High school; UG: Undergraduate; PG: Postgraduate.; n.d.: not disclosed

Table C.3: eThekwini municipality

	Names	Gender	Age	Race	Religion	Education	Affiliation
1	Muzi Tembe	M	30	B	Christian	HS	User Platform
2	Segu Relloy	M	>30	B	Other	HS	User Platform
3	Ntombi Zondi	F	<30	B	Christian	HS	User Platform
4	Nokuthula Mba	F	<30	B	Other	HS	AA Focus Group
5	Zethu Thabethe	F	>30	B	Christian	HS	AA Focus Group
6	S. Ngwenya	F	<30	B	Christian	HS	AA Focus Group
7	T. Maphumlo	M	<30	B	Christian	UG	AA Focus Group
8	Sihle Skhosana	F	<30	B	Other	UG	AA Focus Group
9	Sindy Ndlovu	F	>40	B	Christian	HS	AA Focus Group
10	B. Mthembu	F	<40	B	Christian	HS	Ward committee
11	Hazel Mdletshe	M	<30	B	Other	HS	Ward Committee
12	Sam Mhlongo	M	>30	B	Christian	UG	Ward Committee
13	Sonwabile Yale	M	>30	B	Christian	HS	Ward Committee
14	Neil Macleod	M	n.d.	W	n.d.	n.d.	Director Water Services (EWS)
15	Teddy Gouden	M	>50	I	n.d.	n.d.	Water Services (EWS)
16	S. Moodlier	M	n.d.	W	n.d.	n.d.	Planning dept. (EWS)
17	Lucky Sibiya	M	>40	B	Christian	UG	Community Liaison (EWS)
18	P. Mzobe	F	>40	B	Christian	UG	Environmental Health (EWS)
19	Bongani Hlope	F	>40	B	Christian	UG	Community Liaison (EWS)
20	N. Buthelezi	F	<40	B	Christian	UG	Education Officer (EWS)
21	T. Gumede	M	<40	B	Christian	UG	Education Officer (EWS)
22	Anonymous	M	n.d.	B	Other	HS	Process controller (EWS)
23	Chris Buckley	M	>50	W	n.d.	PG	Partner researcher – UKZN
24	Rob Hounsome	M	n.d.	W	n.d.	n.d.	Golder Associates
25	Bill Pfaff	M	n.d.	W	n.d.	n.d.	Private consultant
26	Mamothibe	F	n.d	B	Christian	PG	Independent researcher
27	B. Ashe	M	<50	W	Islam	PG	Geasphere (NGO)
28	Pupil 1	F	<18	B	Christian	HS	School
29	Pupil 2	M	<18	B	Christian	HS	School
30	Pupil 3	M	<18	B	Christian	HS	School
31	Pupil 4	M	<18	B	Christian	HS	School
32	Pupil 5	M	<18	B	Christian	PS	School
33	Pupil 6	M	<18	B	Christian	PS	School
34	Teacher 1	F	~30	B	Christian	UG	School
35	Techer 2	F	~30	B	Christian	UG	School

Table C.4: Beaufort West municipality

	Names	Gender	Age	Race	Religion	Education	Affiliation
1	Mcebisi Kilani	M	>40	B	Christian	UG	BW LADO (Manager)
2	E. Mapotolo	M	>40	B	Christian	UG	BW LADO
3	Marius Meyer	M	>50	W	Other	UG	Media Gamka FM (Manager)
4	Paul Pakatita	M	n.d.	B	Other	UG	Media Gamka FM
5	Peter DuPrez	M	n.d.	W	Christian	n.d.	BADISA (Manager)
6	Eugene Bastian	M	n.d.	W	Other	PG	St Matthews Primary Principal
7	M. Potgieter	F	n.d.	W	Christian	UG	BW West Secondary (Teacher)
8	Bryan Fritz	M	>50	W	Other	UG	BW Secondary (Teacher)
9	Louw Smit	M	>50	W	Other	UG	BW Mun. (Tech. services)
10	Jafta Booysen	M	>50	C	Christian	UG	BW Municipality (Manager)
11	Eng. services	M	n.d.	C	n.d.	UG	BW Municipality
12	Planning serv.	M	n.d.	C	n.d.	UG	BW Municipality
13	Public partic.	M	n.d.	B	n.d.	UG	BW Municipality
14	IDP	M	n.d.	W	n.d.	UG	BW Municipality
15	Anonymous	M	n.d.	B	n.d.	HS	Councillor
16	Pierre Marais	M	>50	W	n.d.	UG	Engineer Consultant
17	Anonymous	F	n.d.	W	n.d.	UG	NGO (legal advice)
18	Anonymous	F	n.d.	W	n.d.	UG	CSO
19	Anonymous	F	n.d.	C	n.d.	UG	BGCMA
20	Anonymous	M	>60	W	Christian	HS	Church
21	P. Bekatshi	M	47	B	Christian	UG	Church (pastor)
22	V. Mufidi	F	23	B	Other	HS	None
23	A Ibrahim	M	52	C	Islam	HS	None
24	L Majied	M	55	C	Islam	UG	Islamic council
25	M. Mpofu	F	58	B	Animist	n.d.	Traditional healer

APPENDIX D - RESEARCH ACTIVITIES

Table D.1: Case study activity list Overstrand

Overstrand			
Date	**Organisation**	**Role**	**Activity**
18/06/2014	Overstrand Municipality	Engineering Services	- Interview
	Camphill special needs school	Principal	- Interview
19/06/2014	Curro Hermanus school	Campus Manager	- Interview
	Qhayiya secondary school	Deputy Headmaster, Teachers & Learners	- Interview
	Environmental NGO: Whale Coast Conservation	Manager & Programme coordinator	- Interview
	Overstrand Municipality	Councillors	- Interview
20/06/2014	Ismail and Mariam Ebrahim Islamic centre	Religious leader	- Interview
03/03/2015	Overstrand Municipality	Engineering Services	Validation workshop: 3x Focus Group interviews
	Camphill community	Environmental issues	
	Islamic centre	Religious leader	
	Qhayiya secondary school	Teacher & Learners	
	Overstrand Municipality	Councillor	

Table D.2: Case study activity list eThekwini

eThekwini			
Date	**Organisation**	**Role**	**Activity**
1st Ref Group	eThekwini Municipality	Water Services	- Media pack analysis
28/07/2014	eThekwini Municipality	Engineering Services Director	- Interview - Venn Diagram - Emoticons
	eThekwini Municipality	- Management - Researcher	- Focus Group (Venn Diagram, Story with the gap, Emoticon)
	- eThekwini Municipality - Environmental health	Field practitioners	- Focus Group (Venn Diagram, Story with the gap, Emoticons)
	eThekwini Municipality	Consultant Golder Associates	- Interview - Venn Diagram - Story with the gap - Emoticons
29/07/2014	- Ward Committee - AA Focus Group - User Platform	Focus Group workshop participants	- Focus Group (Mapping of knowledge, Venn Diagram, Story with the gap, Emoticons)
30/07/2014	Northern Wastewater treatment plant	Process Controller	- Interview
	Education Centre	Education officers X2	- Interview
20/04/2015	EWS (Water Services)	Community Liaison	Municipal Focus Group interview
	Dept Health - Durban	Environmental Health	
21/04/2015	- Ward Councilor - AA Focus Group - User Platform	Community group of representatives (Water& Sanitation)	Validation workshop: Umlazi Mega City 3x Focus group interviews
	Qhilika High School	High School Educator	
	Sandakahle Primary	Primary Sch. Educator	
	EWS (Water Services)	Education Officer	
	Qhilika High School	Learners	
	Sandakahle Primary	Learner	

15/05/2015	NGO- GeaSphere	Represents civil society – incl. Muslim activists	Interview

Table D.3: Case study activity list Beaufort West

Beaufort West			
Date	**Organisation**	**Role**	**Activity**
25/08/2014	BWLADO	- Programme coordinator - Manager	2x Focus Group Interviews: - Venn Diagram - Story with a Gap - Emoticons
	Radio Gamkaland	- Manager - Board member	
	Library and Media offices	Print media	- Observation and liaison re: public access to information
26/08/2014	BADISA	Office coordinator	Individual Interviews - Emoticons
	ST Matthews Primary	Principal	
	Beaufort West Municipality	Engineering services Director	
	Beaufort West Secondary School	Teachers X2	- Focus Group (Knowledge Mapping, Venn Diagram, Story with a Gap, Emoticons)
27/08/2014	Beaufort West municipality	Municipal Manager	- Interview
	Garage and shop	Water sales	Observation and verification
26/03/2015	Beaufort West Municipality	Engineering services Director	Interview
	Print Media	Media – local print	Liaison for data validation
27/03/2015	ST Matthews Primary	Principal	Validation workshop: Focus Group
	Radio Gamkaland	- Manager	
	BWLADO	Office coordinator	
	Churches – range of Christian	Secretariat officials	Liaison for data validation

APPENDIX E - SUMMARY OF FINDINGS

Initial case study data generation: Interviews and focus groups

Data summaries aligned validated factors with institutional processes in each case study, reflecting a range of validated factors underlying public perceptions as presented below:

Table E.1: Beaufort West data summary (post-implementation): effects of factors

Institutional processes	**Knowledge Deficit**	**Engagement Challenges**	**Emotions - Perceptions**
Water scarcity due to • Severe drought 2009 - 2010 • Water sources limited, including groundwater	• Drought cohesive - *pray for rain together* • Dam empty • Ensure public aware • Educate, inform before emergency	• Significant role of Community radio, Gamka– not to waste water • Dam levels – inform • Use existing network, structures	• **Problem for everyone** - limit on water usage • Public likely to accept due to severe drought and few options – **no choice**
Risk management Responses to drought • Water restrictions. • Fines for use of more than 12 Kl/month D. Councilor raised RW (2007) before drought	Water restrictions. Risk management plan-public communications translated into practice – develop instruments to use at local level. Train to adapt to risk management	Water restrictions communicated via community radio. Public to develop trust in municipality –water scarcity risks shared in adequate public engagements.	• Severe common problem for everyone due to limits on water usage **Trust** municipal provision of services in general *(but not RW)*
Reconciliation study by DWA (Hay et al., 2011) 2yrs after drought. Info. available in WSDP/IDP-Demand vs. Supply status	• Lack of knowledge • Open discussion between public and institution - informs of purpose and outcomes in reconciling Demand & Supply (what & why)	• Public not involved in study • Dissemination of information to public to be made easier and available, accessible.	Research should be shared as opportunity to learn
Feasibility study – Pierre Marais consultant. Rapid sand filter, ultra-filtration, reverse osmosis, ultra-violet, chlorination.	• Identify resources • Submit outcomes, as Council proposal • No public knowledge of feasibility of options	***Public not involved*** • No public involvement in feasibility of options • Cost implications not open	Lack of knowledge perpetuates negative perceptions around water services
Reuse decision *process* - Outcomes inform Disaster Man. funding - Report to DWA incl. financial requirements - Project tender	Council decision- IDP is with Council approval. • Public know of Municipal decision	• Newspapers, local radio approached • Inadequate due to limited circulation • Not all public read newspapers and use library	Angry - as public not well informed, the process not fairly explained
Implementation Plant built in 2010, Operational 15 Jan 2011 • Addressed Equity concerns – built pipeline around township	• Municipal Flyers; print Media; Notice boards;, shops. Operational 3mnths before public informed Public do not know about treatment costs, and safety for human consumption. Public knowledge of	• Municipal EIA; Public meetings. • Public was not properly engaged. • Municipality engaged with Matric students • Via local newspapers, community radio	Fear -, Public feel forced to drink RW. Confused - mind boggling. Uncertain of process, not enlightened. Doubtful of water quality Shameful/sad as expensive.

	treatment. Self-education by visiting plant.		
Post implementation/ O&M procedures **Monitoring.** Drinking water quality published in newspaper, under Blue Drop section • Plant operational on 24/7 basis • Tours to plant available • Plans to engage more with public	• Public is not aware of operation & maintenance • Public is not aware of monitoring mechanisms	• Public has not been engaged adequately • Public visits to plant - understand technology and safety issues	Angry - doesn't taste nice Doubts- Is Water clean? - visited plant to know more Fears - regular tests done, but do trust Municipality Scared/fearful/worried about crisis in supply Encouraged/Hopeful/ Calm/understanding water security

Table E.2: Overstrand data summary (early planning stage): effects of factors

A.

Institutional processes	**Knowledge Deficit**	**Engagement Challenges**	**Emotions - Perceptions**
Water scarcity result of drought, 2-3 years (2010/11)	Droughts, dam13%, depleted surface and ground water. • ensure public is aware of water scarcity impacts • Public educated/ on dam levels, poor rainfall	Existing social networks and structures should be used to engage with the public	Crisis… Public likely to accept because of drought/water scarcity, and no available options – **no choice**
Risk management (***Water security status)*** Water restrictions - ban on irrigation hose pipes	• Awareness reduced water demand to 25% • Water restrictions • Advisory Board for scarcity crisis **consists** of MOs, NGOs, and Ward structures.	• Water restrictions in bills • Forum asked to express opinions and present ideas/ • Water scarcity risks shared - adequate engagement; • Risk management plans shared to build public trust	Trust (in general) in municipality to provide services *(but not RW)* • **No trust** in Advisory Forum due to political agendas
Reconciliation study by DWA (Hay et al. 2011) 25yr frame. involved bulk water users - stakeholders. Informed in WSDP/IDP	• Limited knowledge of RS • One respondent knew • Purpose & outcome of RS • Inform public - available, accessible to all	• Majority of public not involved in RS • Sector meetings with DWA and BOCMA • Communicate 'what' and 'why'	• Want to be involved • Lack of knowledge sharing **perpetuates negative feelings** about water services
Feasibility study informs decisions on option, treatment and costs – SSI consultant. **Treatment technology:** barrier safety,if system faulty, plant shuts off automatically	• Lack knowledge of treatment, costs, safety. • Public do not know about cost and outcomes of study, • Design to Mayor and medical experts in Council meeting – agree • Safety and costs not communicated to public	• No public involved • No open public space for costs or safety discourse. • Nature of communication • Mechanisms for information - access to all. • Choice of feasible option(s): benefits, safety, costs discussed openly	• Doubt quality • Fear potential health risks and use of chemicals. • Calm about lower costs than other options • Need to know about treat-ment to boost confidence

			• Proof of **Safety** to build confidence and trust
Reuse decision *process* later agreed to announce the decision via media • Reuse decision communicated via radio, newsletters and water bill • Responded to only 2-3 enquiries about water quality. If public was unhappy, would raise concerns • Good relationship with public – Regular reports of Ward Committee	• Limited knowledge so research provided space for knowledge sharing. • Public knew Municipal decision taken • Advisory Forum created to address water crises • Introduced via media (print and radio) and the Forum • Decision (**choice**) - benefits and necessity to be communicated well in advance of implementing	• Public guessed reasons for decision: drought, tourism, limited groundwater. • Newsletter announced *strategy for future* • Newspaper: *future water management* • Proposal, budget, strategy in IDP for comment. Few login in library. • Notice of public meetings in media: Hermanus Times, websites, Water Bills, but some prefer meetings about housing… • Public cooperate for services but politics affect	• Angry - unfair not to be informed of decision – may be hiding facts • Despair- at not having a choice - in-house decisions • Value in deciding on solutions to scarcity • Reasons given not convincing • Disgust -thought of dirty water • Calm based on understand • Hopeful and can accept if system works as intended so water safe
RW Implementation Plans for 5/6/7 years, funding from RBIG Plans postponed – rains.	Public is not aware of the time of planned implementation phase	• Plan to engage more with public closer to implementation. EIA procedures Municipal Equity concerns - call for meetings that all may attend	**Religious**: not fit for Muslim spiritual ablution if not treated normally. • Distrust in Municipal services • Concern about safety for fragile infants
Post implementation/ O&M procedures. Drinking water quality is already published in the	• Water quality results in media on regular basis and disclosed in Blue and Green Drop certificates	Water quality monitoring parameters, frequency and process should be communicated to the public	• Health: periodic back-up to ensure that drinking RW is safe

Table E.3: eThekwini data summary (advanced planning stage): effects of factors

Institutional processes	**Knowledge Deficit**	**Engagement Challenges**	**Emotions - Perceptions**
Water scarcity – due to the following: - Population growth - Predicted water shortage - Economic growth - Growing discharge of wastewater effluent	• Moratorium on building plans – city development on hold • Ensure that public aware of water scarcity impacts • Public informed of water scarcity via print media • - introduced scarcity from 2008, through 2009 - 12. • Public to be informed of water scarcity before an emergency	• Most public don't experience water scarcity but know that mismanagement causes water scarcity. • Water scarcity part of awareness programmes on water wastage • Public aware of indicators - dam	Lack of knowledge of scarcity is likely to cause rejection of RW Public is likely to accept because of drought/water scarcity, and no available options – no **choice**

		levels, prolonged dry periods, poor rainfall	
Risk management (***Water security status)*** responding to water scarcity • Plans for Rationing • EWS has plans for more public awareness about scarcity and rationing	• Public aware of drought, river contamination, burst pipes (leaking), stand-pipes leaking and water theft. • Education outreach includes cycle of rain, wastewater, purification	• Risk management plan to be translated into practice – develop instruments for local/public level; • Public should be trained to adapt to risk management plan	Trust Municipality but they expect to engage more on water scarcity risks
Reconciliation study by DWA in 2008- 25yrs time frame involved bulk water users, some stakeholders. Info. in WSDP/IDP Demand vs. Supply	• Institutions to inform public about the 'what' and 'why' of reconciling Demand & Supply. • Mechanisms to inform public - available, accessible to all	• Public not involved in reconciling Demand & Supply • Open discussion between institution and public about purpose, outcomes	Information to public should be available and made accessible to all
Feasibility study • Study undertaken to determine type of treatment technology and associated costs –Consultant • Study prompts decision to opt for potable RW	• No public knowledge on feasibility study • Public do not know about treatment, fail-safes • Media informs of fail-safes but public lack knowledge EIA process informed public via print media • Costs/tariffs not yet conveyed	Public want practical visits to see treatment process. Public involvement throughout process to allay fears. Basis for choice of feasible option: benefits/safety and costs implications to be discussed	• Doubt about **safety** and health implications Public likely to resist potable RW due to cost implications –not shared and may cause resistance. Assurance of water quality
Reuse decision – *process* - **Reasons for reuse were:** - Water scarcity - Ecological balance - Minimises risks - Future demands. - Augment water resource Approval needed for RW effluent at WWT plants: - Appeal by EWS to DWA for urgent approval.	• Some public knowledge from their networks • Knowledge about reasons restricted as they do not experience scarcity • Councillors visit Namibia and BW to view successful potable RW • Media letters of concern re: quality, • Public doesn't know that potable RW quality standards are safer than conventional	• Training by Water Services, AA Focus Group, User Platform, community meetings, • Public will accept RW if **involved /consulted** in decision-making • Workshops to engage **(consultation)** public • **Culture/religious** rejection by Muslim activists, although study shows no resistance from religious leaders	• Disgust factor triggered by portrayal of 'toilet to tap' unbalanced **Media**. • Fear triggered by the disgust factor • Angry due to **lack of choice/option** (wind mill system raised) • Shame as not involved in planning • Lack of trust in purification system cause public to reject/resist
RW Implementation Not implemented yet. Stalled due to lack of political support	• Public doesn't know that quality improves with RW. • **Equitable distribution** of reclaimed potable water	• Minority Muslim activists • Lack of political/DWS support	Frustrated by political stall

	(20% blend to affluent &poorer pp)		
Post implementation/ O&M procedures. ***Monitoring.*** No documented mechanism - proposed to outsource contractor to monitor	- **Municipal actions** • After implementing, ongoing public awareness, education • Ongoing monitoring of safety • Educate people, schools	On going involvement of communities. Assessment of responses and perceptions.	-

PERSEPECTIVES: Semi structured individual and focus group interviews

A. BEAUFORT WEST

Not all the public had access to forms of communication in use, which reduced their opportunity to acquire knowledge about this topic.

KNOWLEDGE		
Sub- themes:	**PERSPECTIVE**	**Beaufort West**
Water Scarcity*- community knowledge*	**MUNICIPAL**	• Information vs issues • Emphasis on mix to all users • Mix makes buy-in easier
	CUSP – interface	*No CLO – IDP officer overloaded.* *Public Participation only through M Managers office.*
	PUBLIC	• Don't know about Reconciliation study. • Drought, severe restrictions. Cohesiveness, praying for rain. • Radio broadcast on waste, recycle.
Reuse -*introduced*	**MUNICIPAL**	• District Councilor raised option (2007) before drought • Questions of risk at meetings
	CUSP – interface	• Flyers, newspapers – insufficient circulation
	PUBLIC	• Drought: common problem, goals • Feasibility conveyed through news article
Reuse -*decision*	**MUNICIPAL**	• EIA process • Community meetings- Councilors
	CUSP – interface	• Local print media
	PUBLIC	• Ward structures used but politically biased.
Technology knowledge	**MUNICIPAL**	• Blend, pipeline, risks and safety for health
	CUSP	• Public meeting – consultant responds
	PUBLIC	• Water quality issues: health and smell
Learning opportunity	**MUNICIPAL**	• Questions: who is to drink it? • Improve awareness at schools. • Educate Ward reps.
	PUBLIC	• Don't know enough • Staff at WWT works inform public too

SOCIAL CAPITAL		
Sub- themes:	**PERSPECTIVE**	**Beaufort West**
View on public *Venn diagrams: 1. Most Important, Most impact 2. Medium 3. Least*	**MUNICIPAL**	• Constitutional obligations • Schools – encouraged to tour plant
	CUSP – interface	*No CLO – IDP officer overloaded.* *Public Participation not functional -t through M Managers office.*
	PUBLIC	• DWA, Depts. Health, Social Services, Education, Environment. • Municipality, users, funders, engineers
Trust	**MUNICIPAL**	• WWT near township – equity issues • Politics – disinformation stirs beliefs • Influenced by interests, events, votes
	CUSP – interface	*No CLO – IDP officer overloaded.* *Public Participation -M Managers office.*
	PUBLIC	• Engineers and Councilors - Public participation is constitutional • Good municipal services – quality • Plans boosted municipal image
Cooperation	**MUNICIPAL**	• Dam level gauge made public • Township equity issues affect pipeline
	CUSP – interface	*No CLO - IDP officer overloaded.* *Public Participation - M Managers office.*
	PUBLIC	• Outsourced - poor skills development • Municipality, Ward structures, DWA • Schools, churches, media influence
Participation *Reconciliation, Feasibility, Planning*	**MUNICIPAL**	• School tours, Teachers – promoted • Media – not read much • Councilors, Gvt depts. NGOs, CSOs.
	CUSP	*No CLO – IDP officer overloaded*
	PUBLIC	• Reliant on Councilors, Ward Committees to convey to civil society
Participation Adequacy *suggestions*	**MUNICIPAL**	• Direct contact easier in small town • Sports field - public meetings
	CUSP	*No CLO – IDP officer overloaded.* *Public Participation - M Managers office.*
	PUBLIC	• Community meetings to explain in different languages

EMOTIONS			
Sub-theme	**Narrative texts**	**Source**	**Emoticon**
Hopeful	"Was hopeful that our intervention will have the desired outcome" "Grateful for the project" "Thankful that we'd have water". "Need water everyday"	Municipality Public Media	
Engaged	"Was happy that the project was embraced by our clients and stakeholders "Engaging about the project with people"	Municipality Municipality	
Confused	"Think about solution for drought" "Drinking recycled water, the idea was mind boggling" "Very uncertain about the whole process" "Not enlightened"	Municipality Public Media Media	
Angry	"Frustrated as lot of people do not see it as the solution at first as well as to get funds "Water doesn't taste nice at all" "The process not fairly explained to them" Angry because we the public is not well informed"	Technical services – Director Secondary school Teacher Gamka FM	
Clear	"The idea 2007" 'It was a great idea in order for us to have water" "Fears of contaminated water addressed after more technical info given to me. Shared with staff" "Would like to know more"	Municipality Public Public Media	
Apathy	"Idea about blending the water. Reason to distribute to everyone	Municipality	
Doubt	"How to make the idea work" "Want regular test results though I trust the process" "Initially fearful – water not properly clean. Contaminated water in system was my major fear" "Many not sure of the water"	Municipality Public Public Media	
Shame	"Water is extremely expensive"	Public	
Calm	"Beaufort West will have a sufficient water source" "I am comfortable with that" "I support the water 100%"	Public Public Public	
Pride	"After the info you've given me, proud to be part of a first in the country"	Public	
Fear	"People are scared. I am also worried that we might have a crisis regarding water supply." "Some people don't know which I feel it's a danger"	Media Public	
Encouraged	"Glad that at least we have water in our taps everyday" "Very pleased when project was amended and still very proud that it is still running on a 24/7 basis with quality water"	Media Municipality	

B. OVERSTRAND

A summary of the copious data produced thus far was provided as a preview to collated details to be presented and made available to validation workshop participants.

KNOWLEDGE		
Sub- themes:	**PERSPECTIVE**	**OVERSTRAND**
Water Scarcity- *community knowledge*	**MUNICIPAL**	*Previous interviews*
	CUSP – interface	*CLO reluctant to be interviewed* *2 Councilors interviewed*
	PUBLIC	• Dam at 13% • Reduced water usage • Drought, water restrictions • Reconciliation: sector meetings - DWA, BOCMA
Reconciliation & Feasibility studies- *introduced*	**MUNICIPAL**	*Previous interviews*
	CUSP – interface	• Press, newsletter, library notices • Radio and forum
	PUBLIC	• Proposal, budget in IDP – comment • Newsletter called it a strategy
Reuse -decision *decide*	**MUNICIPAL**	• EIA process
	CUSP – interface	• Meetings, water bills and website
	PUBLIC	• Options, decision in collaboration with forum.
Technology knowledge *implement*	**MUNICIPAL**	*Previous interviews*
	CUSP	*CLO reluctant to be interviewed*
	PUBLIC	Treatment - safety of drinking water.
Learning opportunity *monitor*	**MUNICIPAL**	*Previous interviews*
	PUBLIC	• Treating water • Doubt on quality • School curricula • Value of water, cost

SOCIAL CAPITAL		
Sub- themes:	**PERSPECTIVE**	**Overstrand**
View on public *Venn diagrams:* *1. Most Important, Most impact* *2. Medium* *3. Least*	**MUNICIPAL**	1. DWA, Environmental Affairs, BOCMA Ratepayers, NGOs, churches, Users
	CUSP – interface	*CLO reluctant to be interviewed*
	PUBLIC	1. All users, Advisory Forum, Municipal officials and Ward structures, DWA 2. Knowledgeable pp –skilled, retired
Trust	**MUNICIPAL**	• Main concern was quality of water • Good relationship with public
	CUSP – interface	*CLO reluctant to be interviewed*
	PUBLIC	• People push own agenda vs represent • Political affiliations polarize people • Mayor supports community well • If : Scarcity proven; Reuse sustainable
Cooperation	**MUNICIPAL**	• Ward Committees report regularly • Little feedback from public
	CUSP – interface	*CLO reluctant to be interviewed* • No real engagement
	PUBLIC	• No debate on issues – present, discuss • NGO active in Ward Committees • Water Committee meets monthly
Participation *Reconciliation, Feasibility, Planning*	**MUNICIPAL**	• EIA process followed
	CUSP	• Public should be involved at all stages • Inform, get opinions/views, buy-in
	PUBLIC	• No public meeting – EIA ticks boxes • DWA study – only interested parties
Participation Adequacy *suggestions*	**MUNICIPAL**	• Planning stage so no engagement yet • Public meetings – improve EIA
	CUSP	*CLO reluctant to be interviewed*
	PUBLIC	• Public campaigns, not only one sector • Engage schools, Councilors vs media

EMOTIONS			
Sub-theme	**Narrative texts**	**Source**	**Emoticon**
Angry	1. "It's never been really explained how it will be done, what control processes will be in place…it has simply been a statement of fact and not real discussion about the issue" 2. "The current way municipality is informing the public on reclaimed water reuse is not sufficient"	Env NGO – Manager Qhayiya school	
Clear	1. "Yes, because the cost can be lesser compared to other options such as desalination but public should be educated regarding reuse – so as to make them understand" 2. "It is an essential option, one should be rational about it because of the scarcity of water" choice	Qhayiya school Camphill - Principal	
Doubt	1. "I will not be comfortable, Worry about the chemicals content.." 2. "Skeptical, wouldn't say it is completely wrong…would like to see background findings like quality before I accept" 3. "I wouldn't feel comfortable unless it is proven drinkable. They should just prove that it is safe…it will be a different one...Bad feeling because of the potential risks…I can use it unless proven that the system work as intended"	Imam Env NGO – X2 Curro High manager	
Calm	1. "Not dissatisfied with it…don't get terrible images coming up" 2. "Will be worried but with quality assurance, I will be satisfied" 3. if well treated and quality disclosed to public - then I will drink" 4. "It's all about knowledge… it's recycled, pure and I can drink it. Public should be informed about the Blue drop… educate the public…tell parents, learners…they should come to schools"	E. NGO coordinator Env NGO – Manager Qhayiya school	
Pride	1. "We learned from others and also look at our own situation. Example, there is huge volume of water being discharged into the sea that could be reused to augment water resources; other municipalities are using treated effluent for various purposes and lastly Water scarce status of water in South Africa" *(if others influenced decision)*	Technical services	
Fear	1. "It is very sensitive"	Councillor	
Confident	1. "Confident they will do right…municipality tells rather than involves" 2. "I feel that reclaimed water reuse will be safe if relevant tests are done regularly and will like to see reports regularly"	Env NGO – Manager Camphill – Principal	
Despair	1. "Regarding reclaimed water, I will drink if left without choice"	Qhayiya school	
Engaged	1. "No much comments as well, just 2 or 3 phone calls in response to the newsletter. We believe that at the implementation stage more comments will be received" 2. "So far there is no such strategies because the project is still at early stage and we believe that we will found a way of dealing with situation when the project will be rolled out"	Technical services Technical services	
Hopeful	1. "Yes, on condition that the quality responds to standards	Camphill – Principal	

C. eThekwini

Field research found that knowledge about potable RW planning was limited in the public sample – perhaps due to a social study focusing on religious leaders, not extending assessment to the public at large. Apart from media reportage, information about potable RW was conveyed by EWS to a public User Platform, AA Focus Group and community meetings. Public focus groups suggested more workshops, pamphlets and news media. They noted that "knowledge is power" and that, "a well-informed nation is a powerful nation". Recycling as a school subject was suggested to improve on knowledge sharing, as well as further direct engagement.

Table E.1: Data summary: Factors influencing public perceptions

Factors	*Data from public and institutional samples on their understanding of factors*	
	Public	**Institution**
Disgust factor	▪ No expression of disgust factor ▪ Perception that scientists will be able to purify the water	▪ Disgust is as a result of fear of the quality of potable RW ▪ The public will make an issue because of emotional discomfort
Safety	▪ Need for knowledge about safety of treatment and operations ▪ Need for visits at the plant ▪ Need for public involvement to allay fears	'Fail-safes' were conveyed to the public to respond to perception of risks associated with water quality.
Choice	Respondents expressed the need for other alternatives and suggested the Windmill system.	Information was published throughout the process in the media
Cost implication	Money and time will be saved - meaning cost of water will be lower.	▪ Reclaimed water is cheaper compared to options e.g. desalination ▪ Tariffs should not increase because of awareness that due to higher costs in treatment, tariffs are likely to increase
Benefits /necessity	▪ It creates jobs ▪ Health security ▪ Clean water supply ▪ Easy access to water by households	Benefits in terms of costs and safety
Trust in municipal services	▪ Trust in municipality to deal with water scarcity prevails ▪ There is confusion and fear about plant operations failing ▪ Associated health risks if plant fails	▪ Public was informed about fail-safes in media
Consulting Public	▪ People must be consulted in an inclusive way ▪ Decision makers should create awareness of the problem before taking decisions	▪ EIA process of stakeholder (IA&P) involvement was legitimate
Media	Media is one way of informing the public of issues on recycling but not everyone reads newspapers.	▪ Unbalanced information – hostile and informative media reports ▪ Use of inappropriate terminology or language ▪ Thoughts of people cannot be controlled, but rather considered
Socio- / Cultural	The most vulnerable users	Muslim group expressed resistance to RW and they perceive RW to be 'bad luck' (haram)

Highlighting sensitivity of the subject at hand is the culmination of public resistance to municipal plans, apparently led by activist minorities coupled with a lack of support by changing political leadership. An opposing petition called for more costly alternatives, such as desalination.

Table E2: Data Summary: eThekwini case study – Perspectives, Themes and subthemes

Theme: KNOWLEDGE			
PERSPECTIVES: ***Sub- themes:***	**INSTITUTIONAL → decisions**	**CUSP between INSTITUTION & PUBLIC**	**PUBLIC sample**
Water Scarcity*- community knowledge*	• Informed of Scarcity – Media, water rationing, moratorium on building plans. • Quality is improved - polluted resources • Safety design – good risk management.	• Scarcity is part of awareness of wasting water. Treated water used for flushing - 65 Ml per day discharged into river. • We do not experience water scarcity - misuse will create problem.	• Obstacles to flow: drought, power supply, burst pipes, leaking, theft. • Contamination from pipes near sewer. • Water dept training - Focus Group, User Platform, public meetings
Reuse *introduction*	• Media introduced scarcity and potable reclaimed option – 2008 to 11 onwards	• Education on water cycle & conservation, wastewater, purification process.	Introduce recycling as subject in schools
Reuse *decision*	• Went ahead on ethically sound principles • Hostile media – “aggressive reporting”	• Messages cover purification. • Recycling is good idea	• Engage to inform about recycling • Advertise: radio, pamphlets, news
Technology knowledge	• Already using treated wastewater: Indirect	• Less knowledge of purification process	Want to know about safety of recycled water. practical at purification sites
Learning opportunity	• Could pursue perceptional taboo beyond gate-keeping • Trust in natural system misplaced	• Outreach programme can readily include RW	• Sharing different ideas is first step towards introduction of recycling. • Public involvement allays fears of risks.

Theme: SOCIAL CAPITAL			
PERSPECTIVES: ***Sub- themes:***	**INSTITUTIONAL → decisions**	**CUSP between INSTITUTION & PUBLIC**	**PUBLIC sample**
View on public *Most important with Greatest impact*	Councilors, National DWA, print Media, Users –North of uMngeni River (800,000 Users uninformed – large impact), uMngeni Water, Officials - Skilled staff, Minister DWA, Consumers, NGO activists,	Municipal Water & Sanitation, End users, Department Health (legislation, standards, regulation), Civic organisations. Education programme	Vulnerable people in civil society: physically challenged, infants, elderly people, children at schools, the sick, NGOs,
Medium importance with Medium impact	Islamic groups (voice), Politicians. National Minister DWA, Councilors, Department of Water & Sanitation, Press, Industry.	outreach: Schools, Nursing Colleges, Industries Rate Payers Association, Ward Councilors, Focus Groups (strategic issues),	CSO's. User Platforms, Churches, Ward
Least impact	Environmental Health, Environmental dept., uMngeni River union group, Muslim and Community groups. Premier KZN, Other media, Focus Groups, User Platforms - about 100 pp. Agriculture, WESSA, Academics, Provincial groups – COGTA.	Clean, Green & Healthy, Municipality (Environmental Health), Department of Health, DWA (legislation, regulation) Religious organisations. Abahlali - residents Informal Settlements, Health Related NGO's, Schools, National & Local Industries, Academia, DEA, DAEA.	Councilors and Committees, Chiefs, Health careers. Political parties are of least importance. Muslims and Indians a minority.
Trust *between community & municipality & within community*	Islamic voice influences DWA, Municipality Politicians/Councilors influence Local Municipality, Provincial Govt (COGTA). Municipal elections – political influences. "People reactive; public support.	No trust between Councilors and CSOs. Rate Payers Association have no trust in any organization Two-day training programme for Ward Committee members, Literacy groups.	Community trusts one another here and there". We trust Municipality-AA Focus group was formed about water supply
Cooperation *community/ municipality & networks*	Antagonism towards partners? Politicians influence DWA, Municipal officials and EWS. Media influences EWS and water recipients.	Municipality – EWS and Focus Groups cooperate on strategic issues. Raising Citizen's Voice is part of our programme brief (Education programme).	Community cooperates around water issues.
Participation*: Reconciliation study Feasibility study*	No space to address challenges such as losses, non–revenue, illegal connections. EIA failed - I&AP process not necessary for pipeline changes. Little registered interest.	Quality concerns (how safe) Communication (Media i.e. newspaper, radio slots, leaflets on treatment safety Engagement with different stakeholders	Need to be well informed about recycling, Understanding of information to be communicated to the public.
Participation adequacy *suggestions* *What are important steps in sequence?*	Open days (School tours) at Education Centre (Northern WWTW). Demonstration (Tours). Environmental benefits, Conservation, Costs, Options, Water restrictions, current challenges to reduce water loss.	Information sharing Economic impact (Media – notice on the newspaper, attachment of flyers into consolidated bills), Price/tariffs (Media – newspapers and internet), Targeting schools Seminars, Pamphlets and leaflets, Media - TV, radio, newspapers	Public engagement strategy in decision - Workshops as open dialogue. Stakeholders engagement. Communities to be made aware of problems in creative, inclusive methods for proper consultation.

	Long lead time to implementation (Legislation – National), User Platforms (Citizens Voice),		

Emoticons that were chosen by respondents, as in the other case studies are collated as a descriptor in the table below. They are clustered alongside a range of three different perspectives with variations captured in narrative text.

Theme: EMOTIONS			
Sub-themes:	**INSTITUTIONAL → decision makers**	**CUSP between INSTITUTION & PUBLIC**	**PUBLIC sample**
Frustration	"DWA attitude: decision processes, not funding reuse or taking it seriously – despite WSDP, IDP… Irritated, they will have to agree at some point"		
Confused	Internal workings of the Municipality How can we change people's perceptions?		
Angry	Angry because of stalled process" "Politics, weak legislation, media" "Exasperation"		Where and why windmill system is not in use since it was master system?
Clear	Innovation"	Very interesting, enlightening, solutions	If our wells run dry Interested to find out more Happy -money and time saved. Conserve water wastage.
Doubt	"Thinking of how to solve the problem"	If costly", might affect implementation of the proposed project/programme	What if tech. fails?" "What if something goes wrong?" "…impurities and germs"
Calm	"Comfortable we did a good job"	Water reclamation is cool, I'm confident it shall work	
Pride		Possible solution to a foreseen problem	
Fear		Worried about broad public uptake.	Afraid of diseases - running stomach
Confident	Confident to go further. Exciting technical challenge.	Confident and comfortable	
Despair	Stalling of process – Stakeholder/political concerns. Decisive decision to take past this stage	No progress	
Shame			We are not cool because they don't involve us in planning of this

APPENDIX F - VALIDATION WORKSHOP

1/ Effects of factors that influence public perceptions

Focus groups was validated selected data to indicate those factors that have a direct effect on public resistance and acceptance, along a continuum. Effects of validated factors, selected from presented data showed links between factors and degrees of resistance The process of validation workshops is shown below:

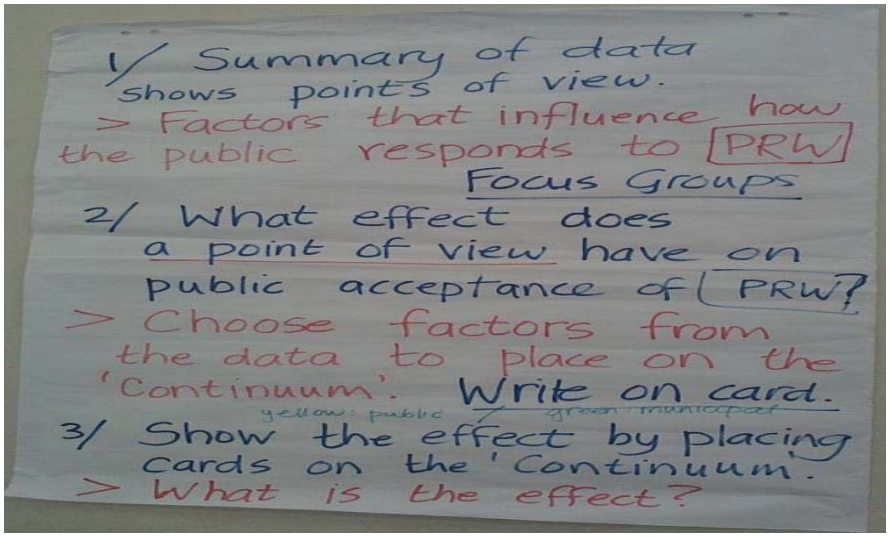


Figure F.1: Validation Workshop Process: Instructions

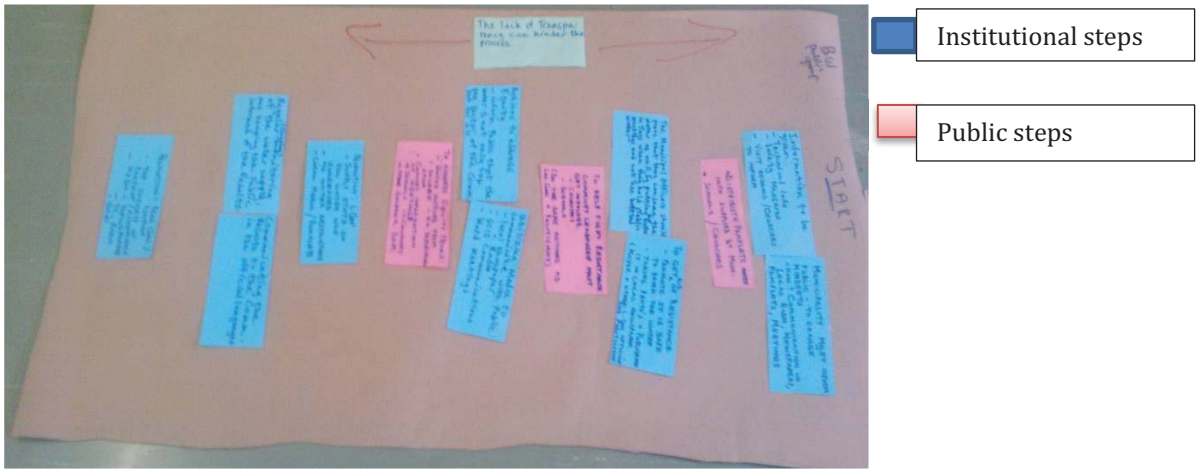
1. Summary of presented data for validation shows point of view.
    - Factors that influence how the public responds to PRW
2. What effect does a point of view have on public acceptance of PRW
    - Choose valid factors from the data to place on the Continuum: Write on a card
3. Show the effect by placing cards on the Continuum.
    - What is the effect?
4. What actions will help to move people from rejection towards promotion?
5. Put them in a sequence, in the order that actions becomes steps (Technical and Social)
6. Mix groups to consider additional steps to progress.
    - What will hinder (or help) progress?

Detailed data shows the effects of Factors as validated data, on public resistance and conditional acceptance by the broader public and users as samples reflecting a diversity of public perspectives. The effects are shown as the degree to which factors are linked to acquiring knowledge that addresses concerns, as reported in the appendices of incremental progress reports.

Detailed data was provided in each set of appendices of progress reports 2-5. Indications from the data are that benefits of knowledge sharing include public engagement processes that involve building trust of public institutions through iterative public consultation.

A. Beaufort West

Figure F.2: Beaufort West case study: Validated factors as effects along Continuum of Acceptance



a) Suggestions: *Knowledge required and Public engagement*

Table 1: Suggestions to address knowledge deficits

Stages	**Knowledge deficit**		
	***Events*[6]**	***Process*[7]**	***Target group****
Reuse decision (Fear)	Schools Religion leaders Councillors Media	Public meeting	Use existing channels Draft message Address public Assess attendance/complaints
Implementation (Safety)	Schools Religion leaders Councillors Media	Plant visit	Use existing channels Draft message Address public Assess attendance/complaints
Post implementation (Trust)	Schools Religion leaders Councillors Media	Launch Plant visit	Use existing channels Draft message Address public Assess attendance/complaints

Using existing communication channels (comprising media, ward councillors, community leaders and civic organisations) for improvements, often based on hindsight, were proposed to address gaps that arose inbuilding trust of municipal capabilities.

[6] Event refers to a gathering that happened or was held for a particular reason(s) and during a stage of the implementation of reclaimed water scheme

[7] Process refers to the sequence of actions that was used to address or convey the message to the public during an event.

B. Overstrand

Institutional and Public Focus Groups

As in communication, trust appeared to be linked to interfacing of institutional and public perspectives. Validated data showed on the Continuums of Acceptance aspiring to public promotion as an outcome of public participation processes which encompassed knowledge sharing.

Figure F.3: Overstrand Focus groups: Validated effects along Continuum of Acceptance

2/ Actions to move public from rejection to promotion of PRW

Figure F.4: Institutional view on actions

Figure 5: Public view point on actions

3/Actions to promote RW, in sequence

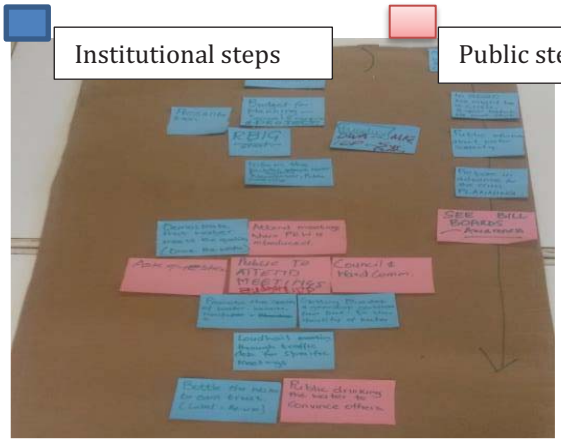


Figure F.5: Institutional perspective on Actions

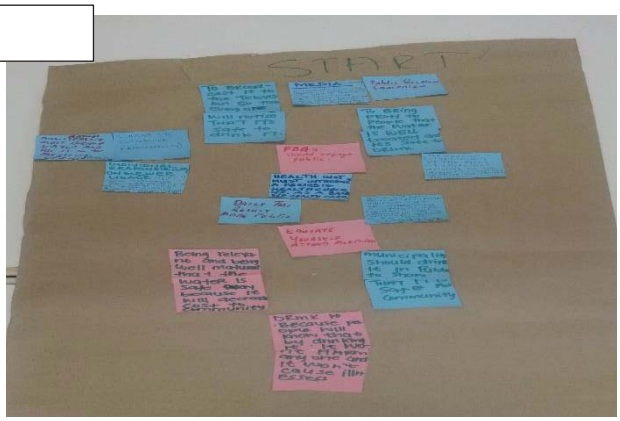


Figure 7: Public perspective on actions

C. eThekwini

In anticipation of overcoming current project stalling, collated data generated in previous field visits was validated, bridging considerations for monitoring, Validate factors were selected for a continuum of effects.

Public Focus Groups:

Group 1: Community – User Platform (Start time: 11:00 – End time: 13:30)

1/ Read data to select perceptions

2/ Effects of validated data on public acceptance of RW

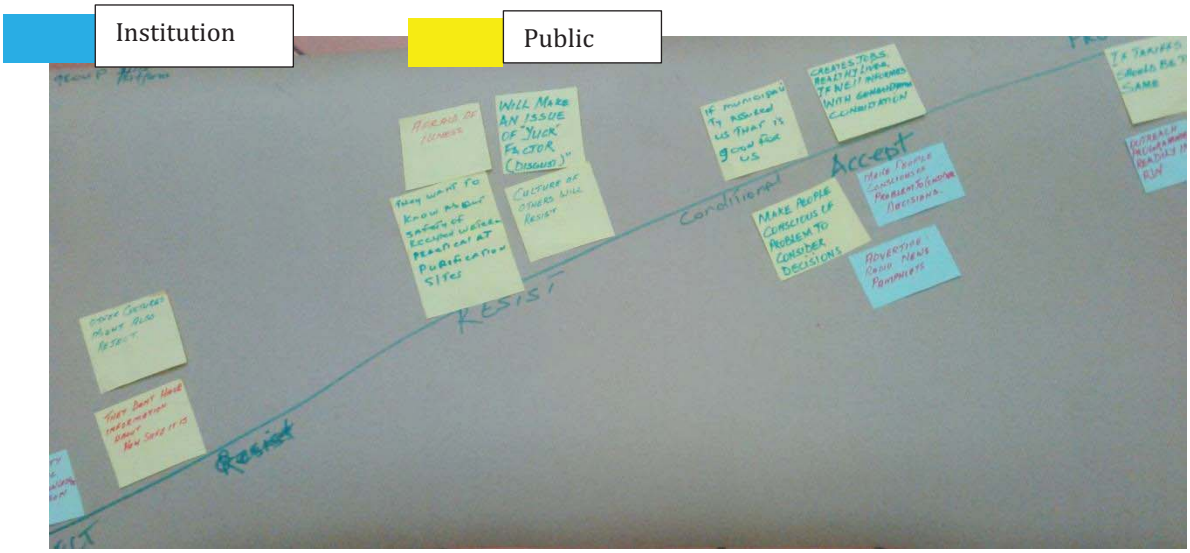
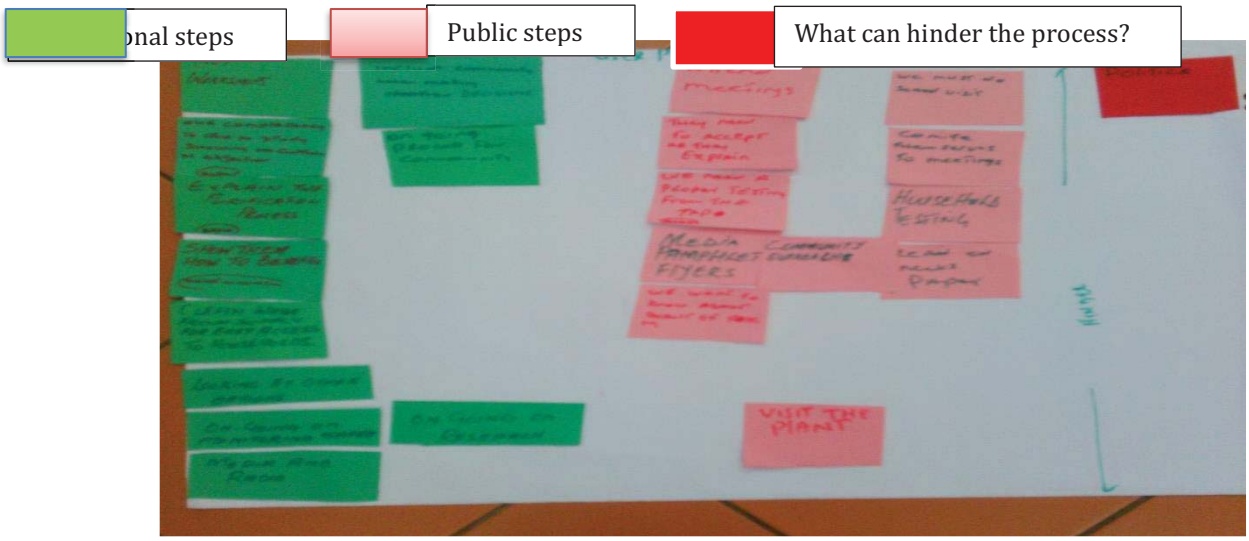


Figure F.6: User Platform Acceptance Continuum of Acceptance

3/ Actions to move public from rejection to promotion of RW

4/ Put actions in a sequence



5/ What can hinder the process? (hinder actions above)

- Politics

Group 2: Cusp between public and institution

1/ Select perceptions from the data

2/ Effects of perception on public acceptance of RW for potable applications

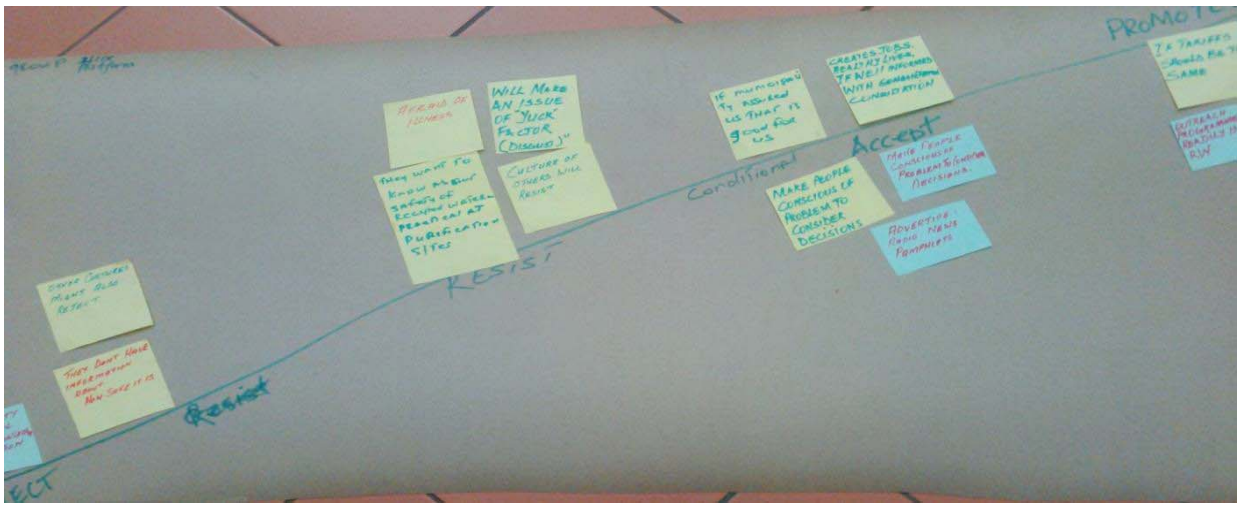


Figure F.6: eThekwini case study: Validated factors as effects along Continuum of Acceptance

3/ Actions to move public resistance from rejection to promotion of RW

4/ Put actions in sequence

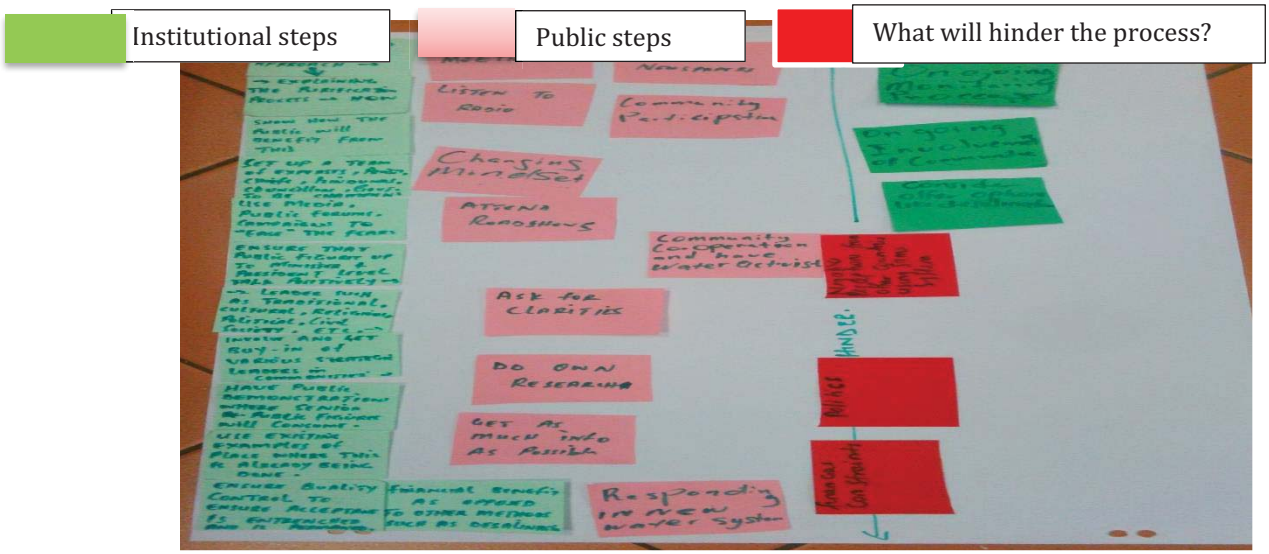


Figure 3: Cusp between public and institution: view on actions

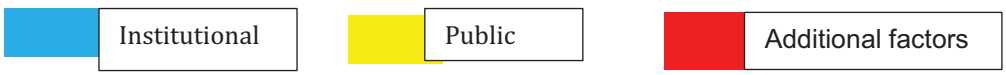
5/ What will hinder the process? (hinder the actions above)

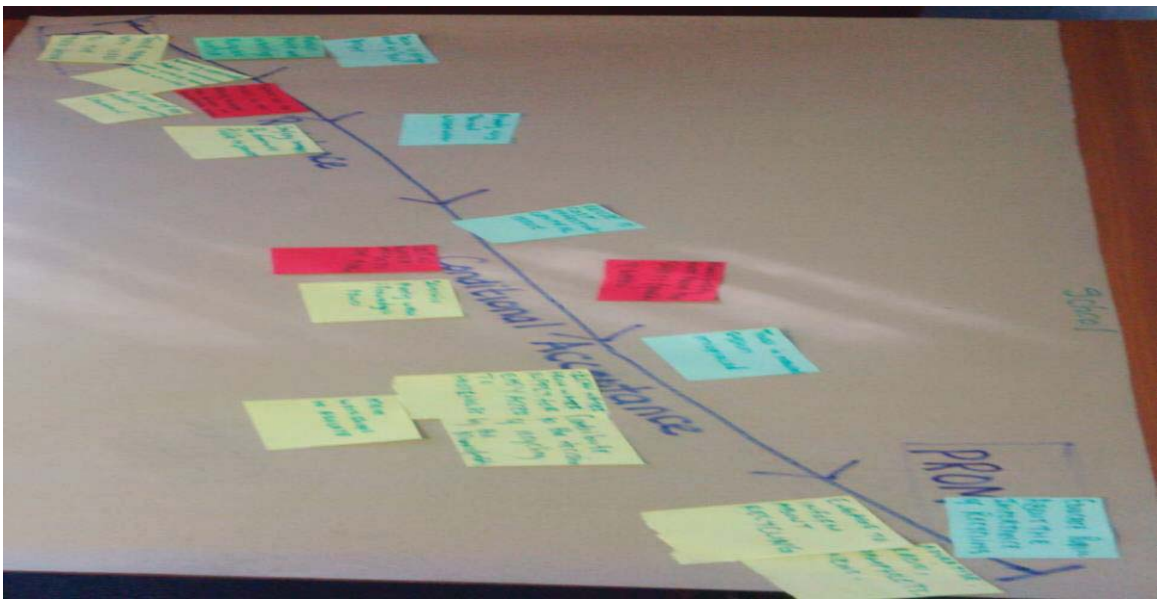
- Politics
- Negative perceptions from other countries using same system
- Financial constraints

Group 3: Schools (Start time: 13:30 – End time: 15:00)

1/ Select perceptions from the data

2/ Effects of perception on public acceptance of RW





3/ Actions to move public from rejection to promotion of RW

4/ Put actions in sequence

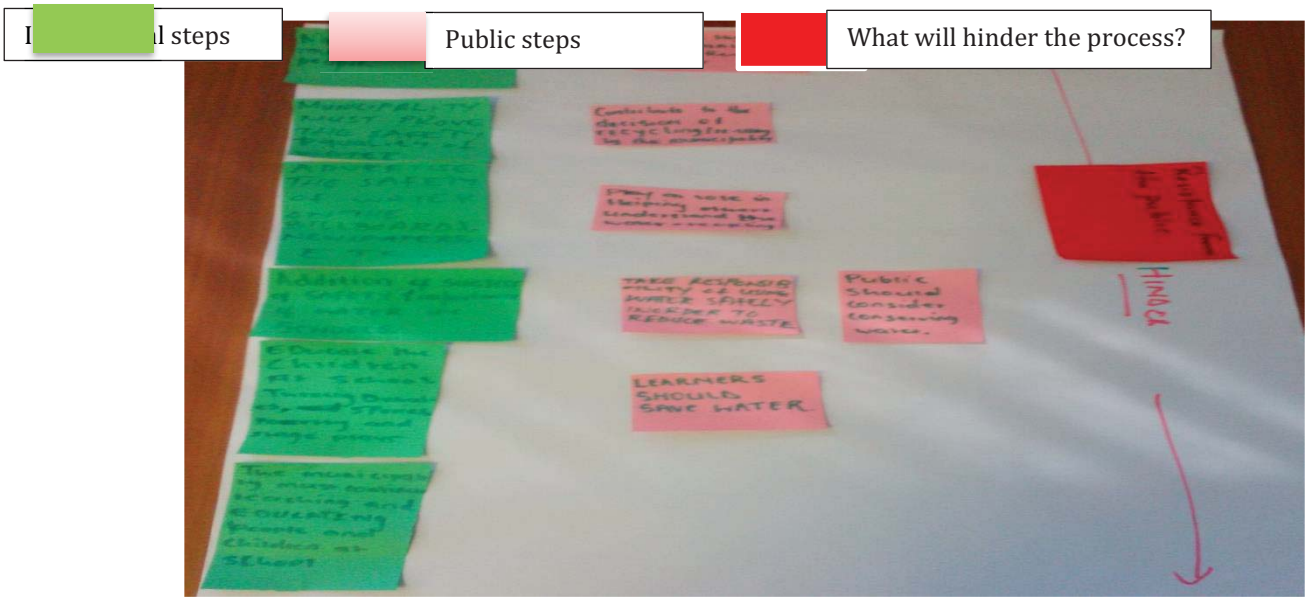


Figure F.7: School (Public) view on Actions

Institutional Focus group:
2x eThekwini Municipality: EWS and Environmental Health

1/Read data to select perceptions

2/ Effects of perceptions on public acceptance of RW.

Institution

Public

Additional factors

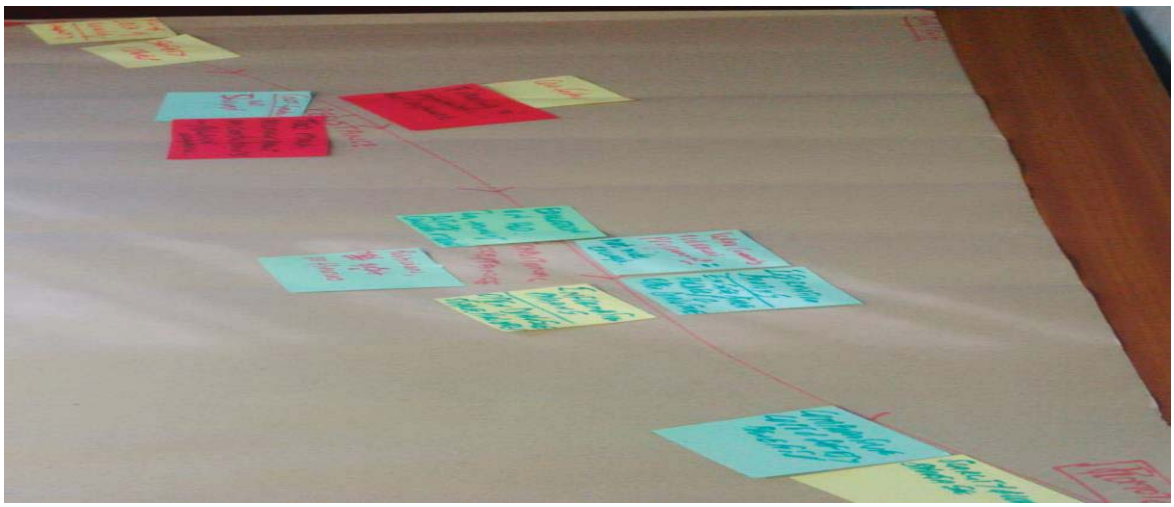


Figure F.8: Institutional practitioners: Continuum of Effects

3/ Actions to move public from rejection to promotion of RW

4/ Put actions in asequence

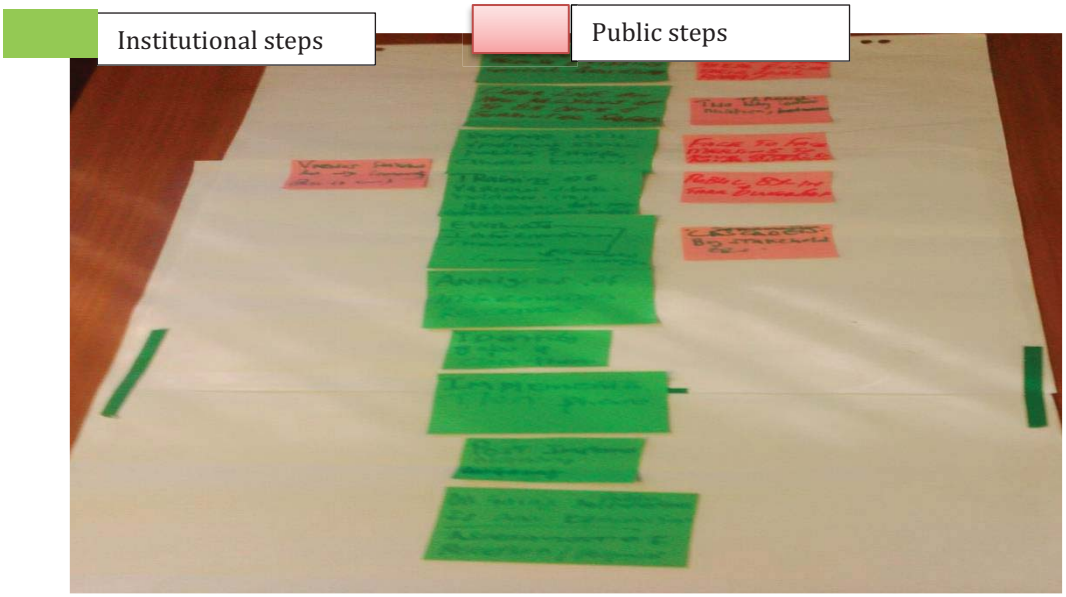


Figure F.9: Institutional practitioners view on Actions

Respondents concurred that conveying information through the media minimized knowledge sharing opportunities. Addressing negative perceptions expressed in media, by vocal Muslim activists, and lack of political support an approach was formulated as follows:

a) **Suggestions:** ***Knowledge required and Public engagement***

An approach to shifting public resistance toward promotion Indicated that translation of EIA may constrain and confine opportunities to "scientific and technical" territory of professional expertise. The I&AP process, conventionally conducted via the media was insufficient in comparison with the existing, in-house, municipal programme.

Reliance on the media for public communication was a deviation from established outreach and education practice.

Table F: eThekwini Summary: **Suggestions** for improving current approach

Logical steps	**Knowledge–WHAT?**	**Public engagement process – HOW?**
Reuse decision/ ***Fear*** (Quality of potable water)	• Public to know **who involved in study, cost, outcomes**. • **Content:** Risks/Safety • Policy and Regulations. • **Examples of successes**. • **Explain purification process.**	**Basis for choice** of feasible option(s), cost, benefits, safety, **openly discussed**. **Mechanisms accessible** to all. **Materials** for media and website. **Promotion**: Roadshows, site tours. Partnerships.
Implementation/*Safety* (Health risks and standards)	**Compliance with standards**. Ensure and assure of **quality control.** **Advertise safety** - billboards, media. Water safety as **school subject**	**Education/Awareness programme**: risks, health and safety focus. **Prove water safety** & **quality** – site visits. Partnerships.
Post-implementation /*Trust* (Potable water provided)	• **Monitoring system.** **Billboards** for monitoring results. Users to **understand results** of regular testing. **Educate public , schools.**	**2- way communication** - **Convey** and **Clarify** -respond to **Questions.** **Site visits** focus on monitoring, sampling and fail-safes - Entrench acceptance of safety. Partnerships.

APPENDIX G: RESEARCH TEAM

Alvin Lagardien (Prof) is the project leader for this research; He has worked in the Water Services Sector for over two decades. His focus areas have covered appropriate technology, strategic approaches to basic water and sanitation services delivery to informal settlements and farm-dwellers and sector skills and capacity to meet national policy imperatives about eradicating backlogs, providing sustainable solutions and alleviating poverty. He has accompanied convening PSTT Western Cape for 5 years, support to Masibambane DWA and research. Guided by Poverty Alleviation strategies, LeD and EPWP research projects that align delivery by Local Authorities' as learning organizations has extended to producing knowledge for managing catchments and Water Quality. As a Senior Fellow of Water Institute of South Africa, his role in the Water Sector Leadership Group has evolved, while as a reviewer of WRC research proposals and member of a number of WRC & Donor Project Reference Groups, his experience in Appropriate Technologies, Strategic approaches to Institutional Development, Directed Procurement and Skills Development Strategies as Part of Public Works & Poverty Alleviation Programmes provides developmental inputs and guidance to multi-disciplinary, collaborative endeavours.

Christophe Muanda, the lead researcher for this research is a PhD candidate in the Integrated Water Systems and Government Department and Civil Engineering at TU Delft in the Netherlands. He is a holder of Bachelor and Master Degrees in Civil Engineering with a strong background in Water and Sanitation. He has previously worked as Civil Engineering for various companies in Africa, training facilitator and consultant engineer, and He is currently working as researcher at the Centre for Water and Sanitation Research and lecturer at the department of Civil Engineering and Surveying (Cape Peninsula University of Technology). Christophe has co-authored a number of Water Research Commission report including Lagardien, A., Cousins, D. and **Muanda, C**., 2014; Lagardien, A. and **Muanda, C**., 2014; Lagardien, A. **Muanda, C**. and Benjamin, A, 2012a; Lagardien, A. **Muanda, C.** and Benjamin, A., 2012b; Lagardien, A. **Muanda, C**., Cousins, D. and Zindoga, C., 2009a; and Lagardien, A. **Muanda, C**., Cousins, D. and Zindoga, C., 2009b. As part of his PhD, Christophe is working closely with various stakeholders including municipal and government officials, civic, political, traditional and religious organisations to understand various perspectives related to service provision with specific focus in informal settlements.

Deborah Cousins is a holder of Master degree in Public Management, and Post Grad Adv. Dip. Adult Education. She has a Community Development background, is a Participatory Methods specialist (SARAR, PRA, CLTS) who led national PHAST Training for 10 years, and coordinated the PSTT Western Cape for 5 years. As an Adult Educator the design, delivery and assessment of accredited training has included Sanitation Coordination for Municipal officials, Sanitation & Health Facilitation (EHPs), Local Monitors (TEAM, UCT) and Health Promoters. Her research initially focused on community-based approaches, capacity building & procurement for reducing risks associated with urban waste streams, which created a foundation for knowledge production on facilitating interfaces between levels and across disciplines. Integration of social and technical aspects of water and sanitation projects is her current focus, conceptualized as Socio-technical Interfaces.

Germaine Owen is currently a PhD research fellow at the University of the Western Cape. She obtained a BSc degree in Geography at the University of Buea, Cameroon focusing on water and vegetable production, and Post-graduate Diploma in IWRM in 2010 at UWC where she gained preliminary knowledge in water resources management. She completed her Master's degree in 2012 in Environmental Water Sciences focusing on youth, water security and food security in the context of a rural rainwater-harvesting project in Mpumalanga Province. She is the author of the article "Assessing the relationship between youth capabilities

and food security: a case study of a rainwater harvesting project in South Africa." She employed the Capability Approach in her work as theoretical framework to demonstrate the significance of youth participation towards water and food security. She uses the Capability Approach in her PhD thesis to advance the claims of social justice by proposing terms of engagement that result in positive perceptions around reclaimed water. Germaine is one of the main contributors in this research. Her contributions included data collection, data analysis and report writing.

Jacqueline Ann Goldin is an Extra-Ordinary Associate Professor of Anthropology and Water Sciences, Centre of UNESCO Chair in Groundwater, Faculty of Natural Sciences, University of the Western Cape and short professional course on participatory research methodology and participatory monitoring and evaluation. She is a Co-ordinator of Water and Society SADC Master's Programme in Integrated Water Resources Management. Jacqueline is author and co-author of a number of WRC reports and peer-review journal article. Her research has extended to reviews of gender mainstreaming in SADC water policy (WRC) and problems in representation of women and youth in the Agricultural Sector. Research focusing on gender sensitive arrangements around the maintenance, control, use, protection and conservation, examining small water infrastructure (SWIs) and determines adequate governance, has complemented her involvement in CGIAR Challenge Programme for Water and Food Phase 2, where "Integrated management of rainwater to improve smallholder productivity and livelihoods and reduce risk" has evolved into a project leader role in "Water Governance in the Limpopo Basin". An institutional adequacy index using a poverty and development theoretical framework (WRC, 2010 - 2013) expanded use of the Capability Approach to create a theoretical frame for considering institutional adequacy of water resources management institutions such as catchment management agencies.

Unathi Noludwe Holds a bachelor degree in Civil Engineering has been productively employed as a research assistant in WRC projects, and develops her research capacity as she moves to Masters level research. Community dynamics, sanitation and its impacts on water quality are key themes in her current academic trajectory.

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