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LESSON SERIES
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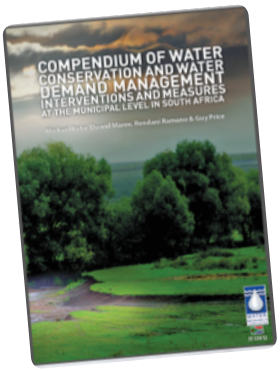
GOOD PRACTICE IN MUNICIPAL WATER CONSERVATION AND WATER DEMAND MANAGEMENT

Financial, Institutional & Behavioural Interventions

WATER RESEARCH COMMISSION



NOTE...

This lesson is compiled from the Water Research Commission Report No: **TT519/12**, by **Michael Rabe, David Maree, Rendani Ramano & Guy Price.**

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Water Conservation and Water Demand Management in South Africa

In South Africa the challenge of ensuring a sustainable water supply is exacerbated by:

- An unusually dry climate with precipitation levels that are lower than the average for many other developed and developing countries;
- A rapidly urbanizing population;
- High evaporation levels;
- Skewed development and economic centres that are far from water resources;
- An ageing water supply infrastructure;
- A focus on expansion of the water distribution network at the sacrifice of improved bulk treatment and pumping infrastructure:
- Increasingly intermittent electricity supply affecting critical infrastructure components;
- Improving socio-economic well-being of a large segment of the population which has led to an increase in water consumption;
- A loss of technical capacity and expertise at all levels of government; and,
- Extension of supply to the un-serviced urban poor.

Solution

A possible solution therefore to these difficulties is a WC/WDM approach that addresses the:

- Efficient use of water whereby more “work” is done with the same amount of water;
- Institutional use of water and efficiency thereof,
- Wasteful use of water, whereby wastage is reduced or halted;
- Loss of water, in that water lost in the supply is limited or stopped; and,
- Re-use and recycling of water.

1 INTRODUCTION

Water is crucial to the advancement of any country. This is especially true for South Africa, which as a developing country, faces multiple challenges to water supply such as pending water stress, growing and urbanizing populations, socio-economic imbalances of the past, widespread poverty, geographically skewed availability and demand, changing weather patterns and persistent drought in many parts of the country.

As a result the infrastructure intensive supply systems needed at a national, regional and local level to deliver water to end-users are stressed and most municipalities across the country are unable to sustainably meet the demand of end-users. The dichotomy is that whilst municipalities are unable to meet demand, water losses are at an all-time high with non-revenue water estimates of around 35% of system input volume for the country as a whole. Much of this loss can be attributed to leakage and losses in both the network and on privately owned properties which, for the most part, is going unaccounted for and represents a revenue loss to the municipality.

The need for demand-side interventions that effectively reduce physical losses in water networks, artificial demand at the end-user level created through leakage, as well as apparent losses due to metering and billing deficiencies is abundantly clear.

In response to this need, municipalities across the country have initiated interventions, programmes and projects to reduce the demand for water with varying levels of success.

The Water Research Commission developed a *Compendium of Case Studies relating to Water Demand Management at the municipal level in South Africa*, aimed at identifying, documenting and disseminating the experiences of municipalities in water demand management.

This booklet captures a snapshot of case studies on financial, institutional, and behavioural interventions as implemented by various municipalities. While some case studies may not necessarily represent best practice or successful achievement of stated objectives, they do however represent experiences that could find broad application by other municipalities.

2 FINANCIAL INTERVENTIONS & LESSONS LEARNT

A strong link or relationship exists between water demand management and revenue management. Typically, the better delivered services are managed in terms of metering, billing and revenue collection functions, the lower the demand for water will be and the need to intervene or change the status quo. By implication then, financial interventions can be extremely effective in reducing excessive water demand and any Water Conservation/Water Demand Management (WC/WDM) programme implemented by a municipality a focus on financial issues such as tariff formulation and structure, meter reading, revenue management and enhancement, accuracy of billing and metering data, asset management, and even credit control.

Interventions in the case studies presented in this section focused step tariffs, asset management, economic evaluation and reducing Non-Revenue Water in affluent areas.

"11 of 19 water management areas in SA have water supply problems."
- WWF South Africa

i. Ekurhuleni Metropolitan Municipality (EMM): Asset Management

Intervention Type	**Creation of an Asset Register to manage assets**
Reason for Intervention	**Neglect of existing assets led to asset failure, maintenance backlogs, water losses and interruption of services.**
Background & Objectives	The Ekurhuleni Metropolitan Municipality (EMM) is home to 2.7 million people and has a daily demand of 900 000 kℓ with an estimated Non-Revenue Water (NRW) figure of 38.9%. The city has over 10 000 km of pipes supplying more than 841 000 consumers with an estimated replacement value for its immovable assets amounting to R83 billion. While much focus has been on providing communities with access to water, this has come at a cost since the shift in focus has led to the neglect of existing infrastructure assets and the creation of severe maintenance backlogs. Like other major metropolitan municipalities in South Africa, failure of infrastructure assets is one of the main contributing factors to water losses in the city. In 2010 the city estimated that the cost of water losses amounted to at least R327 million. This has affected especially townships and informal settlements in the EMM as ageing infrastructure has led to the interruption of water services. The aim of the project was to improve the management and maintenance of their assets in an effort to provide services to communities in a financially viable and sustainable manner through the implementation and use of an asset management system. This was important in terms of mitigating unwanted and costly water wastages, addressing the backlogs in infrastructure development and providing water services to communities. The EMM had an electronic based asset management system set up at their municipal offices. This system included the asset register which listed the infrastructure assets owned by the municipality including the assets needed to provide water services. Implementation of the system began in 2009 starting off with an initial investigation to identify and assess the condition of assets so that a depreciated replacement cost valuation could be performed.
Results & Lessons Learnt	Asset management has helped the EMM to manage and maintain infrastructure assets and assist municipal officials in undertaking critical planning functions such as required maintenance, replacement and/or expansion of logged assets. This combined approach, the use of the asset management system and the subsequent implementation of interventions, has helped mitigate and reduce potential water wastage resulting from the failure of infrastructure. This has been accompanied by an improvement in the provision of water services to communities. **Lessons Learnt:** • Proper asset management practices require the regular upgrading and eventual replacement of infrastructure, which also implies a major capital requirement and access to infrastructure information. • However, obtaining accurate data for all the water assets owned by the municipality is a major obstacle that, in some instances, cannot be overcome. Thus it is important to put in place a well-prepared systematic approach in order to coordinate activities to retrieve as much information as is possible. • It is important to keep an up to date asset register through the regular assessment of infrastructure assets. This provides important information on the asset's condition and aids in improved management of current or impending asset failure which leads to water losses and service delivery interruptions. • For its asset management system to be effective, the EMM found that the lack of cooperation between the financial department, senior managers and the technical staff needed to be addressed to ensure that no barriers existed in getting information and funding for the maintenance or purchases of assets. They found that without effective communication and decision making procedures in place, implementing any maintenance or replacement programmes were delayed.

Water has become a highly precious resource. There are some places where a barrel of water costs more than a barrel of water- Lloyd Axeworthy, Foreign Minister of Canada

ii. City of Cape Town Metropolitan Municipality:Economic Evaluation of Water Conservation/Water Demand Management

Intervention Type	**Financial**
Reason for Intervention	***Evaluation of costs of Water Augmentation vs Water Conservation***
Background & Objectives	The City of Cape Town Metropolitan Municipality (CCT) is home to 3.4 million people with a daily demand of 800 000 kℓ of water. With the current growth of the city, increasing demand for water is going to exceed the available capacity of the existing water resources by 2017. For many years the primary focus of water resources planning in South Africa has been on the augmentation of existing water supplies by building bigger water transfer schemes. Only recently has the importance of Water Conservation/Water Demand Management (WC/WDM) interventions been taken more seriously as an alternative to supplementing existing water supplies. Therefore, the evaluation and cost-benefit techniques and processes to determine the full impact of augmenting water supplies against WC/WDM interventions is still evolving and needs more focus and development so as to become recognised and implemented as a proper evaluation process. The CCT Integrated Water Resources Plan (IWRP) was one of the first and most recent IWRP process completed which included both WC/WDM and supply augmentation options. Also the CCT is responsible for water services in Cape Town. The CCT in the context of a growing demand for water and anticipated prolonged drought initiated an IWRP to find options to manage water demand. The IWRP was based on a Multi Criteria Decision Analysis (MCDA) process which allowed for comparisons of options based on all criteria considered relevant. The financial and economic criteria (amongst the engineering, environmental, social, etc. criteria) were analysed within the process using Cost-benefit Analysis tools. **The evaluation process was developed and the following alternatives were considered:** • Eerste River diversion; Lourens River diversion;Cape Flats aquifer; Pressure control; Leakage repair; Water efficient fittings; Private boreholes; Use of grey-water; Treated sewage effluent for commercial irrigation (exchange with irrigation schemes); Treated sewage effluent for local urban irrigation schemes and industrial use; Adjustment of tariffs, credit control and metering; and User education. **The following criterion groups were used in the MCDA framework:** • Yield and technology; Financial; Socio-economic; Political, institutional, public acceptance and buy-in; and Natural environment.
Results & Lessons Learnt	**The initial preliminary conclusions or outcomes of the MCDA process were:** • Pressure control, user education and replacement of automatic flushing urinals presented themselves as obvious priorities for implementation. Leakage repair and use of treated effluent for sports fields were added to this group; • Treatment of sewage effluent for use as potable water was ranked last and was considered as requiring extensive research and review. The promotion of grey water and private boreholes were also seen as options, as was the swap between treated sewage and irrigation schemes. • An improvement of the management of water services was seen as an action that would result in significant water savings and this included tariff rationalisation, credit control, zone metering and an improved water loss management actions; • Of the standard supply options the Lourens River enjoyed a slight edge over Eerste River and Cape Flats Aquifer; and • The implementation of a subsidised retrofit programme should be investigated further.
	Lessons Learnt • Public consultation was not part of the MCDA process. Experts specialising in the analysis of specific criterion were given opportunity to give input towards the scoring of the criteria. • Politicians and authorities were given the opportunity in specifying the weight of criteria depending of the priorities of the criterion in the government's decision making process. The public would only be consulted on the final outcomes. This could be seen as a fundamental error in the "decision-making process". • The MCDA process was considered a success and participants were pleased that the process facilitated the practical inclusion of aspects in the decision making that may have been ignored under normal decision making processes within the CCT. • The MCDA process was seen as allowing for a structured evaluation through the use of scores and weights, albeit many of the participants were experiencing the MCDA process for the first time. • However, the process was seen as too time consuming even though it was acknowledged that the comprehensive nature of the process was one of its major advantages. A counter argument was that this was because participants were not familiar with the process and was not because of the process used which was considered as not being a complex one. • One of the main goals of the IWRP process was to generate information on the likely efficacy of WC/WDM interventions and the lack of information thereof remains the main constraint for the successful evaluation of the different WC/WDM options. If the value for money of a particular WC/WDM intervention is lacking, it makes it difficult to evaluate against the generally easier to estimate efficacy of the supply side options.

"Water is the driving force of all nature."

-Leonardo da Vinci

iii. Emthanjeni Local Municipality: Step Tariffs

Intervention Type	Financial
Reason for Intervention	**Need to save water and further required by DWA**
Background & Objectives	Emthanjeni Local Municipality (ELM) is located in the Northern Cape and comprises the towns of Britstown, Hanover and De Aar and is home to 33 310 people. Like other South African municipalities, Emthanjeni is facing a situation in which water demand will outstrip the capacity of its natural water resources. Therefore water conservation and water demand management (WC/WDM) interventions need to be implemented to prevent a national crisis which is already occurring in many municipal areas. However, the issue remains of providing water supply to all communities especially in areas where no such services exist, and this should which incorporate the principles of affordability, financially viability for the implementing agent and most importantly encourage environmental sustainability. Given its mandate to comply with national regulations, the Emthanjeni Local Municipality drafted a step tariff policy following the then Department of Water Affairs and Forestry's (DWAF) guidelines on norms and standards for water services tariffs. ELM's objective was to comply with the provisions of Section 74 of the Municipal Systems Act, 2000 (Act 32 of 2001) with the aim of creating equitable access to water at affordable rates for basic water supply, regulate water demand in an effort to affect behavioural change while at the same time recovering costs (Figure 2) for the supply of water from point of abstraction to the delivery of water to customers. ELM put a tariff policy in place which set different tariffs for different water uses which included household and industrial activities. The Municipality structured its tariffs in accordance with national regulations and adjusted certain parameters such as the basic water quantity per household, tariff rates for normal and luxury water consumption and the kilolitre (kℓ) range for each tariff block. Tariffs were calculated to ensure that ELM remained financially stable especially in ensuring its costs were covered for providing water to consumers, and a premium was added to discourage excessive water use. Making allowance for the free basic water to be supplied to all households, the Municipality also set within the tariff structure a subsidy to recoup the costs of providing the basic free water. Having installed meters for all customers, the Municipality included indigent households in the household tariff structure.
Results & Lessons Learnt	• The Municipality now has around a 80% payment levels for water services, and through a study done post implementation, it was found that a large number of indigent households where using below their quota of 6kℓ per month.The implementation of block tariffs contributed significantly in the effort to save water in the area, with consumption decreasing by 5.5%. • As a result of putting in place increasing step tariffs, the municipality has experienced its biggest water savings. The step tariffs have effected behaviour change towards water conservation and consumers are more wary of how much water they are using. This has gone a long way in ensuring a sustainable water supply for the Municipality.

Water has become a highly precious resource. There are some places where a barrel of water costs more than a barrel of water- Lloyd Axeworthy, Foreign Minister of "If the reasons for reducing levels of NRW are so compelling, then why hasn't this widespread and generally well-understood challenge already been tackled and defeated?

The reason is that reducing NRW is not just a technical issue but also one that goes to the heart of the failings of public water utilities in developing countries." – World Bank Canada

iv. Kungwini West Local Municipality: Non-Revenue Water in Affluent Areas

Intervention Type	**Financial**
Reason for Intervention	**High levels of Non-Revenue Water**
Background & Objectives	During a programme aimed at reducing Non Revenue Water (NRW) in the Kungwini Local Municipality to the west of Pretoria, the affluent and newly established Silver Lakes Golf Course Development was identified as experiencing large discrepancies between the volume of water supplied and the volume of water metered and billed via individual connections to private households. This was indicative of a high level of NRW which required corrective action. A programme aimed at establishing the reason behind the experienced losses and identifying elements that were contributing to the high level of NRW within the ring-fenced estate development was embarked upon Based on the initial findings relating to NRW for the Silver Lakes Development, it was decided that further assessment work was required involving the following activities: • Visual inspection of each connection/meter; • Limited replacement of meters if found to be broken; • Removal of debris trapped in the meter mechanism if a water meter was found to be standing; • Correction of meter installation if required, and • Advanced leak detection (or sounding) of underground network pipes if suspected of leaking. After completion of the detailed assessment, the following corrective actions were taken: • Approximately 60 new water meters were installed; • All meter boxes throughout the estate were cleaned to enable the reading of meters on a monthly basis; • Corrections required to the billing database were communicated to the income section of the municipality; and • Monitoring and management measures were recommended to the municipality to ensure that similar conditions or situations are detected earlier in the future and managed accordingly.
Results & Lessons Learnt	Overall the number of stands where corrective action was required to the water meter to enable accurate metering and meter reading was higher than expected or anticipated. This could largely explain the high NRW % recorded for the development. The following lessons can be learned from this case study: • Even in high-income areas, there is a need to properly monitor and manage NRW and formulate appropriate interventions; • Accurate metering, meter reading and billing procedures are critical to ensuring proper revenue collection in affluent areas, • Water usage and consumption in affluent areas tends to be high, providing additional justification to properly manage delivery of water services to these types of development; • The status of water meters in high-income areas should be monitored to ensure they are functioning accurately at all times, thereby optimising revenue potential and reducing NRW; • There should be proper segregation of duties between the various departments within a municipality, which will in turn highlight process and system problems that require attention; and • Staff should be properly trained in assigned tasks and provided with a suitable level of supervision.

3 INSTITUTIONAL INTERVENTIONS & LESSONS LEARNT

Municipalities exist as third tier government institutions with a specific mandate to deliver services to resident communities and end-users. They are usually large and complex organizations employing hundreds and even thousands of officials and workers. Often the volume of water used by the municipality itself can be considerable and usage by other government departments, institutions and entities such as the department of education, can be of equal or even greater proportion.

The complexity of the organization and its bureaucratic processes can hinder and distract from service delivery and make managing water demand extremely difficult, given that WDM in itself can be a management intensive exercise requiring a high level of planning, structure, resource allocation, organization, investment and intervention.

Institutional arrangements therefore in relation to WDM are important and case studies that highlight institutional planning for WDM, institutional water use, policy, alternative service delivery mechanisms and the adoption of austere water restrictions during a severe drought have been documented in the following section.

"The National Water Act (Act 36 of 1998) recognises that effective water resource management can only be achieved if all water resources are managed in a holistic manner." - DWA

i. Ekurhuleni Metropolitan Municipality: Development of Water Demand Management Strategy

Intervention Type	WC/WDM Strategy
Reason for Intervention	Reduce Demand for Water
Background & Objectives	Ekurhuleni Metropolitan Municipality (EMM) is located in the East of Gauteng, with a population of 2.7 million people, of which 653 000 have been classified as poor or indigent. EMM is the second largest bulk water consumer in the Rand Water supply area (behind the City of Johannesburg), utilising approximately 25% of Rand Water's total supply. In 2006/2007, the total System Input Volume (SIV) averaged 26 million kl/month, of which the majority was purchased from Rand Water. It is estimated that approximately 55% of this water was unaccounted for, or classified as Non-Revenue Water. EMM saw it as imperative to develop a strategy that would aid in the implementation of WDM projects and initiatives. The purpose of a WC/WDM strategy at the municipal level is to improve the efficiency and effectiveness of both water service delivery and customer end-use, through the implementation of various technical, financial, institutional and behavioural interventions. The stated purpose of the EMM WC/WDM strategy was to: • Clearly illustrate the strategy EMM would follow towards addressing current water wastage and inefficient use; • Provide a roadmap as to how EMM would capacitate and resource itself in order to successfully decrease water wastage and improve efficiency; and • Document how EMM would sustain implemented interventions aimed at decreasing water wastage and improving efficiency.
Results & Lessons Learnt	The EMM WC/WDM strategy provided a list of potential initiatives and identified some of the key governance and regulatory issues that required consideration within the municipal service delivery environment. Challenges faced by the industry in South Africa were also highlighted. The strategy has become the accepted vehicle for implementing WDM projects in EMM and has had the added benefit of identifying a significant number of projects which also required implementation. It has helped significantly in providing overall direction for the municipality in WDM. Important lessons were learnt through the development of a WC/WDM strategy and are summarized as follows: • Drafting a WC/WDM strategy helps tremendously in giving direction and focus to the implementation of WC/WDM projects. This strategy ensures that a municipality takes into consideration social, environmental, technical, and economic risks and aspects when implementing relevant projects, programmes and initiatives. • A WC/WDM strategy helps focus, target and coordinate efforts by a municipality in reducing water demand. In this way effort is focused around initiatives that achieve maximum results with the highest benefit-cost ratio. • Engagement with key stakeholders is crucial to obtaining buy-in and participation not only around implementation, but also in terms of decision-making. • Conducting of a situational analysis upfront of development of the strategy is instrumental in highlighting constraints, opportunities, strengths and weaknesses, which in turn ensures that the developed strategy can be successfully implemented. • Formulation of a WC/WDM strategy should be done within a broader context of Integrated Water Resource Management (IWRM), which incorporates not only other users of surface water such as agriculture but also the Ecological Reserve in an overall Water Conservation and Demand strategy. It is estimated that the potential economic benefit of WC/WDM over the next fifteen years to the Water Services Sector in South Africa is approximately R50 billion. Much of this could be achieved through cost savings in the postponement of capital infrastructure and savings in operating costs.

"The programme has transformed water management in a manner unparalleled in urban areas in South Africa." -Yasmina Shabodien

ii. Overstrand Local Municipality: Greater Hermanus Water Conservation Programme

Intervention Type	Social and Technical
Reason for Intervention	**Water Source Capacity limited development**
Background & Objectives	In 2000 Hermanus is the main centre of the Overstrand Local Municipality. It is known as "The world's best land based whale-watching site" and is internationally famous for cave diving, with Great White Sharks (Gansbaai). The future of the Overstrand's economy cannot be separated from the region's natural heritage and physical beauty, but its' biggest asset, its natural resource base, is limiting the potential economic growth of the area. The population of Hermanus triples to 60 000 inhabitants during the holiday seasons and water consumption levels started exceeding the expected increased water supply levels. This suggested that there were high water losses and or wastage. Furthermore, these sharp summer peak demands were in an area that receives a winter rainfall. To makes matters critical the water supply allocation from the De Bos Dam, at the time of construction in 1976, was expected to meet demands up until 2010. But with the economic boom of the 1990's the water allocation from the De Bos Dam was exceeded in 1994/5 with only 70% of the potentially available properties developed. Hermanus at the time had a 2.8 million kℓ/annum allocation from the De Bos dam but in 1995 was using 4.9 million kℓ/annum. In September 1996 Hermanus was the first town in South Africa to implement a holistic WC/WDM approach. The aim of "The Greater Hermanus Water Conservation Programme" was to reduce water consumption by 30 % over the next 3 years by implementing a 12-point WC/WDM plan. To fund the programme an additional 15% in revenue had to be sourced from the water sales. The 12 point WC/WDM plan involved: 1)Assurance of Supply Tariff; 2) Escalating Block Rate Tariff; 3) Informative Billing; 4) Water Wise Gardening; 5)Water-Wise Food Production; 6) Water Loss Management; 7) National Water Regulations; 8) Retrofitting of Water Saving Devices; 9) Security meter; 10) Alien vegetation clearing; 11) School water audits; 12) Communication.
Results & Lessons Learnt	In the first four months, a 25 per cent saving was achieved. Only a few sections of the 12-point plan were implemented. Some of these initiatives still exist in the now Overstrand Local Municipality 12 years later, some of which would have had to have been reinstated. The back-bone of this WC/WDM programme still remains the increasing block tariff system – now used across the country. **Lessons Learnt:** • Perceptions of programmes, like the Hermanus WC/WDM programme and similar actions taken in the Knysna Local Municipality, is that once the "crisis" has been averted there is no longer a need to conserve water. • Of the 12-point programme not implemented, the retrofitting of water saving devices, the water loss management programme and the water-wise gardening project (by the local authority) were expected to reduce the level of consumption significantly, although it appears this was never tested. • The average growth rate in new housing units over the next three years was 9%/year, which could be attributed to the success of the WC/WDM programme, albeit that the now Overstrand Local Municipality is investing heavily in utilising the area's rich groundwater resources. • An intensive communication campaign was essential to ensure co-operation and participation from the community, and WC/WDM was taken into the homes of consumers. It is clear that WC/WDM must become a way of life, and not only during periods of drought. • Informative billing was one of the most powerful tools for consumers to manage their own water wastage. • Over-irrigation of the gardens was found to be the main cause of water wastage.

"South Africa's water resources will be fully utilised within the next 20 years." – South African Government

iii Joe Gqabi Local Municipality: Water Demand Management

Intervention Type	Institutional
Reason for Intervention	**Funds made available by DWA to initiate and implement WCDM projects and programmes**
Background & Objectives	Situated in the Eastern Cape the Joe Gqabi District Municipality (JGDM) comprises an estimated population of 355 000 people of which 320 000 are classified as indigent. JGDM abstracts and distributes 414 800 kℓ/ month of water of which 60% is attributed to Non-Revenue Water. With the large water losses occurring in the JGDM there was a need to implement interventions to curb high water wastage and inefficient water use. The Department of Water Affairs (DWA) in the Eastern Cape made R1.5 million available to implement a water conservation and water demand management (WC/WDM) programme in the JGDM. The funds made available by DWA to the JGDM for the establishment of a WC/WDM unit for institutional and social development (ISD unit), within the district municipal area which would initiate and implement WC/WDM interventions.The ISD unit initiated a number of interventions which aimed at addressing water losses in the area. Due to a lack of funds however, it became clear that there would need to be some interventions implemented other than the conventional technical measures. One of these was a behavioural change initiative in the form of a water awareness programme which was initiated to inform community members about the importance of water and water conservation. An institutional programme, initiated by the ISD unit, was a meter reading training programme. This was aimed at improving the skills of meter readers as it was found that they were not performing according to the municipality's standards and they did not understand the importance of the work they were doing. Another initiative of the ISD unit was to identify high water consumers. This process identified schools with high levels of water wastage. It was found that schools did not have a budget to fix leaks.
Results & Lessons Learnt	The ISD unit has continued with its projects even after the direct support from DWA came to an end. This in itself is a significant achievement as many projects that have been initiated in the past by DWA have discontinued once DWA's funding and involvement came to an end. The success of the ISD in saving water can be attributed to: • A strong leadership, • Committed team members, • Support from senior management and have not lost interest once DWA's involvement had ended, • ISD officers were appointed on a full time basis, and • A water awareness message which appeals to the conscience of the community members, letting them know why it is important for themselves and their neighbours to conserve and use water wisely was their main focus. • Despite a lack of funding, JGDM has showed that through leadership, a committed group effort, and internal institutional support, a successful WC/WDM programme can be initiated and sustained, showing results especially through the behavioural change in the communities.

iv. Various Public Schools throughout South Africa: School Plumbing Repair, Learner Education and Caretaker Training Project

> "The reality today is that the issue of water is no longer limited to areas of the third world, but is predicted to soon be a major concern for people all over the world." – Pure Inside Out

Intervention Type	**Repairs and Retrofitting**
Reason for Intervention	**High Water Losses**
Background & Objectives	This project was aimed at addressing schools in previously disadvantaged areas, characterised by poor facilities, non-payment for water, a lack of capacity to maintain facilities, water wastage and a general neglect of plumbing fixtures. The project was implemented only at identified schools located in different municipalities as a repair of school plumbing, learner education and the training of caretakers at schools. The Coca-Cola Africa Foundation, looking for opportunities to help develop communities through Water Conservation/Water Demand Management (WC/WDM) initiatives, in consultation with municipalities, identified schools with badly neglected plumbing fixtures as an opportunity to reduce Non-Revenue Water (NRW) at municipalities. Big industries, such as breweries and paper manufacturers, are known to use large volumes of water, but schools and prisons are often the biggest users of water and unfortunately also some of the biggest payment defaulters. The situation is made worse with plumbing fixtures that are not properly maintained resulting in potable water flowing unused directly into the sewer system or just simply flooding parts of the school property. Municipalities ultimately carry the cost of this wasted water when schools do not pay for their water use. The objectives of the project were: • To enable and empower schools especially within disadvantaged communities to improve their water use efficiency and access to basic sanitation through education and awareness; • Supporting key role-players including local, provincial and national government, as well as community stakeholders in addressing the protection of water resources; • Implementing water and energy efficiency intervention measures and supporting existing initiatives that ensure sustainable water use and the reduction of green-house gas emissions; • Mobilising international awareness and support to address similar water issues; and, • Engaging the community to alleviate poverty through job creation. The overall approach and methodology of the project was to ensure that the work done at the schools would be sustainable.
Results & Lessons Learnt	Through the Department of Education and field visits, a number of schools were selected and visited. Selection was based on both the schools' state of plumbing fixtures, their willingness to be involved in the project and, where possible, those showing potential to maintain the repairs that would be done. Once a school was visited, a detailed assessment was drawn up including a bill of quantities which then determined how many schools could be addressed with the budget available. The water supply to these schools was logged for 7 days to determine consumption, minimum night flows, consumption patterns etc. The necessary repairs, education and training components of the project were then finalised. This was followed by a post-intervention logging to verify water savings achieved at the schools. **Lessons Learnt** • In addition to the savings achieved at schools, the sanitation was improved immeasurably and therefore if this project was continued throughout South Africa the impact would benefit a large portion of the population through learners; • Department of Education, through the various municipalities, should roll this type of project out to all previously disadvantaged schools throughout South Africa as vast savings are experienced through straightforward interventions; and • If a school has badly maintained plumbing fixtures then learners are forced to go home to use toilets and their learning is severely disrupted.

v. City of Johannesburg Metropolitan Municipality: Repair and Retrofitting of Plumbing in Council Buildings

Intervention Type	Retrofitting of Plumbing in Council Hostels
Reason for Intervention	**High water losses at Council Hostels**
Background & Objectives	With funding secured from the national Department of Water Affairs, Johannesburg Water (JW) embarked on an intervention to reduce the amount of water supplied to Council-owned hostels, much of which was being wasted due to broken/vandalised or missing/stolen plumbing fixtures. Various studies have identified opportunities to reduce water losses in government buildings, schools and hostels. Investigations undertaken by the City of Johannesburg's (CoJ) Department of Housing indicated that internal plumbing in most municipal hostels is in an extremely poor condition. Maintenance of plumbing is almost non-existent with many fittings having been vandalised or stolen, leading to water waste on a grand scale. Johannesburg Water identified four Council-owned hostels with high water consumption and also no payment for water. The utility initiated a project to repair/replace and retrofit plumbing at these hostels. It was envisaged that by retrofitting especially plumbing fixtures in the hostels, water losses could be reduced considerably. Initial assessments established that much of this infrastructure had collapsed completely.
Results & Lessons Learnt	No meter readings were taken before the implementation of the intervention thus JW could not properly assess the impact the retrofitting had on water consumption. However from physical inspection, it could be seen that there was an improvement and water was being saved (see Figures 3 to 6). An example is that prior to implementation, water leaks had led to flooding in bathrooms making it difficult for individuals to enter, however post retrofitting this had ceased thus implying that water had been saved Despite this achievement meter readings post intervention show that water consumption has been increasing steadily by between 10-15% for all the hostels. JW is still to determine what the cause is, but it is reasoned that it could be either due to an increase in occupation leading to increased demand, or that there is wastage occurring due to inefficient water use or leaking plumbing fixtures as a result of vandalism or theft. **Lessons Learnt** • No meter readings were taken before the implementation of the intervention. Therefore JW could not assess quantitatively the impact the retrofitting had on water consumption post intervention. It is thus important to collect consumption data prior to implementation to derive saving levels post implementation and assess whether the intervention was a success. • Given that data is showing that consumption at hostels is increasing, JW cannot link this increase to either water wastage through inefficient water use or increased consumption due to an increase in population. Thus JW found that it would be advantageous to collect data on the changing population numbers over a period of time so as to determine the source of the increase in consumption. • As compared to the Helen Joseph Hostel where few problems have been experienced with vandalism and theft, the residents of the Madala Hostel vandalised retrofitted plumbing fixtures after they were installed. This behaviour has been linked to a lack of knowledge on the purpose of the intervention and how it affects its targeted recipients. JW stated that it was thus important to convey a strong message on the importance of conserving water and maintaining plumbing fixtures in good working condition. The lesson learnt was that for this intervention to succeed community buy-in would be of the utmost importance. • With the view of reducing high water wastage in institutions, implementing a leak repair programme is seen as being a beneficial intervention in achieving water conservation and demand objectives. However, given the challenges that have been faced by the contractors and JW, it has been concluded that this type of intervention is better implemented in an institution like a school in which there is a basis for the creation of sustainable savings rather than hostels in which no ownership of property exists, residents do not pay for water and there is a large turnover in occupation making it difficult to retain water conservation and use efficiency knowledge. • A strategy of creating a forum and appointing individuals from the hostel to monitor and enforce recommendations of the forum seems to have had a greater impact in reducing theft and vandalism.

"We think of our land and water and human resources not as static and sterile possessions but as life-giving assets to be directed by wise provisions for future days." - Franklin D. Rooseveltt

vi. eThekwini Metropolitan Municipality: Community Ablution Blocks

Intervention Type	Community Water and Sanitation Services for Informal Settlements
Reason for Intervention	Lack of water and sanitation services
Background & Objectives	There are more than 400 informal settlements scattered across the eThekwini municipal area. Communities in these informal settlements represent the urban poor who live in basic shacks and suffer from poor water and sanitation conditions. By installing Community Ablution Blocks, the municipality is able to provide shared water and sanitation facilities to these communities at a ratio of approximately 100 dwellings per ablution block. From the perspective of the Municipality, it is important that these services are provided in a sustainable and manageable manner and that potential water wastage is minimized. The main objective of the intervention was to provide a sustainable water and sanitation service to informal communities. Ablution blocks constructed were connected directly to the municipal water and sewer networks. In areas where no waterborne sewerage exists, storage tanks were used and the effluent removed at regular intervals by the municipality. For management purposes the ablution blocks are metered as separate units. In this way the water consumption including the identification of leaks or water wastage can quickly be determined and resolved. To further restrict pipe or plumbing fixture bursts due to high system pressures, water supply to the block is pressure managed. Illegal connections were managed by formalizing them through the installation of water meters and reducing wastage through repairs. The Municipality also hired caretakers at each block to manage and clean the facility, ensure availability of toilet paper, report to eThekwini Water about structural problems including leakages and pipe breakdowns, and ensure that residents have access to the facility.
Results & Lessons Learnt	In 2010, the total number of Ablution blocks installed amounted to 348, with EWS having installed 240 blocks since they took over the project from the provincial department. An estimated 120 000 families benefit from the project by having access to safe hygienic sanitation facilities. The net result is an increase in the quality of life and dignity of these people, and the reduction of the possible spread of diseases amongst poorer communities. The community ablution block concept implemented in conjunction with properly trained caretakers who are supported by the municipality helps in managing overall water demand and avoids many of the problems associated with open-ended water supply to individual shacks and informal dwellings. This is especially so in terms of water wastage. **Lessons Learnt:** • The success of this type of approach is largely dependent upon successful community consultation. • An additional potential benefit of this approach could be the implementation of water and waste water re-use interventions at each ablution block. Reusing waste water has an economic benefit when compared to the costs of operating and maintaining a centralised conventional treatment system. Installing conventional treatment systems in remote areas or in areas where no such systems exist has the disadvantage of requiring a large capital outlay. With this in mind, the Municipality has been conducting extensive research into various re-use options which could further benefit the sustainability of the project, one of which is the Decentralised Wastewater Treatment Systems (DEWATS). • By having caretakers, major maintenance problems have been identified in areas where there was no caretaker supervision. • By providing toilet paper and washing material, blockages caused by newspapers have been avoided. • The provision of lights and fences, as well as constant presence of a caretaker provides a safer environment especially for women and children at night. • Copper pipes and other material used for taps and showers had been stolen. • Vandalism of Copper pipes and other material used for taps and showers has reduced after replacing the materials with plastic pipes and taps.

"Water is life's mater and matrix, mother and medium. There is no life without water."
- Albert Szent-Gyorgyi

vii. eThekwini Metropolitan Municipality: Levels of Service Policy

Intervention Type	Service Delivery
Reason for Intervention	**Formalise Services**
Background & Objectives	eThekwini Metropolitan Municipality (EMM) is situated in Kwa-Zulu Natal with a population of 3.5 million people residing in both urban and rural communities. About 43% of the population earn below R1 500 per month. Approximately 27.3 million kℓ of water is supplied per month to all residents, of which 35% is considered to be Non-Revenue Water (NRW) made up of both physical (or real) and apparent (or commercial) losses. The municipality services in excess of 1 million households, with the largest majority having access to running water within the vicinity of their properties. However, 36 000 households have to travel varying distances to collect water. Given the government's policy to provide all people with access to an appropriate, acceptable, safe and affordable basic water supply service in an equitable, affordable, effective, efficient and sustainable manner, the municipality has developed a policy relating to levels of water and sanitation service provided to domestic customers and how these will be delivered. A Level of Service policy seeks to enhance the relationship between the Water Service Provider (WSP), in this case eThekwini Water and Sanitation unit (EWS), and the customer. Additional objectives of such a policy could also include: Reducing areas of customer dissatisfaction; Clearly communicating the processes involved in dispute resolution; Eliminating unrealistic expectations; Clearly communicating escalation procedures in the event of differences arising between the service provider and customers; and Making members of the public aware of how to get in contact with their WSP. eThekwini municipality provides its domestic consumers with three levels of services in order to provide water equitably and at an affordable cost. These levels of service are as follows: 1) Domestic Full Pressure Supply, available in formal housing areas, where a full pressured metered water supply is fed directly to the household from the City's supply network. 2) Domestic Roof Tank – Semi-pressure System, where a semi-pressured supply is supplied to the household via a roof tank. 3) Stand Pipe with Water Management Device, available in informal and rural settlements where potable water is also available nearby - normally a standpipe in the road reserve located within 200 metres of any dwelling.
Results & Lessons Learnt	Important lessons that were learnt by the municipality in the implementation of a service level policy include: • First establishing the needs of consumers by conducting consumer research, • Being specific and measurable when drafting the service policy, • Ensuring customers understand and agree with standards by rolling out an extensive awareness campaign, • Ensuring that those people who are instrumental in delivering services recognise what is important to customers, and • Matching the level of water service with equivalent sewerage service, so as not to cause public health problems. Additionally stakeholder participation in the drafting and implementation of service level standards is important in gaining co-operation which ultimately helps in managing water demand.

"Increasing demand for water, and decreasing water quality, make careful water management a priority in our country."
-Delta enviro.org

viii. City of Tshwane Metropolitan Municipality: Parks Metering Investigation

Intervention Type	**Metering**
Reason for Intervention	**Ensuring that all municipal parks are properly metered and monitored**
Background & Objectives	The City of Tshwane Metropolitan Municipality (CTMM) has a population of 2.4 million people. There are approximately 350 000 households, of which 146 000 are informal, and a further 34 000 households are indigent. The municipality supplies approximately 23 million kℓ/month of water to the residents of the CTMM. It is estimated that 30% of the water purchased by the CTMM is Non-Revenue Water (NRW). It has become important for water services institutions to put in place measures to reduce and manage water demand and NRW. In order to manage and monitor water supplied, it is essential for municipalities to accurately meter all water connections including water supplied to municipal buildings and city parks as these sites can be sources of water losses if unchecked. CTMM initiated a meter audit of all irrigated road islands and parks throughout the city by establishing and correcting metering and billing inconsistencies. The overall objective of the project was to improve metering at the road islands and in the parks reducing NRW.
Results & Lessons Learnt	**Lessons Learnt:** • Meter auditing is a useful tool that can be used to detect metering inconsistencies which will assist in improving accurate meter readings and reducing NRW for any municipality; • Understanding the municipality's water usage and losses on council owned properties is important in terms of aligning the municipality with their strategic objectives and thus setting a precedent for their consumers to follow; • Accounting for all water used within a municipal boundary, including water used by the institution is an important activity to undertake on a regular basis; • It is crucial to ensure that all metering inconsistencies, including meters not working, meters showing incorrect reading, or where there is not a meter, that the incorrect meters that were identified through the audit are replaced or that a meter is installed; and • The impact of every meter audit and subsequent meter replacements should be determined to assess the benefit for the municipality.

"Across the world, 884 million people do not have access to clean water and 2.6 billion do not have access to adequate sanitation." – One International

ix. City of Johannesburg Metropolitan Municipality: Corporatisation of Water and Sanitation Services

Intervention Type	**Institutional Arrangement**
Reason for Intervention	**Improve operational and management efficiency**
Background & Objectives	The City of Johannesburg is home to 4.0 million people. A quarter of these residents can be classified as urban poor who reside in informal settlements, backyard shacks or abandoned inner city buildings. Water and sanitation services are provided by Johannesburg Water (Pty) Ltd (JW), which was established as a Municipal Owned Entity (MOE) in 2001 as part of the greater iGoli 2002 plan implemented by the City of Johannesburg as a major transformation initiative aimed at creating sustainable service delivery entities. In the post-apartheid era in South Africa, the need to extend and enhance service delivery has had to be balanced with the need to create efficiencies and ensure technical and financial sustainability of services provided to existing customers. As part of a major institutional restructuring exercise undertaken during the late 1990s, CoJ implemented a strategy known as iGoli 2002, which was aimed at addressing five key issues faced by the city namely, Financial Sustainability, Service Delivery, a Framework of Accountability, Administrative Efficiency and Political Leadership. This strategy included the formation of Utilities, Agencies, and Corporatized Enterprises (commonly referred to as UACs or more recently as Municipal Owned Entities or MOEs), including Johannesburg Water (Pty) Ltd, representing a corporatized entity (or utility) assigned with the responsibility of providing and extending water and sanitation services to all the residents of Johannesburg. Although various models were considered, a corporatized model – as opposed to a privatized model – was selected. From the outset, JW was established to "run like a business" with its own board of directors, management and organizational structure and decision-making capabilities. As the sole shareholder, the city appoints the board of directors and the Managing Director of the company.
Results & Lessons Learnt	As a result of transferring metering and billing functions for 60% of the customer base to JW as well as the implementation of OGA, JW was successful in reducing NRW to around 30% by 2007. Although the overall NRW rate was still high, JW was confident that the rate could have been further reduced to around 25% by continuing with the implementation of targeted initiatives. The single most difficult and frustrating challenge that has arisen from the corporatisation of JW relates to ownership of the billing function and the lack of autonomy afforded to JW in being able to manage this critical function. When the city initially endorsed the creation of a separate water and sanitation utility in 1999, the intention was that the utility would operate independently and take control of all metering and revenue collection functions. After local government elections in 2000, the new political leadership of the city was less enthusiastic about devolving such significant control to the newly created utilities and feared the perceived political risk associated with these entities being unable to manage the city's services. Although the Service Delivery Agreement (SDA) signed in 2001 with JW agreed to transfer billing functions, the political unease regarding this scenario prevented the transfer of this critical function to JW. In effect, only the top 14 000 customers of the utility were transferred, giving JW control of only 30% of its revenue. **Lessons Learnt:** • Corporatized utilities should be allowed to operate in an independent manner with sufficient control over those functions that are critical to their day-to-day operations, financial sustainability and overall performance, whilst the city (shareholder) retains control over key aspects such as approval of tariffs, setting of policy and holding the utility accountable for performance. The old adage that says responsibility should be delegated whilst accountability is retained finds great application in the relationship between the CoJ and JW. • Johannesburg Water as a corporatized entity was successful in reducing those components of NRW over which it had direct control, thereby demonstrating the strength of a more independent organization in being able to create business, financial and operational efficiencies given sufficient autonomy. • Governance difficulties between the city and its 14 established UACs became apparent soon after establishment, greatly compounded by the lack of capacity of both the CMU and SHU to manage, monitor, regulate and service the tasks, activities and performance of all these organizations. This was particularly evident given the mountain of data received on a monthly basis from the utilities as well as the need to provide reciprocal data to the UACs to allow them to operate optimally, as well as the need to regulate and set tariffs. The lesson learnt is that sufficient capacity should be created both at the utility and city level, in order to adequately manage the created relationship, assigned responsibilities and performance of each party. It is also critical that the expectations of each party towards the other be well communicated so as to avoid potential tensions, difficulties and misunderstandings.

"I have to be very positive about the future of PPPs... I don't think there's a pot of gold, but I think there is a tremendous amount to be gained by government going through this process."
– George Spadoro

x. Mbombela Local Municipality: Public-Private Partnership

Intervention Type	Institutional Restructuring
Reason for Intervention	**Extended municipal boundaries incorporating large un-serviced areas requiring large investments in infrastructure to enable service provision**
Background & Objectives	The Mbombela Local Municipality (MLM) is situated in Mpumalanga and has transferred the provision of water and sanitation services to Sembcorp Silulumanzi (Silulumanzi) through a long-term concession contract. This represents the establishment of a Public Private Partnership commonly known as a PPP. The PPP model, as it relates to the delivery of water and sanitation services, has been relatively successful throughout the world as a vehicle enabling the extension of services to the urban poor, whilst simultaneously creating greater efficiencies – especially in terms of reducing Non-Revenue Water (NRW) – in delivery of services to existing customers. **Objectives:** Along with providing water and sanitation services to the urban areas of Mbombela Municipality, the contract set out targets that Sembcorp Silulumanzi had to meet by 2009. These included: • Reducing NRW to 15% in Nelspruit and 35% 35% in all other areas, • Reducing daily household water consumption to 0.5 kℓ in Kanyamazane and 0.6kℓ in Matsulu, and, • Generally improving revenue collection throughout the municipal supply area.
Results & Lessons Learnt	**Achievements** • Since 1999, Silulumanzi has succeeded in extending water and sewer networks to unserviced communities, with 94% of households now having access to some level of water service. This is an impressive achievement given the levels of growth in the number of households over the past 10 years. However, 68% of households receive an intermittent supply and do not have access 24/7; • Satellite offices have been set up in the different supply areas to provide customer services such as payment kiosks, raising of queries and reporting leaks/water supply problems; • A comprehensive asset register has been maintained and is linked to a GIS Master Plan and fault reporting/repair system, which in turn is linked to customer billing and service level data; • Through the two pilot projects, illegal connections have been uncovered, removed and household leaks repaired. This has led to the reduction of water wastage and a savings of 30 000kℓ/month in the area of Matsulu; and • Over 8 000 non-functioning water meters have been replaced and a further 15 000 new meters have been installed throughout the municipal area. There is also an in-house training department which provides training to both staff members and communities in water matters including the importance of water supply and the management thereof. **Lessons Learnt:** • PPP contracts should be kept as simple as possible due to their long term nature and the high level of staff turnover; • The need for strong and experienced contract management on the part of the Municipality is important in ensuring that the target communities benefit from the PPP contract and the private party meets the objectives of the Municipality; • It is important to consider economic, political and social factors that can affect the PPP, especially in developing countries. Due to changes in legislation, policies, socio-economic and environmental conditions, the risk assumed by Silulumanzi was reduced after signing of the original contract, which direct negative implications to overall performance and achievement of agreed to targets; • It is critical for the Municipality to clearly understand the affordability element associated with the PPP model and how targets set out in the PPP contract affect the cost of the providing services through a private company; • It is important to ensure that sufficient capacity, in the form of personnel, financial resources and investments, be deployed in delivering services to communities through the PPP model; and • Expectations and requirements of the PPP contract especially in terms of continued investment over the life of the contract, should form part of the contract and be strictly managed by the municipality.

xi. Beaufort West Local Municipality: Water Restrictions

"The drought in the Central Karoo has become so severe that the Beaufort West municipality has introduced a water sharing scheme."
-Tisha Steyn, Die Burger

Intervention Type	Water Restrictions
Reason for Intervention	Severe Drought Restrictions
Background & Objectives	The Beaufort West Local Municipality (Beaufort West) is located in the central Karoo in the Western Cape. It has a population of 41 000 people with a high percentage of the residents classified as indigent. The Western Cape had been experiencing the worst drought conditions in over 100 years which has had a significant impact on the region and its communities. Beaufort West's water resources, the Gamka Dam, had dried up and borehole water levels had dropped significantly. The municipality no longer had a sustainable water supply and had to implement severe water restrictions in an effort to significantly curb the water demand. The objective of the intervention was to ration water consumption in order to extend the water supply from the existing stressed water resources. Water restrictions were initiated in 2010 by the Department of Water Affairs. The water restrictions, as implemented initially, required Beaufort West to reduce the volume of water abstracted by 40% and prohibit residents with private boreholes from abstracting groundwater for the irrigation of gardens between 07h00 and 17h00. However, towards the end of 2010, the situation was dire with available water levels reaching critical levels. This prompted the municipality to implement further restrictions in the form of a shared savings scheme. The municipal area was divided into 12 sections or zones, and each section, on a rotational basis, would have their water cut-off for 36 hours.
Results & Lessons Learnt	Beaufort West experienced an immediate savings in water when water restrictions and the shared scheme were implemented. This also had a positive impact on the behaviour of the residents. The experience of having no running water changed their perspective of the need for implementing water conservation and water demand management practices. **Lessons Learnt:** • Water restrictions can be an effective tool in controlling water demand and easing pressure on the depleted water resources. An added benefit is the influence the restrictions had on the perceptions of residents of the importance of water and entrenching a behavioural change towards water conservation and water demand management practices. What became overwhelmingly apparent to the residents of Beaufort West was the extent of a human's dependency on water when no more water flows out of the taps, • Rolling out an awareness campaign to ensure that the whole community understands the need for water restrictions is an important part of helping residents understand the situation and avoid conflict with the residents when implementing water restrictions, • Cutting off the water supply to the more affluent areas first helped the poorer communities realise that the impact of water restrictions would be felt by everyone and that it was not as a result of poor services or punitive measures because of lack of payment, and • This helped to sooth any adverse reactions from the community Beaufort West made every effort to identify all possible risks and mitigate any negative reactions that might arise as a result of the water restrictions. Due to their foresight, they were able to implement the water restrictions successfully which helped carry the community through the drought period and ensure that there was a continual supply of water.

4 BEHAVIOURAL INTERVENTIONS & LESSONS LEARNT

Programmatic approaches to water demand management should include initiatives that are aimed at modifying behaviour of the end-user towards water and water use. This is even more critical within the national context relating to water stress and future scarcity.

These could include changing attitudes towards water and its perceived value, changing habits relating to water use, encouraging the use and uptake of alternative technologies that can lead to water savings as well as education and awareness campaigns. These are in addition to interventions aimed at transferring ownership of plumbing fixtures and consumption to the end-user such as improved metering and billing, which have been addressed in previous sections of the compendium.

A selection of case studies that document successful approaches to behaviour modification are presented in the section below. These include public campaigns, customer education drives, individual metering as opposed to bulk metering of apartment buildings, and rainwater harvesting.

WHEN THE WELL IS DRY, WE LEARN THE WORTH OF WATER
-BENJAMIN FRANKLIN

i. Knysna Local Municipality: Public Water Savings Campaign

Intervention Type	**Public Water Savings Campaign**
Reason for Intervention	**Limited available stored raw water**
Background & Objectives	As the drought persisted in 2009, considered to be the worst in the Southern Cape in 132 years, the Knysna Local Municipality (Knysna) was required to reduce its water abstraction by at least 30%. This would require the average household water consumption in the area to be reduced from 24 kℓ/month to 15 kℓ/month. The objective was to stimulate a change in the behaviour or attitude of the residents and the industrial sector to implement efficient water consumption. Knysna decided to use a combination of strategies to emphasis its water savings campaign message in the most effective way. These included: • Erecting 14 billboards on Knysna's most popular beaches and routes, • Distributing pamphlets containing water savings tips, • Issuing each household and business premise a package containing consumption audit forms • Water savings notices that had to be placed at all water usage points by businesses on their premises, • Issuing of notices to residents and businesses updating the customer about their current water use • Vehicles driving around the municipal area with loud-hailers broadcasting the extent of the water shortage and reminding residents and businesses how to save water, and, • Visiting schools, and through an education programme, raising awareness amongst learnerS
Results & Lessons Learnt	The Water Savings Campaign had an impact on the behaviour within the community creating a new water consumption culture. The Knysna residents responded well to the information passed on to them and were fully supportive of the need to conserve water. Many of the residents started implementing water savings initiatives of their own in their homes such as installing rain water harvesting systems and water demand management devices. As a result the campaign achieved a water savings of 39% enabling the Municipality to maintain a sustainable water supply even under extreme drought conditions. **Lessons Learnt:** The experiences gained through the implementation of the public awareness intervention included that: • Drought management by-laws needed to be put in place as part of the Municipality's disaster management plan to ensure that drought situations would be managed quickly and effectively, • Capacity or the contingencies to make such capacity available with the event of a drought for a dedicated team to enforce drought management by-laws, • Capacity has to be increased, especially specialised standby staff, to immediately address water losses as a result of water system failures (such as burst pipes, etc.), • Customer water consumption database has to undergo a stringent analysis to identify high water consumption by consumers and other discrepancies such as problems within water supply zones, the ring-fencing of zones and tariff and step-tariff allocations which in Knysna's experience when rectified also resulted in improved revenue collection and further lowering of water consumption. • WC/WDM Municipal forums that cut across the different departments within the Municipality resulted in better understanding of the responsibilities and contributions that could be made by all Municipal officials in all the departments, • The installation of back-up tanks in the residential areas by the Municipality had a direct impact on the attitude and behaviour of the community (the piped water supply was to be cut-off as the drought intensified and the water tanks would supply only drinking water that would have to be collected by residents with containers, and, • Customer water consumption database has to undergo a stringent analysis to identify high water consumption by consumers and other discrepancies such as problems within water supply zones, the ring-fencing of zones and tariff and step-tariff allocations which in Knysna's experience when rectified also resulted in improved revenue collection and further lowering of water consumption.

"We never know the worth of water till the well is dry."
– Thomas Fuller

ii. Baviaans Local Municipality: Water Awareness Programme

Intervention Type	**Behavioural**
Reason for Intervention	**Due to severe drought conditions, behavioural change was necessary in order to conserve water.**
Background & Objectives	The Baviaans Local Municipality (Baviaans) is located in the Karoo in the Eastern Cape, with a population of 16 500 (9 900 impoverished) residents. The municipality extracts 1 700 kl/day from groundwater and surface water sources of which 20% is lost. The Eastern Cape was experiencing the worst drought conditions in almost 50 years. This left many of the surface water resources dry and the extraction from boreholes has had to be extended. This has prompted municipalities in the province to review their available water resources and implement water conservation and water demand management (WC/WDM) strategies. Baviaans also had an increase in water demand due to higher temperatures during the summer period adding further stress on their available water resources. A multi-pronged approach was undertaken by the municipality which included an intensive water awareness campaign, whose objective was to inform the community about dam and borehole levels, water consumption data and other pertinent water related issues. An awareness campaign is an approach that can be used to highlight a potential catastrophe in an effort to effect a behavioural change that will avert a disaster. Baviaans had to highlight the high demand for water use and wastage to avert a water shortage by changing people's perceptions of water usage and reduce water consumption.
Results & Lessons Learnt	Baviaans has seen a notable change in water use behaviour in the area. Residents have been willing to assist the municipality in their efforts to conserve water by changing their perspective on the importance of water and its conservation and implementing water savings tips. This has helped the municipality in ensuring that water supply to the community has continued and that there would be future water resources to meet the communities demand requirements. **Lessons Learnt:** • An awareness programme plays a critical role in an effective WC/WDM strategy. From this case it can be seen that even a low-keyed water awareness campaign has a significant impact on the behaviour of resident's water consumption practices, • There is a need to understand the effect prevailing conditions could have on water resources, • Commitment from municipal officials is needed, • It is important to ensure the community is constantly aware of the municipality's water status, • Although the need for a water resources and catchment area policy was identified, the development of specific measurable outcomes in the policy and implementation of the policy is poor making the policy a paper exercise, • The need to build capacity and institutional arrangements within the municipality to address WC/WDM was recognised by the municipality, and, • The existence, albeit with a low ranking municipal official, of a champion with the commitment and dedication to drive the campaign is seen as being critical in leading to a successful water savings programme.

iii. City of Cape Town Metropolitan Municipality: Promotion of Grey Water Use

Intervention Type	Consumer Education
Reason for Intervention	**Reducing the Demand for Water**
Background & Objectives	The City of Cape Town Metropolitan Municipality (CCT) is home to 3.4 million people with a daily demand of 800 000 kℓ of water. With the growth of the city as it currently is the demand for water is going to exceed the available capacity of the water resources in 2017. Furthermore, climate change is now an added factor and is probably the main reason for the increased frequency and severity of droughts in the Western Cape. The implementation of Water Conservation/ Water Demand Management (WC/WDM) interventions in the CCT has become crucial to the sustainability of its growth and development. As part of the CCT's existing WC/WDM strategy it has implemented, amongst a number of other WC/WDM interventions, a programme to encourage the use of grey water in households. The main objective was to promote the installation of Grey Water Systems by household consumers in an effort to reduce water demand by consumers, thus conserving scarce water resources and ensuring the sustainability of the water supply in the future.
Results & Lessons Learnt	The CCT states that over 1 000 households in the City have already installed grey water systems. On average, a household of 4 people uses 0.7 kℓ/day of water supplied by the city. But if 35% of this water, normally used for irrigation, is not sourced directly from the municipality's network, but is grey water, water used for the irrigation of the home's gardens, it is calculated that a savings of 246 kℓ/day of water can be achieved by these 1 000 households. Grey water use has also reduced the volumes of wastewater at the waste water treatments plants. This will in the long term have a significant positive impact on the financial implications for the need to upgrade the waste water treatment works. **Lessons Learnt:** • There should be an awareness of the potential health and environmental risks associated with the use of grey water, • Formal policies and standards which regulate the installation and use of grey water systems should be put in place to mitigate and manage the potentially negative impacts on the environment and individuals, • There should be a multi-pronged approach, using various mediums to raise awareness of water conservation, convey understanding on the importance of installing a grey water system and must reach as wide an audience as possible. Media which have been successful in engaging communities include street theatre, street competitions, simple colourful pictorial posters to be hung in the household at the point of use and simple colourful pamphlets for residents to keep handy as ready sources of information. Local sources of reasonably priced hardware for maintenance of structures and systems and community-based facilities for immediate problem solving are also excellent places to convey the message, • Communicate the message in a language suitable for the targeted market, • Ensure that the user understands how to properly use a grey water system and understands the health and environmental risks of the wrong use of grey water. Failing to do so can result in the deterioration of soil quality, reduce the ability of plants to grow, and spread disease. • A grey water system reduces the use of potable water thus bringing about water savings. Less water needs to be pumped from the already stressed water resource which ensures the sustainability of future water supply, and • Financially, both the consumer and the municipality benefit as costs decrease due to the reduction in water supplied and consumed. Pressure on the need to ugrade infrastructure such as treatment plants is also reduced.

"Filthy water cannot be washed."
– West African Proverb

iv. City of Tshwane Metropolitan Municipality: Individual Metering vs Bulk Metering.

Intervention Type	Individual Metering vs. Bulk Metering
Reason for Intervention	**Due to severe drought conditions, behavioural change was necessary in order to conserve water**
Background & Objectives	As the drought in the 1980s continued unabated, the City of Tshwane Metropolitan Municipality (CTMM) was forced to implement different Water Conservation/Water Demand Management (WC/WDM) interventions to reduce the city's overall water consumption. One of the actions taken by the city was to implement a stepped-tariff system as a punitive measure in the hope that it would bring about a change in behaviour. The system was designed to charge a lower tariff for "reasonable" consumption and a higher tariff for "excessive" consumption. Based on the water meter's readings, households with high levels of water consumption were going to be faced with high water accounts. However, blocks of flats or apartments have a single bulk meter which measures the total water consumption for the whole block of flats. The owners or the corporate body simply shared the cost of water between the individual units. When comparing the water consumption of bulk-metered complexes, specifically apartments or blocks of flats, the water consumption levels did not decrease as was being achieved with standard individually metered free standing residential units (houses). The Municipality analysed the monthly bulk meter readings (over a 12 month period) of the 1 213 apartment blocks in the city and found that 51% of the water consumed by all these apartment blocks was in excess of the prescribed quota of water. The main reason for the difference in reduction in levels of water consumption between houses and flats could only be accredited to the fact that houses were individually metered and blocks of flats had a bulk meter. The objective of this WC/WDM intervention was to determine to what extent the installation of individual meters would have on a change in behaviour towards water consumption of individual households in blocks of flats.
Results & Lessons Learnt	The results showed a definite reduction of water consumption where some form of WC/WDM intervention has been implemented even though the users are only monitored by a bulk meter. In reviewing possible options to implement individual metering, it was found that to retrofit most blocks of flats with individual meters to each flat with access to water piping was virtually inaccessible, and that in most cases individual flats were supplied from more than one point. One of the initial results of introducing individual metering was the identification of points at which water was being wasted. It was also found that tenants of individually metered flats prefer this system to bulk metering. **Lessons Learnt:** • The provision of individual meters would result in a cost to the local authority which will not be recovered because the revenue received from the water consumption measured by the bulk metering has already been accounted for, as well as with individual metering the water consumption would reduce the revenue. • Different residential environments, the number of people in those environments, etc. all have an influence on the water consumption per capita. • Water restrictions and stepped tariffing systems definitely have a limited effect on controlling water consumption in bulk-metered apartment complexes, but the end-result is that by increasing the cost of water, water savings are achieved. This may, however, not reflect in revenue received from the consumer. • Water reticulation systems in blocks of flats are hidden and housed in separate service ducts within a building and discharge directly into storm water systems or the sewer and leaks or pipe bursts are not visible and may occur over long periods of time before being repaired. • The retrofitting of water meter in existing apartment buildings is generally impractical; however, it is imperative that building regulations and the process for the approval of building plans and supply of services should insure that new building apartments and other types of complexes include metering for individual metering.

In South Africa WC/WDM is defined by the Department of Water Affairs' (DWA) WC/WDM strategy as: "The adaptation and implementation of a strategy by a water institution to influence the water demand and usage of water in order to meet any of the following objectives, which include, economic efficiency, social development, social equity, environmental protection, sustainability of water supply and services, and is political acceptability

v. Ikwezi Local Municipality: Promotion of Rainwater Harvesting

Intervention Type	**Consumer Education**
Reason for Intervention	**Scarce Water Resources**
Background & Objectives	Water Conservation and Water Demand Management (WC/WDM) is the responsibility of municipalities to ensure that water is used efficiently to "safeguard" the "capacity" of South Africa's threatened water resources. By municipalities encouraging rainwater harvesting, they are changing the behavioural pattern of water consumers and decreasing the pressure of the municipality's demand on water resources. The Ikwezi Local Municipality (Ikwezi) which includes the towns of Jansenville, Klipplaat and Waterford is situated in the Karoo, an arid area, which is prone to prolonged drought conditions with an average rainfall of only 300 mm/year (compared to South Africa's average rainfall of 464 mm and the world average rainfall of 860 mm). The objective of the municipality's WCWDM intervention was to supply water to households of a good quality by installing tanks for rainwater harvesting because of the lack of capacity to address: • Bulk demand (local network systems, imported from another catchment, and a dam that needs to be built), • The poor quality of local groundwater, and • The high levels of water wastage by consumers (when consumers are in control of their own water collection they are more careful of not wasting water).
Results & Lessons Learnt	**Lessons Learnt:** • Rainwater harvesting is only seen as a short term intervention. Authorities and communities should view rainwater harvesting as a viable option and also learn to live within the constraints of their environment and not consider piped water as the only "real" water supply option, • To supplement or increase water supply volumes additional rainwater collection "technologies" could be considered including additional roofs, paved areas and increasing storage capacity with additional water tanks, • Rainwater harvesting is: ➢ Cost effective in terms of water supplied versus capital investments made, ➢ Suited to rural communities far from available water resources, ➢ Ideal for areas where there is a groundwater quality problem, and ➢ The services can be implemented in a shorter period ensuring a quicker supply of water. • Albeit it that the rainwater harvesting intervention in Ikwezi was a success and that there have been prolonged droughts is the area WC/WDM is not included in the IDP. The Ikewzi municipal officials are not considering alternative options to bulk water supply from a dam. This is contrary to the fact that the collection of rainwater in Ikwezi LM improves the supply of water, the quality of water supplied is better and more house have a supply of water to more households without having to upgrade the existing water supply network, • In 2009 the government set aside R67 million just to address the water supply-drought related issues in Ikwezi LM alone. R60 million was budgeted for bulk supply upgrades compared to the R2 million spent on rainwater harvesting, • Ikwezi LM is located in a hot arid area where a large percentage of the rainwater, if allowed to flow into the environment, would be lost due to evaporation or to groundwater. Therefore, rainwater harvesting is the efficient use of water in an economically efficient and prudent manner, and • Groundwater in the Ikwezi LM area is not of an acceptable quality for domestic purposes. The water is highly saline and is not palatable. The groundwater, however, is the only available source of water in the area and people in the Karoo have grown up with the taste of the "Brakwater" (salty water). Therefore, by collecting the water, it is used before it filters through soil and rock (making it salty) and enters into the groundwater resource from where it is abstracted.

5 CONCLUSION

A key challenge in planning for future economic growth and social upliftment in South Africa is ensuring efficient use of water supplies and reducing water consumption through improved management of demand for water. This notion also recognizes that the eradication of poverty cannot take place without water.

Historically demand for water continues to grow across the country and unless steps are taken to reduce demand, especially given that South Africa faces water scarcity in the near future, water shortages will become the order of the day.

Case Studies documented in this compendium abundantly demonstrate that it is possible to reduce water demand of municipal customers through carefully managed interventions, and in so doing also achieve greater financial efficiency, reduce Non-Revenue Water and improve operation and maintenance procedures.

Compiled and edited by:

Juliet Mwale

The WIN-SA lesson series aims to capture the innovative work of people tackling real service delivery challenges. It also aims to stimulate learning and sharing around these challenges to support creative solutions. To achieve this, the lessons series is supported by ancillary learning opportunities facilitated by WIN-SA to strengthen people-to-people learning.

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Our mission is to ensure the body of knowledge in the sector is well managed, readily accessible and applied, leading to improved decision-making and performance, especially of local government.

Address: 491 18th Avenue, Rietfontein, Pretoria
Postal Address: Private Bag X03, Gezina, 0031
Tel: (012) 330 0340 Fax: (012) 331 2565
E-mail: info@win-sa.org.za
Website: www.win-sa.org.za