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LESSON SERIES
September 2013

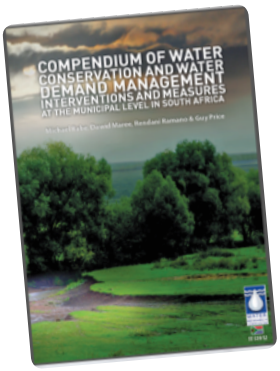
TECHNICAL INTERVENTIONS IN WATER CONSERVATION AND WATER DEMAND MANAGEMENT AT THE MUNICIPAL LEVEL IN SOUTH AFRICA

Sharing Lessons

WATER RESEARCH COMMISSION

ACKNOWLEDGEMENT

This lesson is a summary of technical achievements and lessons learnt compiled from the **Water Research Commission Report No: TT519/12**, compiled 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.

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.

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. Aimed at identifying, documenting and disseminating the experiences of municipalities in water demand management, the Water Research Commission directed the development of this Compendium of Case Studies relating to Water Demand Management at the municipal level in South Africa, presenting 40 case studies in an anecdotal easy-to-read format. The presented case studies highlight not only best practise in the industry, but also less effective approaches that can potentially achieve greater effectiveness through improved management and implementation.

MUNICIPAL TECHNICAL INTERVENTIONS & LESSONS LEARNT

Although water demand management cannot be viewed purely as a technical function due to the cross-cutting nature of municipal service delivery that includes financial management, institutional arrangements, community involvement, and policy, it remains at its core a technical exercise. This can best be explained in terms of the extensive infrastructure required to deliver the physical element of water in large quantities to thousands of consumers through an extensive network consisting of primary and secondary pipes, storage reservoirs, water towers, pump-stations, customer connection pipes and water meters, as well as piping and plumbing on properties beyond the meter. It is appropriate therefore that the technical staff of municipalities should 'own' water demand management and initiate solutions that can reduce demand and losses.

The largest majority of case studies documented in this compendium are technically orientated interventions implemented by technical departments of the municipality, aimed at providing a technical type solution to the problem at hand (which may or may not be technical in nature).

Technical case studies have been 'clustered' into categories that are aligned to the different components/operations of the water supply system, namely:

- Infrastructure,
- Pressure management,
- On-property leak repairs,
- Water reuse, and
- End-user metering

1 THE NELSON MANDELA BAY MUNICIPALITY (NMBM) - WATER LOSS PROGRAMME

"Water loss from a water distribution system is a significant factor affecting water delivery to customers."
– EPD Guidance Document

Intervention Type	**Institutional**
Reason for Intervention	**Reduce Non-Revenue Water and Water Wastage**
Background & Objectives	The objective of the programme, initiated in 2009, has been to reduce Non-Revenue Water (NRW) by 15% within the next ten years. However, the severity of the recent drought in the Eastern Cape, has forced the Municipality to intensify the reduction of NRW and water wastage. Figure 1 shows the significant fluctuation of the levels of water in the NMBM's supply dam over a period of 42 months highlighting the importance of an effective Water Resource and Water Demand Management programme. The NRW for the municipality has also increased annually since the formation of the NMBM and is attributed to a number of reasons including: • Lack of education and awareness regarding water conservation • amongst consumers, including the youth, • Ageing water supply infrastructure, • Water losses from leaking water meters and on-property leakage in low income residential areas, • The NMBM not able to put in place the institutional structures to capacitate and successfully deploy a WC/WDM division, and • A large number of un-metered consumers who are not on the billing system.
Achievements & Lessons Learnt	• Approximately 68 000 properties, out of a total of 210 000, have been targeted to date as part of the Water Loss Services Programme. To isolate (or make discrete) water supply zones was often a problem due to faulty valves between or to zones, • Some zones cannot be operated according to the design criteria for the network due to low pressures resulting from the excessive head losses in the supply network associated with the abnormally high water losses, • Poorly installed and leaking plumbing fixtures on houses which have recently had solar geysers installed, • Water losses and wastage as a result of damage to the water supply network by contractors responsible for the installation of bulk services (roads and stormwater). • No access to certain residential areas due to political interference and infighting • Delays in completing repairs due to material shortages and contractual disputes with the municipality (repair contractor). • Low income houses which are not categorized as indigent with high levels of on-site leakage because the residents cannot afford to or not able to make repairs. • The identification of additional leaks after initial plumbing repairs because the systems overall pressure has increased as the bigger and more visible leaks have been repaired. • The importance and significance of the municipality implementing an IWRM approach, that included a comprehensive WC/WDM Strategy, was highlighted by the extensive drought recently experienced in the region.

2 ETHEKWINI METROPOLITAN MUNICIPALITY - DECENTRALISED WASTE WATER TREATMENT SYSTEMS.

Intervention Type	**Water Services Infrastructure**
Reason for Intervention	**Pilot project to determine if treated wastewater could be used for agriculture**
Background & Objectives	The eThekwini Municipality is home to 3.5 million (7.2%) of the 48.5 million South Africans. Yet up to one million (28%) of eThekwini's residents live in the 415 informal settlements located throughout the municipal area. The main objective of the Decentralised Wastewater Treatment Systems/Solutions (DEWATS) is to improve sanitation services in areas where there are no water and or sewage facilities. DEWATS is an improvement to the sanitation system when compared to pit latrines or chemical toilets. It is an intermediate step towards implementing a fully conventional sanitation system. It provides a small sewer network which produces biogas that can be used as an energy source and an effluent which can be used as water, with nutrients, for irrigation. The main focus of the DEWATS project is to improve the general health of indigent people through encouraging a change in the behaviour and as a result a change in the way that they conduct their health related practices.
Achievements & Lessons Learnt	An installed DEWATS unit in a densely populated informal settlement has the following impacts: • Reduces the size, complexities and costs of a fully constructed sewer network system. • Time Horizons for the Implementation of Services: The time needed to plan, budget and build a DEWATS unit is "years" shorter than the period before a conventional sewer system is constructed in an urban area. Yet, DEWATS has most of the advantages of a conventional system, at a considerable reduced cost, with immediate implementation in urban areas with poor service levels, and simpler installation of the system. • Energy from Biogas: DEWATS caters for generating energy from the collection of biogas reducing the energy consumption of the residents by giving them an alternative form of energy. • Water and Nutrients: DEWATS generates water and nutrients that can be used for the irrigation of gardens. Water that is supplied to the community can be re-used and not lost to the sea when discharged directly to the river or through a WWTW, which is especially important for coastal settlements making it an important water efficiency and water conservation project. • Upgradability and Size of DEWATS: Anything between 40 and 2 000 households can be connected to a single DEWATS unit. This gives the system practicability of servicing various sizes of communities or areas of communities depending on location and position of the houses without increasing the costs and practicality of managing numerous units. • Improved Living Conditions, such as improved hygienic conditions due to improved sanitation systems, the availability and use of ablution blocks, controlled water consumption reducing water wastage or occurrences of wastewater flowing in streets and stagnant water pools attracting pests, mosquitoes, water borne related diseases, etc. • Employment and Labour Opportunities, helping communities take responsibility for their own water systems and the economic opportunities that come with growing gardens. • Water Conservation is improved through training, community education, controlled dispensing points (less illegal connections) and through metering of the water supplied to the DEWATS units.
Achievements & Lessons Learnt	Lessons Learnt: • The South African government and communities have a perception that only a "traditional" flushing sewer system is an acceptable form of service and that other alternatives means that the community is being "cheated" of proper services. • Cost implications, budget restrictions, aging infrastructure and poor implementation of traditional systems are leading to an ever increasing back-log of functional sanitations systems.

	• DEWATS is economically, practically and environmentally viable, and can be installed in areas where sewer connections will not be available for the foreseeable future. • DEWATS units can be planned, built and in operation within a period of 12 months which is significantly shorter than it would take to put in a conventional sewage network. • The "service" delivered is "acceptable" and comparable to a "traditional" flushing water borne system. • Partnering and co-management with communities and private parties with the reality of corruption levels as they are is a concern and the implementation of DEWATS is open to abuse. However, sanitation systems need to be put in place, jobs need to be created and communities need long term sustainable options to generate additional income. DEWATS is an opportunity to up-lift an indigent community and municipalities need to conceptualise and realise the opportunities that DEWATS presents for a municipality to implement services quickly and effectively.

3 CITY OF JOHANNESBURG METROPOLITAN MUNICIPALITY: ACTIVE LEAK CONTROL

"We take clean water blissfully for granted, because it's always so abundantly available to us." – Pure Inside Out

Intervention Type	Leak Detection and Repair
Reason for Intervention	**Reduction of real or physical water losses associated with underground infrastructure**
Background & Objectives	In recent years, Johannesburg Water (JW) has experienced an increase in real or physical water losses, reflective of an ageing network across most parts of the city. These losses are associated with the distribution network and are indicative of the age, condition and operating regime (pressure, surge, flow, etc.) in which water services are delivered by the utility to consumers. Over time, it will be necessary for JW to replace large parts of the existing water network and, especially, networks consisting of Asbestos Cement (AC) pipes, which is prone to leaching of cement from the pipe wall over time. As an alternative interim measure to the outright replacement of networks, Active Leak Control (ALC) can easily be implemented by a utility as an on-going programme to detect and repair both visible and invisible leaks. In contrast to In contrast to Passive Leak Control (PLC) which relies on the general public to report leaks and bursts through a centralised call centre operation, ALC is a programme whereby pipeline 'routes' (or the surface position of underground pipes) are 'walked' regularly with a view to identifying visible leaks. Commencing in 2008, JW has implemented an Active Leak Control programme, whose main objective is the reduction of real losses associated with the water network including pipe bursts, leaking valves, leaking hydrants and leaking/broken water meters. Approximately 70% of the total water network consisting of more than 10 000 km of pipeline is physically walked and inspected once a year to identify visible leaks and faults (including the use of leak detection equipment as and where appropriate). Logged leaks and faults are reported back to dedicated operational staff (plumbers, artisans and general workers) in each region or depot for repairs. This exercise includes inspecting each consumer meter, network valve and fire hydrant for leaks and faults.

Achievements & Lessons Learnt	• According to Johannesburg Water, an 80% success rate in terms of repairs of faults reported on by the ALC teams has been achieved. This has been attributed to good communication between the repair crews and the ALC teams, directly as a result of the dedicated ALC teams operating out of actual depots and satellite offices and reporting to Depot Management. • There is need for additional human resources and capacity to improve the success of this initiative. There is also need for specialised training on the use of some of the logging and leak detection equipment as well as the upgrading of certain items such as the amplified listening sticks. • Various problems were highlighted and specifically the lack of maintenance of Pressure Reducing Valves or PRVs (both proactive and reactive maintenance) in the water network. Failure to maintain specialised equipment such as electronic PRV controllers has meant that they need to be removed and returned to the suppliers for repair. This has had a negative impact on water savings achieved through the ALC programme as pressure cannot be regulated over time whilst the controllers are in for repairs. • Another key factor is that all faults are logged onto the Operations Management System, assigned a Job Number with a Job Card allocated to either a plumber, artisan or Special Services Team for repair. • The repair team is required to report back to the Management System on completion of the task. All feedback is collated and reported on to the JW NRW Operations Manager. • Although it is difficult to quantify the reduction in physical losses that have been realized through this initiative, JW staff are in general agreement that the programme has been successful in better managing bursts and reducing water losses. As a result, JW has committed to increasing the total length of mains covered per annum by the ALC teams from the current 70% to 80% of the water network.

4 CITY OF JOHANNESBURG METROPOLITAN MUNICIPALITY: SOWETO INFRASTRUCTURE UPGRADE PROGRAMME

"We take clean water blissfully for granted, because it's always so abundantly available to us." – Pure Inside Out

Intervention Type	Infrastructure upgrade, metering and leak repair
Reason for Intervention	**To reduce the high level of water losses in both the network and on properties**
Background & Objectives	During the early 2000s the supply of water to Soweto was characterized by unsustainably high wastage. Water supplied to the greater Soweto region averaged close on 70 kilolitres (kℓ) per property per month with the total supply volume increasing at 4% per annum. Given the culture of non-payment which was prevalent at the time, the supply to Soweto represented an enormous unsustainable financial loss to both the municipality and JW. In response JW formulated a multi-faceted intervention project including the renewing and relocating of the decrepit water network, repair of leaks on private properties and the installation of prepayment water meters. The objective of Operation Gcin'amanzi was to create an efficient water supply system and achieve significant savings in total water supplied to the area by reducing excessive consumption and wastage. It was anticipated that the project would lead to savings of almost 20% in the water consumption for the city as a whole. Operation Gcin'amanzi was designed to add social and economic value to the community through: • Improved water service delivery and customer interface; • Rehabilitated municipal infrastructure; • Rehabilitated private plumbing fixtures;

	• Temporary and permanent employment for unskilled and semi-skilled labour in Soweto; • Empowering of the customer to take ownership of water consumption; • Net reduction in the cost of water to the end user; • Dispensing of Free Basic Water to all residential properties; and • Reduced municipal service arrears based on acceptance of the prepayment metering system A prototype phase was successfully completed in the suburb of Phiri towards the end of 2004. The objective of the prototype phase was to refine the implementation approach and methodology before rolling out the project across the greater Soweto region consisting of around 200 000 properties. Results achieved to date in completed areas are spectacular, with the average water supply volume per property dropping by more than 50 kℓ per residential property per month. This equates to a saving of R200 million per annum to JW in bulk water purchases alone, providing an effective payback period of less than 3 years on the investment made.
Achievements & Lessons Learnt	Key Anticipated Results • Estimated Energy Savings (when all phases completed) 175,000 mWh/year • Cost Savings (estimated when all phases completed) R500 million per annum • Water Savings (estimated when all phases completed) 97,200,000 kℓ/year • Transfer of ownership of consumption to the consumer (a first in real terms for Soweto) • Reduction in operating and maintenance costs due to water network upgrade • Creation of over 1500 temporary jobs in the communities where project being implemented • Realization of the true value of potable water • Improved sanitation Lessons Learned • Operation Gcin'amanzi shows the importance and value of creating water efficiencies at the municipal service delivery level through intervention and remedial action, especially when a host of complementary interventions are implemented simultaneously. • The issues around water supply in Soweto are not unique and occur in many urban areas in South Africa and abroad. The results of this project demonstrate that Demand Side Management should at all times be considered as a cost-effective alternative to Supply Side Management, which often considers demand trends in isolation without due recognition to those factors contributing to that demand. The project also illustrates that significant public opposition can be replaced by the willingness of people to pay for reliable, clean water—once they experience the benefits and go through the ownership process.

All the water that will ever be is, right now.
National Geographic, October 1993

5 DRAKENSTEIN LOCAL MUNICIPALITY: DRAKENSTEIN GENERAL PRESSURE MANAGEMENT

Intervention Type	**General Pressure Management**
Reason for Intervention	**Drought and on-going stress on available water resources in the Western Cape.**
Background & Objectives	The Drakenstein Local Municipality which includes the towns of Paarl, Wellington, Hermon, Gouda and Saron has faced shortages in the availability of water for especially municipal supply, along with other urban areas in the Western Cape including Cape Town, Stellenbosch and Somerset West. Shortages are linked to the availability of surface water in the Western Cape which has become water stressed. Water scarcity is especially pronounced during drought periods which have become more frequent, attributed by some to climate change. In response the municipality (then known as Paarl Town Council) approved a Water Demand Management (WDM) Programme in 1997, aimed at reducing overall demand for and wastage of potable water. Proposed measures and interventions to address WDM included the introduction of a rising block tariff for residential water use, compilation of a computerised water network model and Master Plan, metering of unmetered connections (e.g. parks and industrial fire water), installation of district and zone water meters, a public awareness drive, installation of water saving devices and the implementation of a comprehensive pressure management programme. Pressure management was key to achieving water savings in terms of the WDM programme and involved the installation of Pressure Reducing Valves (PRV's) at strategic locations in the network characterised by high supply pressures.
Achievements & Lessons Learnt	The WDM programme of Drakenstein Local Municipality has been highly successful in achieving significant reductions in demand. Much of the achieved saving can be attributed to pressure management, which was the most significant technical component of the programme. Lessons learnt during the implementation of this programme: WDM programmes are most successful when a holistic approach to implementation is adopted that includes technical, social, behavioural and institutional interventions; Although pressure management is highly cost-effective, consideration needs to be given to certain supply characteristics such as measured Minimum Night Flow, nature of terrain, number of supply points, level of payment, condition of the network, etc; In order to sustain savings in water demand, implementation of pressure management should be proceeded by additional technical interventions aimed at fixing leaks and bursts in the network as well as on private properties; Subject to an overall implementation master plan, pressure management lends itself to a phased or incremental implementation approach whereby additional PRV's, controllers, etc, are installed as progress is made in reducing the level of leakage or minimum night flow; and Pressure Reducing Valves should be maintained and inspected regularly to ensure they are in proper working order. Failure of the valve or controlling equipment normally leads to loss of pressure control which defeats and/or negates the effect of pressure management and the resulting water savings.

"Water is the lifeblood of our bodies, our economy, our nation and our well-being."
-Stephen Johnson, EPA Administrator

6 DRAKENSTEIN LOCAL MUNICIPALITY: DRAKENSTEIN GENERAL PRESSURE MANAGEMENT

Intervention Type	**Pressure Management**
Reason for Intervention	**High Water Losses because of leaks on properties and in the distribution network.**
Background & Objectives	The Emfuleni Local Municipality (ELM) has an estimated population of around 650 000 people living in approximately 194 600 households, of which 51.6% are deemed to be indigent. ELM supplies 6 million kl of water per month and it is estimated that 39% of the total volume of water supplied represents Non Revenue Water and/or water losses. The main purpose of this project was to reduce the high level of recorded leakage by installing Pressure Reducing Valves with advanced controllers that reduce pressure according to a pre-set time-of-day schedule. It was calculated that the yearly payments by the municipality to the bulk water supplier could potentially be reduced by two-thirds through implementation of the proposed pressure management solution. Implementation of advanced pressure management to control the bulk supply of water to the Sebokeng/Evaton low-income residential area is a good example of the application of modern pressure control equipment and the resulting saving in volumes of water supplied that can be attained. Because of the water-energy nexus, savings in bulk water supply can also be translated into energy savings and resulting reductions in Greenhouse Gas Emissions. Overall, a reduction in operating pressure also translates into savings in operating costs, as the number of pipe bursts is reduced.
Achievements & Lessons Learnt	Key Results: • Innovative project financing solution • Payback period less than 3 months • Annual projected cost savings: R25 million • Annual projected water savings: 7 000 000 kl(30% of pre-intervention supply) • Annual projected energy savings of 14 000 000 kWh • Annual GHG emissions avoided: 12 000 tons • Innovative application of pressure management technology Lessons Learnt & Benefits: • The application of advanced pressure management in Emfuleni is a good example of the type and magnitude of savings that can be achieved using state-of-the-art technology that reduces operating pressures according to a time related pre-programmed schedule • Deferred capital expenditure for the upgrading of Wastewater Treatment Plants (WWTW). Because inflows into the WWTW were reduced, upgrading of the capacity of the plant could be deferred for an estimated 10 year period, • Improved network operating conditions. This unexpected benefit was the result of supply problems being identified once pressures had been reduced, highlighting basic network pipes, valves and connections that, although indicated as installed and operational on As-Built drawings, were in reality missing and/or could not be located. Various boundary valves were also found to be incorrectly operated. Corrective measures were taken to restore the network to its original operating configuration, and • Highlighted bulk meter inaccuracies. After commissioning of the pressure management station which included the installation of bulk meters serving as check meters, the municipality was able to verify inaccurate bulk meter readings used for invoicing purposes by the bulk supplier.

"All these strategic interventions will work together in the City's drive to meet the presidential directive of reducing water loss by half, by 2014." -Specifile

7 ETHEKWINI METROPOLITAN MUNICIPALITY: PRESSURE MANAGEMENT IN REAL TIME

Intervention Type	**Pressure Management**
Reason for Intervention	**High water losses through leaking distribution system**
Background & Objectives	EThekwini supplies 910 000 kl/day to 3.5 million residents through 440 000 service connections, but can only bill or account for 550 000 kl/day of that water. The main objective of this project was to reduce the known level of water losses taking place in the Durban CBD area through pressure management. A phased water pressure management system was implemented in the Durban CBD as part of the Non-Revenue Water Reduction Master Plan to reduce water losses as introduced by the eThekwini Metropolitan Municipality's Water and Sanitation Directorate (EWS). Savings of 6 000 kl/day of potable water was achieved after the pressure management system was installed and commissioned. The phased implementation approach to pressure management is as follows: • Phase 1: The construction of a Pressure Reducing Valve (PRV) Station to control the CBD pressures and commissioning of the PRV station without any form of pressure control • Phase 2: Reduction of off-peak pressures by 10m • Phase 3: Reduction of off-peak pressures by 20m • Phase 4: Reduction of off-peak pressures by 25m • Phase 5: Reduction of peak pressures by 10m and off-peak pressures by 25m
Achievements & Lessons Learnt	• Non-Revenue Water (NRW) decreased by 5% for the City with a 32 000 kl/day, representing a cost savings of R38 million/year. Figure 3 below represents the water consumption before pressure management was implemented with a dark blue line and the water saving achieved with a dark red line. The vertical dotted red line illustrates the Minimum Night Flow (MNF) which was significantly reduced. The MNF is the minimum flow (water supplied) during the night-time when there should be no water consumption and represents water loss/leakage in the water supply system. The reduction in the MNF with the implementation of the pressure management system is indicative of a reduction in NRW. • The communications strategy also, proved to be extremely effective as not only did it facilitate a successful project, but a good relationship between the municipality and their customers was developed. This resulted in the compliance with the pressure management and regulatory standards by the customers in a prompt fashion allowing for the PRV station to be successfully commissioned and an appropriate level of service maintained. • The significance of a focused and motivated eThekwini project team was recognised when the project was completed on time and within budget even though there were initial delays with the implementation because of a sudden increase of network failures just as construction work was to start. The team had realised the importance of the intervention because they had a quantifiable solution and as a result were motivated to achieve the goal of reducing water losses. The eThekwini team limited time delays by initiating a number of parallel actions to reduce the sudden unpredictably high volume of water losses due to old water pipes bursting.

8 CITY OF MOGALE LOCAL MUNICIPALITY: MUNSIEVILLE PRIVATE PROPERTY LEAK REPAIR

Intervention Type	**Private Property Leak Repair**
Reason for Intervention	**Due to high levels of wastage, this project addressed leakage and municipal cost recovery for the provision of basic services**
Background & Objectives	In a drive to reduce water losses, Mogale City initiated a private property leak repair project in Munsieville, a previously disadvantaged low-income area consisting of around 2 500 formal dwellings. As the municipal water supply to this area was ring-fenced, it was established that the bulk of the leakage was occurring beyond the meter, or on the privately owned properties. The main aim of this project was to reduce water wastage and develop a methodology for undertaking larger-scale projects of this nature that include repairing, retrofitting, and/or replacing household plumbing fixtures. By eliminating wastage the project also aimed to address municipal cost recovery for the provision of basic services. Other objectives also included: Job creation,Skills training, Empowerment of local community members for a sustainable future, Community awareness, Community upliftment, Energy savings, and Protection of the environment. Before commencement of the project, average consumption per household in the project area was about 31.7kl/month. After completion of the project, consumption had reduced to 23.3kl/ month. This represented a savings of approximately 12 000 kl/month for the beneficiary area, or almost 30% reduction by R352 000 per annum. Figure 4 illustrates the impact of the project on the supply trend, from initiation to completion.
Achievements & Lessons Learnt	The most important lessons learnt through implementation of this project were: • During implementation community meetings were held with the Ward Councillor of the area, community leaders, prospective plumbers, plumbing suppliers and the Department of Labour. Through this process, it was established that the disabled and especially those using wheelchairs did not have easy access to the toilets, thus providing an opportunity for the project to assist in improving access. Through the building of access ramps, breaking out walls and installing hand-rails, access to toilets was provided to the disabled. The lesson learnt is that by engaging and interacting with beneficiary communities, the needs of the community can be better understood and vital information gleaned through a process of consultation. • The services of a plumbing auditor were utilized to ensure that repairs were effected in private houses were to an acceptable in water supply. • Based on the minimum night flow measurement taken after completion of the project, it was evident that there had been a 38% reduction in the leakage rate, resulting in the municipality's bulk purchases reducing standard. This process also included the signing off of repairs by the home owners. • Attention was paid to rolling out an awareness campaign to ensure that the community understood the importance and objectives of the project, the need to conserve water as well as convey best practice related to water use efficiency. Each household in the project area was visited by a Community Liaison Officer to discuss the leak repair project and hand out a brochure containing information relating to the project, water savings tips, and information on how to fix leaks, general awareness of water and the environment as well as contact details of the municipality. As part of the project launch activities, a soccer festival was also held in Munsieville. • An investment was made in skills development and job creation aimed at enhancing the sustainability of project impacts after implementation. The project was able to employ 34 previously unemployed people during implementation, of which 11 where female. This contributed to overall skills transfer and local economic development.

"Approximately 1 in every 318 homes or buildings has a leak." - Smart Leak Detection and Smart Plumbing

9 DRAKENSTEIN LOCAL MUNICIPALITY: SARON LEAK REPAIRS ON INDIGENT PRIVATE PROPERTIES

Intervention Type	Indigent Leak Repair
Background & Objectives	Reason/Aim: High water losses due to high leakage levels on indigent properties The DLM through a process of logging water supply networks in their area found that minimum night flows (MNF) in Saron averaged 27 267 kl/month. High MNF is an indication of high water losses that can be attributed to leaks in the network or open taps or leaks in houses. MNF is the flow in the water supply network (or demand for water) during the early hours of the morning. This is when the normal water consumption by sleeping residents is at its lowest and should theoretically be zero. A leak repair project was thus undertaken by DLM to address the high water demand due to leakages on indigent domestic properties. The objective of the project was to identify and repair plumbing fixtures in indigent households where there were water leaks on their properties in an effort to reduce the high levels of water wastage. This included raising the awareness of the residents that their water consumption was high, the need to conserve water and the reasons why it was important to pay for services.
Achievements & Lessons Learnt	The project achieved a saving of 12 363.84 kl/month as measured against the MNF. MNF decreased from about 10l/s in 2008 to about 6l/s in 2009. The overall demand for water in the area also decreased as a result of the repairs. Lessons Learnt Repairing plumbing in indigent homes is an important intervention in the effort to conserve water. Non-paying residents generally do not repair their plumbing fixtures and waste water. It is in the interest of the municipality to implement a leak repair project because there is a reduction in water losses. There is also a cost recovery over time that will also cover the costs of the leak repairs. As water savings are achieved the cost of water supplied is lowered and the percentage of revenue collected improves. In other words the cost recovery of water improves leaving the municipality with less of a financial burden. The education of the community on the benefits of the project, the potential risks of water wastage and basic leak detection and repair goes a long way in ensuring a longer sustained success of the project. Perceptions and attitudes surrounding the water conservation and water demand management need to be influenced in order to bring about a change in behaviour which will lead to the more efficient use of water.

"A leak the size of a pinhead can waste 31362748.24 litres per year, enough to fill 12,000 bathtubs to the overflow mark."
-Smart Leak Detection

10 EMFULENI LOCAL MUNICIPALITY: SHARPEVILLE PRIVATE PROPERTY LEAK REPAIR

Intervention Type	Private Property Leak Repair
Objective & Background	Leaks on private properties in especially low-income areas identified as one of the major causes of water wastage. The population of ELM is approximately 650 000 people living in 194 600 households, of which around half are deemed to be indigent. The high number of indigents seriously affects the sustainability of water services, especially given that the municipality supplies 6 million kilolitres (kl) of water per month, of which 39% is considered as Non-Revenue Water (NRW). In South Africa, leaks on private properties especially in low-income areas; have been identified as one of the major causes of water wastage, which can be as high as 80% of total water supplied by the municipality. These leaks can be attributed to the use of poor quality plumbing fixtures, excessive pressure in the water supply system and also a general disregard for the efficient use of water by the serviced customer. The aim of this project was to repair/replace/retrofit plumbing fixtures (cisterns, taps, pipes, etc) on private properties in a previously disadvantaged community in order to reduce high levels of wastage, whilst simultaneously addressing municipal cost recovery for the provision of the basic services. Additionally the project aimed to create local employment opportunities for Community Liaison Officers (CLOs) and Learner Plumbers from Sharpeville.
Results & Lessons Learnt	Overall water demand in Sharpeville did not reduce significantly after implementation, due to various challenges which have been highlighted below. This also meant that the cost of interventions could not be offset against achieved water savings, seriously questioning the success of the initiative. Savings in water supply achieved directly after implementation were estimated to be in the region of 15 600 kl/month or equivalent to R83 000/month. These savings were however not sustained in the longer term and soon after intervention overall volumes of water supply returned to pre-intervention levels. The project did however have other benefits such as the improvement to plumbing fixtures on more than 80% of all properties in the beneficiary area. Communication with the community is critical to success of a project of this nature and a dedicated CLO should be appointed to liaise with the community on all project matters; Every effort should be made to use only plumbing fixtures that have no scrap value, so as to avoid theft and resulting water wastage; The municipality and/or beneficiary community must buy into and adopt the project as their own, to ensure sustainability and success. It is recommended that learner plumbers be permanently employed by the municipality after completion of the project so as to incentivise them to continue with repairs and in so doing minimize wastage; and Network related leaks and bursts should also be attended to by the municipality within an acceptable period of time. If not attended to, any savings achieved through the repair of small on-property leaks will quickly be negated by the bigger network leaks and bursts and the benefits of the project will very quickly be lost.

"In an age when man has forgotten his origins and is blind even to his most essential needs for survival, water - along with other resources - has become the victim of his indifference."
– Rachel Carson

11 eTHEKWINI METROPOLITAN MUNICIPALITY: WATER RECYCLING

Intervention Type	**Water Recycling**
Reason for Intervention	**Capacity of WWTW and sea outfall pipe line limited**
Objective & Background	In the early 1990s the eThekwini Metropolitan Municipality's (eThekwini) Southern Waste Water Treatment Works (WWTW), including the sea outfall pipeline, had exceeded its capacity and needed to be extended. However, the eThekwini Metropolitan Municipality was confronted with the high capital, operating and environmental related costs. After some research, eThekwini's Water and Sanitation Directorate (EWS) identified the potential of reusing the effluent which would in turn address many of the costs and environmental issues as well as reduce eThekwini's demand for water. The overall project objectives (See Table 1) had to address the need to treat the increased volumes of waste water from the southern Durban area and simultaneously reduce the capital costs of new infrastructure. A practical sustainable alternative of disposal of the WWTWs effluent, as well as environmentally acceptable options, had to be found.
Results & Lessons Learnt	Achievements • Despite the complexity of the project and the space constraints on site the project was completed in 10 months. Since commissioning the plant in 2001 37 Ml/day of potable water is now being saved by eThekwini. • Further, 37 Ml/day of sewage effluent is no longer being discharged into the sea. This has led to important cost savings as there is no longer a need to increase the capacity of the WWTW's sea outfall discharge infrastructure. There is also a significant reduction of the impact from the WWTW on the environment. • Further a win-win-win workable Public Private Partnership (PPP) deal was tabled that would benefit eThekwini (cutting costs, addressing the need to treat additional waste water volumes and limiting the environmental impact). Local industries (albeit only a limited number of industries) benefitted by having access to an additional volume of water at almost half the cost. There was the establishment of a private operating consortium which would increase technical capacity and job opportunities in the eThekwini community. Lessons Learnt • The initiation of the Public Private Partnership and then the collaboration between the newly established Durban Water Recycling (Pty) Ltd and EWS was instrumental to the success of the project. The success of the project was also because of the innovative approach of the contract which allowed scope for a financial model to be implemented that would provide capital for construction. • During the project there was also the realisation that the use of effluent from a WWTW is not always as straightforward as expected. There are different types of effluents which have different waste loads depending on the volumes of waste water discharged by industries or by residents. The waste load from industrial areas will vary significantly from area to area and even from hour to hour during the working day. However, the waste load from a residential area is fairly constant in quality and basically only varies in volume depending on the time of day.

"The beauty of grey water is that it's constantly generated, unlike rainwater or stormwater which has to fall from the sky before it can be harvested."
–Dr Wendy van Dok

12 SOL PLAATJE LOCAL MUNICIPALITY: GREY WATER MANAGEMENT

Intervention Type	**Water Reuse**
Reason for Intervention	**Implemented a grey water systems for the reuse of grey water due to scarce water resources**
Background & Objective	The objective of the projects was to test different affordable environmentally sustainable low income housing concepts, with the intention of replicating the applicable best practices on a larger scale in Moshoeshoe, and then at a later stage role the project out to the whole Municipal area. Amongst other initiatives around ensuring that the project was sustainable, affordable and practically implementable was the key objective to provide a grey water as a source of water to meet the community's needs for the irrigation of gardens.
Achievements & Lessons Learnt	The Eco-village Pilot Project saw 11 houses being built, each connected to the centralised grey water system. As a direct result of using grey water, residents pay less for municipal water services. Less water is being abstracted and less water is being discharged to the sewage treatment plant. Lessons learnt: • Combining the grey water in a centralised system reduces capacity related issues when compared having a separate grey water system for each unit, • The education of residents is needed to ensure that they understand the benefits of and buy-into the concept of using grey water, • The perceived prejudice of alternative housing needs to be dispelled through workshops and demonstrating the success of the project, • Residents should participate in the project from its inception and planning stages with the involvement of the community, politicians, the municipality, province and financiers. • The project should be as flexible as possible to allow for changes and improvements to be made once feedback has been received and as new lessons and challenges which constantly present themselves can be addressed together with the community. • Urban agriculture was not particularly popular amongst the beneficiaries. If urban agriculture is to be part of the approach it needs to be driven by a dedicated person or organisation providing training, support and the financial motivation to make a gardening venture successful.

"In addition to conserving highly treated, expensive drinking water, wastewater reuse reduces the release of nutrient-rich wastewater into environmentally stressed streams and rivers."
– Caigan McKenzie

13 SOL PLAATJE LOCAL MUNICIPALITY: WASTE WATER REUSE

Intervention Type	Water Reuse
Reason for Intervention	**Excess effluent discharge into the Kamfers Dam pan due to a lack of capacity at the wastewater treatment works.**
Background & Objective	The Sol Plaatje LM, located in the Northern Cape, has a population of 245 000 of which 74 000 are indigent. Water supply infrastructure is aging and there is a backlog of the construction of new networks to accommodate the ever increasing growth in population all of which is contributing to the high water losses and wastage. It operates and manages the Homevale Wastewater Treatment Works (HWWTW). The works has been designed with a capacity to treat 30 000 kl/day of domestic wastewater and the final effluent from the works is discharged into the Kamfers Dam. The Kamfers Dam is a large wetland, which is one of only four places in the whole of Africa where the spectacular Lesser Flamingo breeds. Due to deteriorating infrastructure and the growth of the population the HWWTW was no longer able to adequately treat Kimberley's increased volumes of domestic wastewater. The volumes of treated effluent being discharged by the HWWTW have increased significantly and the quality of the effluent has deteriorated as a result. The project sought to provide a sustainable solution to the challenges facing the municipality with regard to the capacity of the works and the prevailing environmental issues associated with Kamfers Dam. The reuse of the treated effluent from the HWWTW was also seen as a water conservation intervention. Also, by utilising the treated wastewater effluent for agricultural purposes the intervention was contributing towards addressing the socio-economic challenges of Sol Plaatje through the creation of commercial farming opportunities for small scale community farmers.
Achievements & Lessons Learnt	• The diversion of effluent is still in its initial stages and it is thus difficult to evaluate results. It is, however, intended that the use of purified effluent be monitored. The municipality is confident that as the advantages of using this water for both agricultural and industrial purposes becomes known its use will be accelerated to meet the supply. • Although discussions have taken place between farmers and the municipality, and a draft Memorandum of Understanding between the two parties has been prepared, no final mechanism for the distribution of effluent has been agreed upon. • The use of effluent for emerging farmers has not progressed beyond the conceptual stage. A detailed business plan must still be prepared and potential funders and beneficiaries identified. • These types of integrated projects are complex with many different forms of stakeholders that have to be consulted with which stretches out the timeline and at the same time frustrates interested parties. • The implementation of a project of this nature should identify stakeholders as early as possible in the planning phase in order to prevent any unforeseen events arising during the application stage. • A project such as this requires flexibility in approach, planning and implementation along with alternatives built into the potential options for implementation.

"Waterborne sewage systems demand large quantities of water that can be better used for human consumption." - Ecosan

14 SOL PLAATJE LOCAL MUNICIPALITY: DRY SANITATION

Intervention Type	**Water Reuse**
Reason for Intervention	**Scarce Water Resources**
Background & Objective	The need for housing in the Sol Plaatje area increases the demand for water as water supply networks are expanded for new housing projects and more people are supplied with water. Ironically these scarce water supplies are used to "transport" human waste by installing mainstream sanitation systems which require large volumes of water from the already stressed water resources. These wastewater systems also cause pollution which affects the environment as well as human health. Ecological Sanitation (EcoSan) is a sanitation process in which human excreta is dealt with in an environmentally friendly way through recycling and as a source energy production and composting. The Eco-village pilot project was initiated as a testing site for the implementation of dry sanitations systems in Sol Plaatje area. Later, the Hull Street project was also developed in an effort to build environmentally friendly houses with an alternative environmentally acceptable sanitation solution that would conserve water in a sustainable manner and provide an equitable service. The objective of the projects was to test several concepts for low cost, environmentally sustainable housing. Part of the testing included the viability of using dry sanitation systems as an alternative to conventional waterborne sewage systems.
Achievements & Lessons Learnt	• 127 housing units had urine diversion toilets installed. Research found that 85% of the residents were unhappy about the dry sanitation system, with 11% being satisfied and a further 4% being happy with the system. The study found that although 68% of residents were satisfied with the living conditions, residents were unhappy about the continuous smell in the house and the unhygienic nature of the dry sanitation system. Those residents who were satisfied with the system indicated that the benefit was that no payment was required for water or sanitation • Distributing educational information on dry sanitation concerned with health risks and proper maintenance is an important step, especially in the effort to change perceptions around the use of dry sanitation and so that the system works properly and is not a problem.

The benefits of wastewater re-use include a reduction in the demand for potable water, quantity of effluent and loading on the environment.

15 CITY OF CAPE TOWN METROPOLITAN MUNICIPALITY: TREATED EFFLUENT REUSE

Intervention Type	Wastewater reuse
Background & Objective	Alternative means of supplying water in order to conserve potable water resources: The City of Cape Town Metropolitan Municipality (CCT) is home to 3.4 million people with 15% living in informal settlements. This implies that besides the normal expected growth in water demand that the water supply to the city needs to grow by at least 10% to meet the needs of all the residents. Approximately 24 million kl/month of water is already abstracted by the city. Of the total water abstracted by the city 25.4% is lost and on average 16 million kl/month (66% of the total abstracted) is discharged as wastewater. At the current growth in population and development the demand for water by the CCT will exceed the capacity of the available water resources by 2017. There is now an urgent need to find alternative sources of water and the CCT has put in place plans to abstract water from groundwater resources, desalinate sea water and reuse treated wastewater effluent. The capacity of the natural water resources from which the CCT abstracts its water will soon be depleted. CCT have recognised the potential to augment their water supply by using treated wastewater effluent thereby reducing the demand for water to be abstracted from their existing natural water sources.
Achievements & Lessons Learnt	• The municipality has 10 plants in operation from which a total of 110 consumers are supplied with 1 million kl/month of treated wastewater effluent which represents a water savings of 4% of total water supply to the CCT. • In 2007, about 60% of potable water supplied to the CCT was discharged to the CCT's sewer systems as wastewater. Only 10% of this wastewater is then treated and re-used. The rest is discharged to the sea after some treatment. Therefore there is huge potential for the CCT to extend its programme to reuse treated wastewater effluent to supply more consumers and thus realise a greater savings in water and in the longer term cost of augmentation schemes or desalination. • In the planning phases for the identification and supply of treated wastewater effluent to new customers there must be more effort or focus on ensuring that the public's health and the protection of the environment are taken into account. • The cost of the additional treatment of wastewater is high because the water quality requirements of the different users are specific. • In the planning and construction of a new sewage wastewater treatment works, or when a waste water treatment works is to be extended, additional treatment facilities to treat wastewater to an acceptable standard for water supply, must be taken into consideration.

16 BEAUFORT WEST LOCAL MUNICIPALITY: RECLAIMED WATER

"The town's main reservoir, the Gamka Dam, has dried up, forcing municipal officials to introduce a water management scheme."- Warda Meyer

Intervention Type	**Waste Water Reuse**
Reason for Intervention	**Persistent drought leading to severe water shortages**
Background & Objective	Beaufort West has a population of 41 000 people of which 17 000 are considered indigent. Beaufort West abstracts 41 000 kl/month from the Gamka dam and 137 000 kl/month from 18 boreholes. Total water losses from bulk and network supply systems have been estimated at 40%. During the late 2000s the Central Karoo region in the Western Cape experienced severe droughts that ultimately resulted in surface water storage dams drying up completely. BWLM was not spared this hardship and the Gamka Dam, representing the main source of surface water for the town, also dried up completely. The situation led to an acute shortage of water for supply to the urban areas, forcing the municipality to implement severe water restrictions. Even these steps were insufficient, and eventually the municipality was forced to supply borehole water via tankers that filled storage tanks located strategically across the town. The objective of this project was to construct a wastewater reclamation plant to provide potable water aimed at meeting the minimum critical demand and thus conserving the very limited availability of surface water to the municipality due to on-going severe drought.
Achievements & Lessons Learnt	• Beaufort West municipality has achieved a milestone in South Africa by being the first municipality to construct and commission a reclamation plant and use reclaimed wastewater for distribution to all users as potable water. • Implementation has ensured that the municipality can maintain the supply of a minimum critical demand for water even during severe drought conditions. • Another important achievement has been ensuring community buy-in and a change in perception of the "toilet to tap stigma" associated with the use of reclaimed water. This was achieved by engaging the community in public discussion and rolling out an awareness campaign that disseminated knowledge on safety procedures followed in treating wastewater, reinforcing the message that reclaimed water is safe to drink. • Amongst the important lessons learnt is that buy-in from employees of the municipality is just as critical as buy-in from the general public. • Employees at the reclamation plant played an important role in influencing the perceptions of their families and friends by taking home bottles of reclaimed water from the plant during the period of severe water restrictions. This allowed their families and friends to warm up to the idea of drinking reclaimed water. • Blending of reclaimed water with bulk water abstracted from natural water sources helped overcome some of the negative perceptions relating to the use of treated effluent water in the supply system. The fact that no one was exempt from receiving the blended water from the municipality also helped allay fears and concerns experienced by the general public.

"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

17 CITY OF CAPE TOWN METROPOLITAN MUNICIPALITY: TREATED EFFLUENT REUSE

Intervention Type	**Installation of a pre-payment metering device**
Reason For Intervention	**Non-payment for water usage**
Background & Objective	Due to population growth, urbanization, poor water service delivery, a lack of expertise in water management, ageing infrastructure and an entrenched culture of non-payment in especially the previously disadvantaged areas, high water losses were being experienced and revenues from the sale of water were dwindling. The municipality also faced various issues resulting from a lack of metering and inadequate accounting of water volumes supplied to individual customers Records for Kagiso showed that only 10% of customers were paying for water consumption and by 1996, unpaid bills amounted to R1.5 million a month. There was a clear and urgent need to address this situation and thus the Municipality initiated the rollout of a large-scale Prepayment Water Metering Programme.
Achievements & Lessons Learnt	Achievements • To date, Mogale City has installed around 30 000 prepayment water meters mainly to residential customers in low-income areas. Meters have also been installed in middle and high-income areas subject to availability and demand. Throughout the project, the municipality has followed a policy of installing meters on demand from existing customers, whilst also stipulating the installation of prepayment meters to all new households. • Sustained water savings have been realised in the form of reduced consumption and increased payment levels. Payment for water usage rose from 10% to 95% in Kagiso with congruent water savings of around 500 000 kl/month. This represents a monetary saving of about R3 million per month in today's terms. Figure 1 below shows the reduction in water consumption in Kagiso after project implementation. • Acceptance levels in beneficiary communities reached 90%, further reinforcing the success of the project and approach adopted by the municipality. Installation of the water meters has resulted in a positive behavioural and perceptual change towards water use. • The municipality has also achieved savings in various operational costs relating to meter reading, billing and revenue collection. Lessons Learnt: • In order to ensure the sustainability of the system, it was essential to establish systems and processes to address any problems experienced by customers with the installed meter. Field workers and technicians were employed by Mogale City to attend to reported complaints and faults on site, and response included removing the meter in the event of failure. A through-pipe was provided to the property to ensure continued water supply while repairs to the meter were being effected, • Repair of faulty meters was a lengthy process and resulted in customers receiving free water whilst the meter was being repaired. Additional measures could have been implemented to ensure a shorter turn-around time on faulty meters, • Metering of customers is critical to ensuring that water supply services remain sustainable and that costs can be recouped from customers • Prepayment encourages effective water use and thus savings are realised, which benefit both the customer and the municipality, • Prepayment is an effective way of dispensing Free Basic Water volumes to especially indigent consumers, • With the correct approach prepayment tackles the issue of non-payment and transfers ownership of consumption to the consumer, • Prepayment enhances the customer's ability to monitor and manage water consumption on private properties, • Prepayment metering should not be seen as a means to increase revenues, but rather as a means to reduce water wastage and realise savings in operational expenditure, and • The municipality should ensure that customers can purchase prepayment credits at any time (and especially after-hours) from locally based vendors.

"We forget that the water cycle and the life cycle are one."
-Jacques Cousteau

18 CITY OF CAPE TOWN METROPOLITAN MUNICIPALITY: WATER MANAGEMENT DEVICES

Intervention Type	**Controlled water supply to indigent consumers**
Reason For Intervention	**High levels of wastage by indigent consumers**
Background & Objective	The City of Cape Town Metropolitan Municipality (CCT) is home to 3.4 million people and uses 800 000 kl/day of water. The demand for water continues to grow and will exceed the capacity of available water resources by 2017. As part of its water conservation programme, the city has to find solutions to reduce the 19.9% water Non-Revenue Water (NRW). One of the main contributors to these water losses is the indigent households because of their leaking plumbing fixtures and water wastage. The CCT drafted a Credit Control and Debt Collection Policy which prescribed and prompted the initiation of an intervention to address the high debt levels and water wastage. The main objective of the intervention was to assist low income households to only consume the quantity of water that they needed and the additional volume of water that they could afford. The intervention included the installation of water management devices (WMD) in low income households. CCT made the device available to all residents directing special focus on installing devices on indigent properties at the cost to the city.
Achievements & Lessons Learnt	Results It is estimated that more than 55 000 devices have been installed since June 2007. The results have included a behavioural change by most of the residents combined with an improved awareness of water conservation. In some areas there has been a significant drop in the water consumption which enabled the city to waive debts owed by indigent households exceeding R55 million and collect revenue for water consumed going forward. The WMD has brought about a savings of 4.8 kl/month/household (indigent households) where the devices were installed, which represents a R1.2 million/month savings for water losses and water consumption not paid for. Lessons Learnt • The delivery of basic services to the previously disadvantaged is a political and contentious issue. Despite the savings achieved from implementation of the WMD, it has been discovered that some households intentionally reach their daily limit and then report to the municipality that they no longer have access to water forcing the municipality to increase their daily limit to avoid a political confrontation. The CCT is finding that this is becoming a barrier in rolling out the intervention and as a result is counteracting their efforts to reduce and manage water demand. • Educating the community on how the WMD operates, why it is being installed, how it can benefit the consumer and the importance of water conservation and water demand management is an essential step to undertake. Given that delivery of basic services is a political issue, steps taken to educate the community go a long way in diffusing possible future dissensions. • The cost of water wastage through leaks and the subsequent non-payment by indigent households costs the city millions of Rands. Thus, the implementation of other WC/WDM interventions such as pressure management and on-indigent-property leak repair project are important to implement in conjunction with the installation of WMDs. Leak repairs also have the added advantage of preventing on property leaks from wasting the allocated daily quantity of water thus assisting households to meet their basic water needs as is required by legislation, • Finding common ground and working with the various stakeholders who are affected by the intervention in order to mitigate community opposition and ensure successful implementation is an important step to take. • As a result of installing the devices, a municipality, with the support of the consumer, is able to reduce and manage water consumption through the use of WMDs while still ensuring the delivery of the free basic water as is set out by the legislation. • The setting up of a customer care service centre with a 24-hour call out service for emergency cases allows consumers to report any problems they experience. In addition, a dedicated SMS line has been set up to deal solely with water and sanitation problems.

"If we continue at our present rate of water consumption, we could run out of drinking water before 2040."
-WWF South Africa

19 CITY OF TSHWANE METROPOLITAN MUNICIPALITY: ODI INDUSTRIAL METER AUDIT

Intervention Type	**Water Meter Audit**
Reason For Intervention	**High NRW figure in the industrial zone necessitated an audit of meters and connections**
Background & Objective	Due to a recurring NRW figure of 54.4% and an increase of 3.2% in the volume of water supplied to the Garankuwa Industrial area, it was decided that a thorough meter audit be undertaken, aimed at locating and identifying meters and connections that were potentially contributing to the high level of NRW and associated loss of revenue. The volume of NRW for this industrial area was quoted as 43 000 kl/month by Sandspruit Works Association (SWA) which currently provides water and sanitation services on behalf of the City of Tshwane Metropolitan Municipality to communities north of Pretoria. The purpose of this audit was to undertake an on-site assessment of water connections to establish: • The condition and accuracy of installed water meters to especially large industrial consumers in the area, • Establish the existence of unmetered connections including unmetered fire connections, • Compare on-site meter information against captured database information, and • Report back on the existence of illegal connections.
Achievements & Lessons Learnt	By taking remedial action based on the findings of the audit, the WSP was able to reduce the NRW figure to 17% of water purchases, equating to an increase of 30 000 kl/month in billed metered water volumes. In addition to a reduction in NRW, the audit produced an updated accurate water balance for the two industrial zones. • Lessons learnt from the implementation of this intervention included: • Obtaining cooperation from both the technical (metering) and financial (billing) departments of the municipality prior to implementation – sometimes this can be difficult especially if either of these departments are unaware of the planned intervention, • Approaching industrial consumers with care and consideration as these are usually paying customers and they should be treated with due respect when representing the municipality. However, if a consumer has not being paying or has been under-billed, then the visit by the audit staff can be unwelcome, • Working off aerial photos of the zones as these are helpful in determining if a site is empty, occupied or encumbered by existing buildings, • Aligning the audit - especially the reading of consumer and bulk meters - with the monthly meter read cycle of the municipality. This helps tremendously with the water balance and can show immediately if there is an improvement in the level of NRW, and • Ensuring that information gathered from the audit corresponds with the consumer database and where this is not the case, a process should be instituted to rectify the database. This process ensures that industrial consumers are correctly billed.

If there is magic on this planet, it is contained in water.
Loran Eisely, The Immense Journey, 1957

20 MANGAUNG LOCAL MUNICIPALITY: METER AUDIT AND REPLACEMENT PROGRAMME

Intervention Type	**Meters**
Reason For Intervention	**Non-payment of water negatively affecting revenues**
Background & Objective	The Mangaung Local Municipality (MLM) finds itself in a position in which the current average daily water demand exceeds the current sustainable water supply putting pressure on the MLM to implement measures to reduce demand. Due mainly to problems associated with consumer meters which resulted in consumption not being paid for, the municipality was not receiving sufficient revenue to budget for and fund water conservation and water demand management (WC/WDM) interventions. It was hoped that a programme focused on addressing problems related to meters would enhance the collection of revenues. The MLM found that most of the complaints received by the Water Demand Management (WDM) Department were about meters not working and issues concerning the accuracy of accounts. The long term view of the MLM is to have sufficient funds to implement WC/WDM intervention and thus the main objective of this intervention was to enhance revenue collection by rectifying problems associated with meters and subsequently with the billing of consumption and the payment of accounts.
Achievements & Lessons Learnt	The municipality has been making steady progress in rectifying meter faults. Between the period of July 2010 and March 2011, over 18 000 identified meter faults were rectified, with the majority, 17 000 faults, being rectified in Bloemfontein. This has led to improved revenue collection by the city due to increased billing. Lessons learnt Sufficient human resources with the necessary technical skills are needed in order to implement this intervention; The proper drafting of the tender document and construction drawings are critical in terms of managing risk from the onset; and Full time supervision on site by the MLM is critical during project implementation to ensure that contractors adhere to stipulations provided by the city.

CONCLUSION

The case studies and lessons learnt presented above indicate that due to many shortcomings relating to metering, billing and payment for services delivered, water demand management at the municipal level in South Africa must of necessity include interventions beyond the metering point, or on privately owned domestic properties. Indeed the experience of many municipalities is that the largest volume of water being lost or wasted occurs on privately owned properties in especially low-income areas. This can be attributed to the lack of ownership of consumption and plumbing on these properties by same owners.

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.

To find out more about these and other WIN-SA services go to the WIN-SA portal at www.win-sa.org.za or contact the Network directly.

This document hopes to encourage ongoing discussion, debate and lesson sharing. To comment, make additions or give further input, please visit www.win-sa.org.za or send an email to info@win-sa.org.za.

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.

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