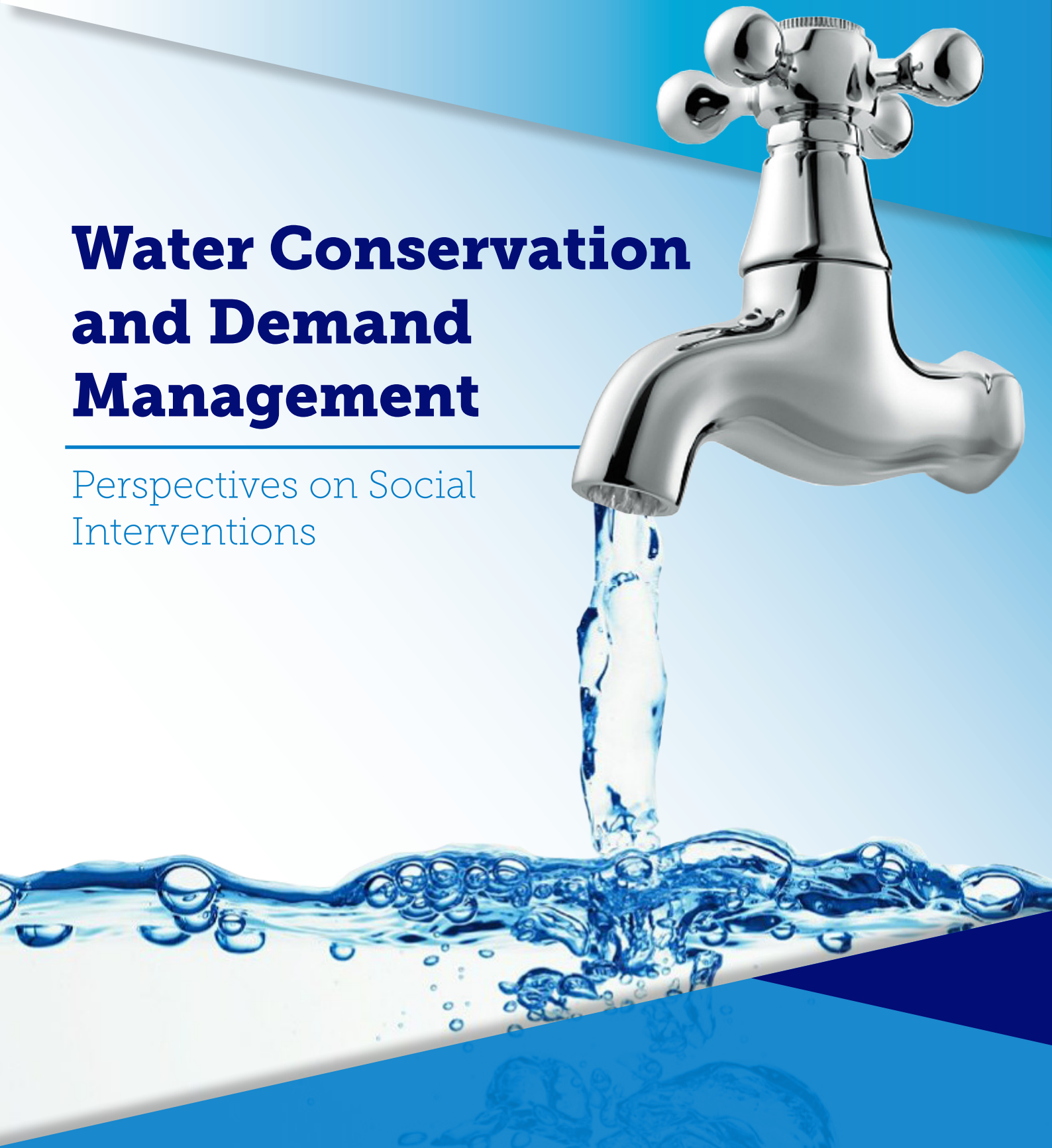
Water Conservation and Demand Management

Perspectives on Social Interventions



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Water Conservation and Demand Management:
Perspectives on Social Interventions

1. Introduction

There are different interventions that can be deployed to mitigate water losses in a municipal water distribution system ranging from technical or infrastructure, financial, institutional and social interventions. In this quarterly research brief, focus will be on the social interventions. This research brief looks at few case studies that municipalities have embarked upon in Water Conservation and Demand Management (WCDM) using social or behavioural measures, and demonstrate positive benefits brought about by these social and behavioural measures.

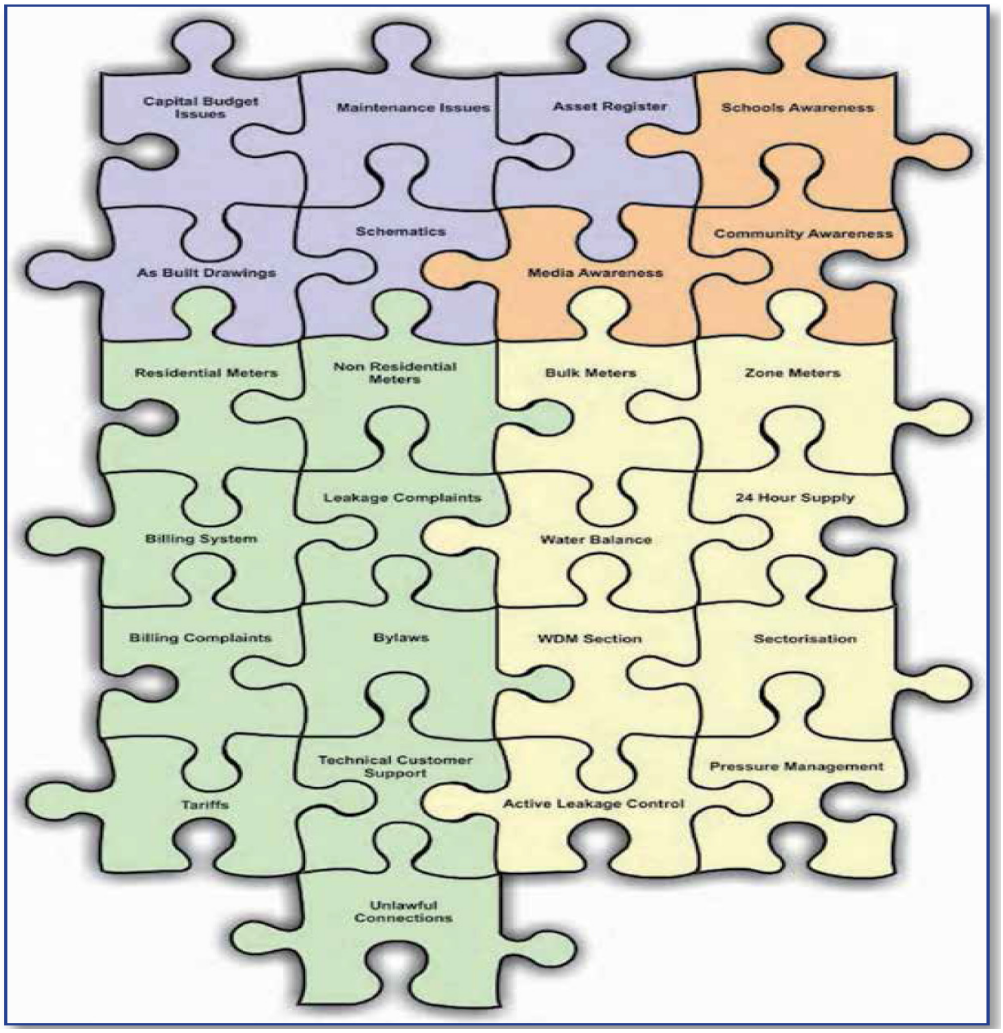

Figure 1: *Some possible WDM Interventions and issues (Schools, Community & media awareness)*

2. Background

It is worth-noting that residential share in the national water usage is projected to reach around 35% by 2025 (Department of Water and Sanitation, 2009), and it is becoming increasingly important for local government to begin focusing on the residential consumers around their water usage. There have been traditional strategies to promote water conservation which included technical and financial measures such as leak detection, night flow logging, tariffs and taxes and water restrictions (and water rationing). However, there is concerted emerging interest in behavioural economics that shows that a much greater, sustained success could be achieved through positive behavioural nudges. Behavioural nudges are interventions that preserve freedom of choice that nonetheless influence people's decisions. These nudges are non-price based behavioural interventions that are inexpensive, scalable and don't feel punitive, and these are normally initiated through public education programmes.

Behavioural changes in WCDM may take time to bring savings in water reticulation system, therefore, municipalities need to develop WCDM projects that hinges on behavioural measures hence programmes and projects need to packaged and implemented to achieve WCDM goals on longer-term. This may include projects that focus on the following in municipalities:

- Information around water saving: Households to be consistently provided with water conservation tips as an insert in their bills. The tips quantified, where possible, the water savings associated with a particular water-saving action.
- Financial information: Financial messages to be provided showing a graphical breakdown of the information on the bill. The messages should be intended to make both tariff rates and level of consumption more salient or noticeable, i.e. more apparent.
- Social comparisons: The social norm message to graphically compare the household's average daily water consumption to that of the average for their neighbourhood.
- Social recognition for conservation efforts: These messages encourages households to reduce their water consumption as part of a municipality led initiative. Some households could further be told that their water-saving achievements will be publicly recognised on the municipality's website.
- Appeals to the public good for voluntary reductions in the context of water scarcity: The message highlighted the public-good context by encouraging households to voluntarily reduce their water consumption in order to reduce the stress on water resources and prevent future water restrictions.

Saving water and water demand management (WDM) in general can be quite confusing to a municipality wishing to embark on some form of water loss reduction activities in that water savings may be a loss of revenue on the other hand. However, a lot of work has taken place in South Africa and internationally to support water loss reduction in order to save money. While immediate savings cannot usually be expected, municipalities are encouraged to plan for a five (or preferably ten) year on behavioural programmes. The savings may be difficult to achieve, and possibly more difficult to sustain, but one thing is certain – if no action is taken to reduce water losses, the losses will continue to increase.

There is no single WDM intervention that will always provide the best savings at the least cost, behavioural and other technical WDM measures can be implemented simultaneously.

The most common mistake is to believe that water loss reduction is achieved only through technical solutions such as leak detection and repair. In such cases, large budgets are often used to search for unreported leaks using the latest hi-tech and expensive equipments. If the water losses are due to inaccurate metering or even background leakage or consumers behaviour, the leak detection activities will yield little or no results. Hence, the emphasis is that municipalities should begin to package interventions that revolves around consumers behaviour because literature demonstrate its effectiveness as it is considered a low hanging fruit without high capital investment outlays.

WDM social measures are perhaps the most important aspect of ensuring successful water loss programmes. Too often, well designed and implemented technical interventions fail because the community they serve are not included in the planning and implementation process, and they do not “buy into” the project. In extreme cases community representatives may go out of their way to ensure that some technically sound project fails. Proper consultation with the community is therefore an essential element of any technical WDM intervention. It is therefore necessary to incorporate the costs associated with the community awareness and education activities as part of either technical intervention when undertaking the cost benefit calculation for the technical intervention or standalone projects.

3. WCDM Case Studies on Behavioural Interventions

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. 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.

CASE STUDY 1: Knysna Local Municipality: Public Water Savings Campaign	
Intervention Type	Public Water Savings Campaign
Reason for Intervention	Limited available stored raw water
Background and 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 emphasise 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

CASE STUDY 1: Knysna Local Municipality: Public Water Savings Campaign	
Results and Lessons Learnt	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.

Case Study 2: 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 and 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.

Case Study 2: Baviaans Local Municipality: Water Awareness Programme	
Results and Lessons Learnt	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. • 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.

Case Study 3: City Of Cape Town Metropolitan Municipality: Promotion Of Grey Water Use	
Intervention Type	Consumer Education
Reason for Intervention	Reducing the Demand for Water
Background and 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 so 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 and 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.

Case Study 3: City Of Cape Town Metropolitan Municipality: Promotion Of Grey Water Use	
Results and Lessons Learnt	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. • 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 upgrade infrastructure such as treatment plants is also reduced.

Case Study 4: 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 and Objectives	As the drought in the 1990s 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.

Case Study 4: City Of Tshwane Metropolitan Municipality: Individual Metering Vs Bulk Metering	
Background and Objectives	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 and 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.

Case Study 4: City Of Tshwane Metropolitan Municipality: Individual Metering Vs Bulk Metering	
Results and Lessons Learnt	• 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.

Case Study 5: Ikwezi Local Municipality: Promotion Of Rainwater Harvesting	
Intervention Type	Consumer Education
Reason for Intervention	Scarce Water Resources
Background and 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).

Case Study 5: Ikwezi Local Municipality: Promotion Of Rainwater Harvesting	
Results and 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 Ikwezi 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,

Case Study 5: Ikwezi Local Municipality: Promotion Of Rainwater Harvesting	
Results and Lessons Learnt	• 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.

4. CONCLUSIONS

The most common mistake is to believe that water loss reduction is achieved only through technical solutions such as leak detection and repair. In such cases, large budgets are often used to search for unreported leaks using the latest hi-tech and expensive equipments. If the water losses are due to inaccurate metering or even background leakage or consumers behaviour, the leak detection activities will yield little or no results. Hence, the emphasis is that municipalities should begin to package interventions that revolves around consumers behaviour because literature demonstrate its effectiveness as it is considered a low hanging fruit without high capital investment outlays.

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References

Agbenyegah, G.K. (2019). Management of Non-Revenue Water (NRW) on Sustainable Basis. The International Journal of Humanities & Social Studies

DWS (2009) The Water Conservation and Water Demand Management Strategy for the Water Services Sector, South Africa. Department of Water Affairs and Forestry, Pretoria.

McKenzie, R.S. and Bhagwan, J.N. (2000) Managing unaccounted for water in potable water distribution systems: recent software developments through the WRC. The Official Journal of the Institution of Municipal Engineers (January) 53–58.

McKenzie, R.S., Siqalaba, Z.N. and Wegelin, W.A (2012) The state of non-revenue water in South Africa. WRC Report No. TT 522/12. Water Research Commission, Pretoria.

WIN-SA (2014). Good Practice in Municipal Water Conservation and Water Demand Management: Financial, Institutional & Behavioural Interventions. https://www.wrc.org.za

WIN-SA (2015). Reducing Water Losses in Municipalities. https://www.wrc.org.za

WIN-SA (2018). Fieldnote: Behavioural nudges, an innovative method to influence people to save water. https://www.wrc.org.za