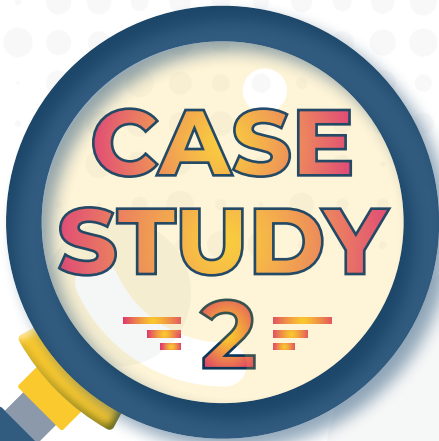




Vuthela

ILEMBE LED PROGRAMME



FIXING WATER REVENUE STREAMS

January 2023

With less water everywhere, there's not a cent to spare

A ground-breaking study into financial losses incurred through the process of providing essential water services has produced recommendations and practical steps for municipalities to improve their revenues and deliver services more efficiently.

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KWAZULU-NATAL PROVINCE
ECONOMIC DEVELOPMENT, TOURISM
AND ENVIRONMENTAL AFFAIRS
REPUBLIC OF SOUTH AFRICA



What's the problem?

For people around the world, water means life. Water is essential for survival, good health and a wide range of agricultural, industrial and economic activities which support social development, social equity, environmental protection and political stability.

In South Africa, an ever-growing population and associated development needs makes the efficient management of water demand and supply essential.

The increasing costs for municipalities to provide water services include human resources and technical resources, fuel and chemicals to abstract, clean and distribute potable water to consumers.

Losing revenue

Many municipalities are already facing financial challenges that inhibit the maintenance and development of infrastructure needed for essential services. Despite this, municipalities continue to provide water services – but they are losing revenue that they should be collecting because of inadequate meter reading practices, billing management systems or revenue collection processes. It is noted that many municipalities also have the challenge of having a poor revenue base as they provide support to indigent communities, especially in largely rural municipalities.

If these revenue losses can be identified accurately, and their causes determined precisely,



practical steps can be implemented to eliminate the losses and restore streams of income that are due to the municipality.

This requires municipalities to curtail 'non-physical' water losses, which refer specifically to municipal water supplies that are "lost" through metering errors, data transfer errors and unpaid accounts. It does not include water lost through leaks or burst pipes, also called 'physical' losses.

The additional revenue accrued from recovering apparent water losses will allow cash-strapped municipalities to restore proper maintenance programmes and provide infrastructure to cater for growing present and future needs, thus enabling economic and social development that will ultimately benefit the municipality and all its constituents.

Economic and social benefits

The potential economic and social benefits of taking such an approach for South Africa are significant.

With the huge costs of providing bulk infrastructure services, municipalities cannot afford

to waste water resources and incur unnecessary financial losses by losing the resources through physical means or by not collecting revenue due for water reaching the end consumer.

South Africa remains a developing and highly unequal society. The provision of safe and reliable water services is still being extended to many communities. Furthermore, reliability due to a lack of maintenance, which also requires revenue, is being affected. This create a vicious cycle where revenue is not collected and infrastructure is not maintained, leading to a

downward spiral in service delivery. The central significance of water in the lives of all South Africans means that the problem extends beyond dams, reservoirs, pipes and pumps – it plays a major role in inhibiting social advancement.

Conversely, resolving this problem not only provides a service that is essential for people to survive and thrive, but also enables economic development and social advancement on a national scale, thus fulfilling the nation’s aspirations for economic growth and jobs, an end to poverty and equality for all South Africans.

How did the study come about?

The study was conducted by the Vuthela iLembe Local Economic Development (LED) Support Programme, which is a five-year programme funded by the Swiss State Secretariat For Economic Affairs (SECO) and partnered by the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs, and the iLembe District Municipality, and the KwaDukuza and Mandeni local municipalities.

It aims to improve the economic future of iLembe district residents through sustainable economic growth of the local economy and the creation of higher, better and more inclusive employment and income-generating opportunities.

The programme consists of five components:

- Public Finance Management (PFM)
- Municipal Infrastructure (MI)
- Private Sector Development (PSD)
- Building Inclusive Growth (BIG)
- Partnership and Coordination (P&C)

The Municipal Infrastructure Component focuses on improving and developing municipal infrastructure and services and has three objectives:

- Reduced infrastructure constraints (improved scope and quality of basic infrastructure services).
- Increased planning capacity and financing strategies for an integrated and systematic expansion of urban infrastructure as a basis for sustainable development of regional centres.
- Enhanced planning and management of key infrastructure sectors.

The Vuthela Programme entered its implementation phase in November 2018. This phase focuses on the implementation-readiness and execution of a portfolio of support projects and continues until 2023. Projects under the Municipal Infrastructure Component involve the iLembe District Municipality, being the Water Services Authority and a Water Services Provider, and the KwaDukuza and Mandeni Local Municipalities which, along with civil

infrastructure services, also provide electricity services to certain areas of their respective jurisdictions.

Pilot project

The pilot project to improve revenue water was rolled out in June 2019, with the appointment of WRP Consulting Engineers to conduct the study. The project investigated operational practices around the collection of revenue for water services and highlighted shortcomings that needed improvement by using the Sundumbili urban area as case study. It was intended to demonstrate how municipalities can improve revenue generation by curtailing water losses.

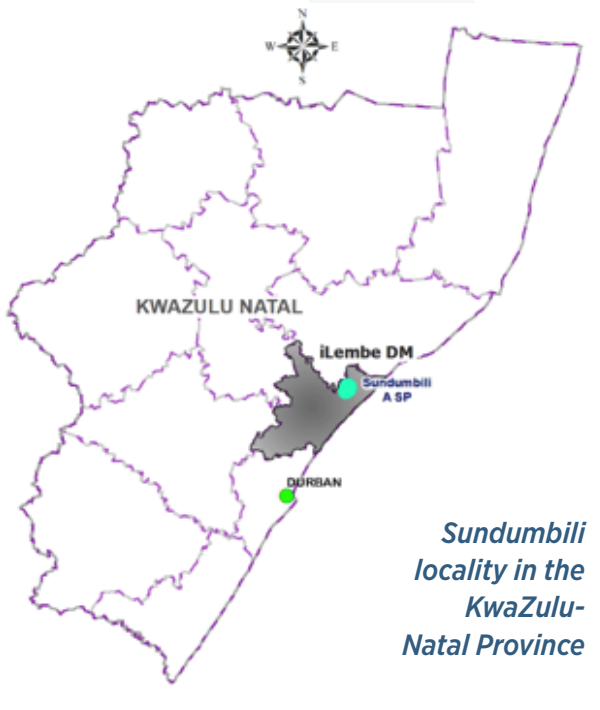
The study focused on the meter reading cycle and data transfer errors during the process of meter reading, meter data management, transfer of the data to the billing system and the billing process.

The study also evaluated the actual billing and sales volumes against the volume of metered water which had been supplied, leading to the analysis of Non-Revenue Water.

Non-Revenue Water losses are both financially and environmentally unsustainable. Payment for water services promotes responsibility and water use efficiency as people who pay for water tend to use it more sparingly.

Where did the study take place?

The study was conducted in Sundumbili, an urban area of the Mandeni Local Municipality.



The Sundumbili area has 10 858 households, representing 32 629 people, according to the study. This is about 5.7% of the total number of households (191 370) in the iLembe District Municipality.

Water metering and billing were assessed within the area of Sundumbili that had exhibited high water losses. This area was typical of many areas where meter reading inaccuracy, data transfer errors and unauthorised connections had led to a loss in revenue for the iLembe District Municipality, being the Water Services Provider for this area.

The challenges of water delivery and revenue collection in the area are typical of the challenges faced throughout most of the iLembe District Municipality, with apparent losses in a formal area where most households are metered, and metering includes both conventional and prepaid metering. Revenue collection rate in 2018 for the

iLembe District Municipality was only 66% (IDM Integrated Development Plan, 2019/2020).

The iLembe District Municipality tries to follow good water management practices and prepares monthly analysis of bulk and consumer metering and billing financial and technical reports. An example is the iLembe District Municipality's water balance in the International Water Association's (IWA) water balance format, which illustrates the apparent losses as approximately 15.3 megalitres per day (MI/d) as per the Sundumbili Study Inception Report, 2019.

The study team conducted a site visit to familiarise themselves with the situation on the ground and obtain informal inputs directly from residents, municipal workers and officials. The site visit assisted the study team to put the desktop data analysis and its interpretation into context.

Initial insights

The study Inception Report listed the following initial insights:

- ☞ Sundumbili is a formal area with good potential for metering, reading, billing and cost recovery.
- ☞ Most properties are metered, although meter maintenance, reading, billing and cost recovery are deficient, resulting in excessive water use and loss of income.
- ☞ There is little prevalence of garden watering.
- ☞ The municipality has taken the decision to discontinue the installation of prepaid meters and revert to conventional meters.
- ☞ There are approximately 20 000 to 25 000 prepaid meters in the iLembe District Municipality which are not read and only 50% are operational. Prepaid meters were last read in June 2016.

☞ Sundumbili has 20% to 30% conventional meters with the rest being prepaid meters.

☞ At least 50% to 60% of connections are considered illegal and often result in leakages.

☞ 10 kilolitres (kl)/month is supplied to registered indigent users free of charge. There are only 2 000 registered indigents in the district, but there are many more registered with the local municipalities.

☞ Domestic users are charged a rising block tariff. The rising block tariff is based on 10, 20 and 30 kl/month consumption blocks.

☞ Meter readers were managed by the technical department from 2003 to 2005. The function was then transferred to the finance department.

☞ Metering and billing are political issues and are influenced as such. Consumers who do not pay are disconnected which is difficult to enforce, as 60% of the population is rural.

☞ Sanitation is now charged based on the valuation of the property whereas previously it was based on the volume of water used.

☞ The Geographic Information System (GIS) data and MunSoft (iLembe District Municipality's financial management system) are connected and up-to-date, but the accuracy will need to be confirmed.

☞ There is scope to promote political ownership, community engagement and education to address issues like garden watering and car washes.

☞ There are specific pay points to buy tokens for the recharge of prepaid meters.

☞ The water supply is reliable and meter problems are resolved on the same day.

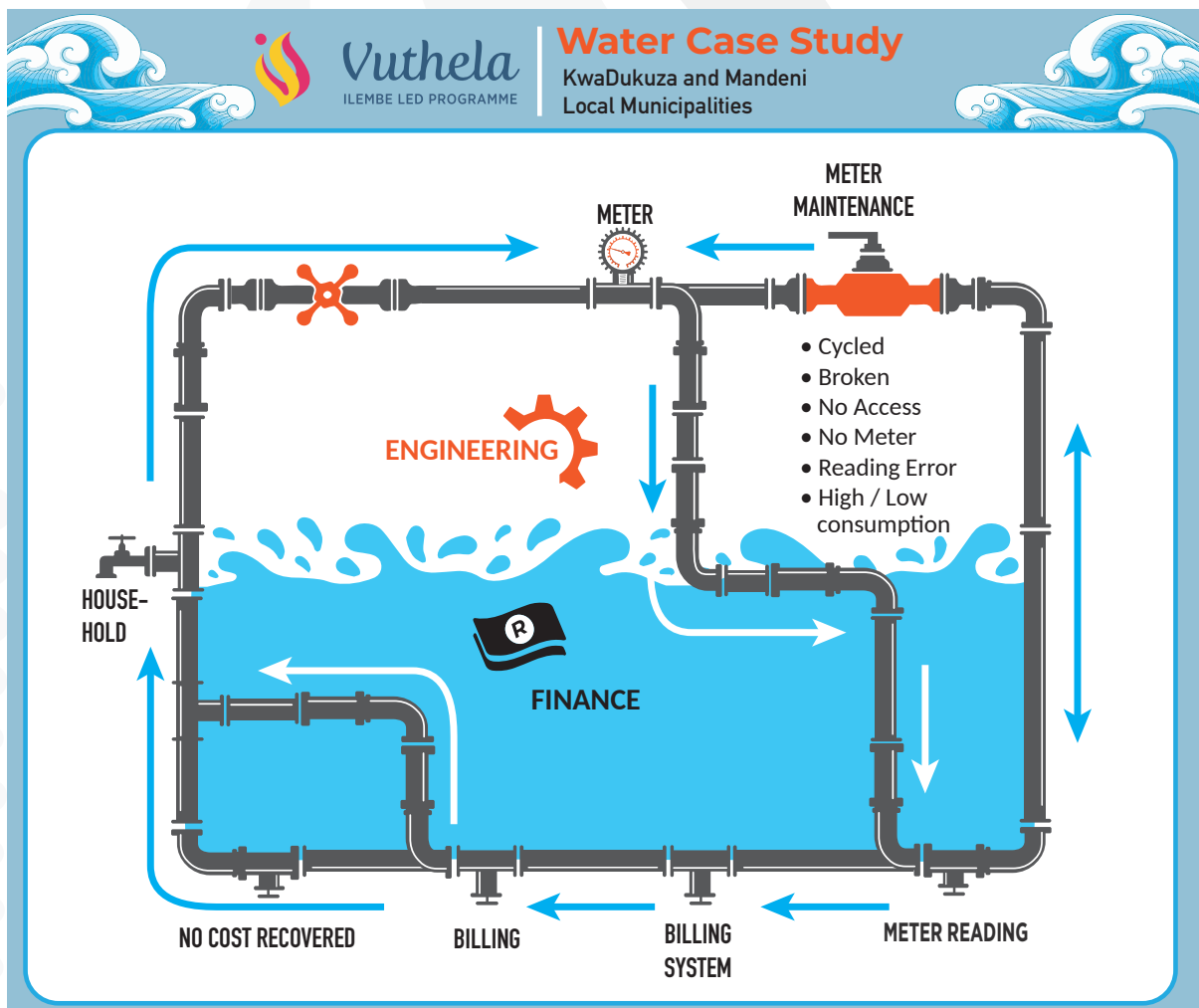
- 🔥 Pressures in the system are between four and six bar and burst pipes occur in some areas.
- 🔥 Reservoirs are manually checked on a daily basis. The telemetry stations at reservoirs are not functional.

🔥 There is no active leakage control programme. All visible leaks are reported to councillors or the call centre at the iLembe District Municipality.

How was the study conducted?

The study was largely desktop-based, but included a site visit to the Sundumbili area and several project progress meetings at the Vuthela offices with iLembe District Municipality officials.





The study focused on the meter reading cycle and on the finance component, while considering the engineering component as part of the cycle, as indicated in the diagram below:





Data analysis

The following data was obtained and used for analysis of meter data, billing and sales data:

-  Spatial data for use in a Geographic Information System (GIS): cadastre or erven parcels, study area boundary, consumer water meter locations and the latest aerial imagery.
-  Billing data extracted for conventional and prepaid meters, for a period of one year.
-  Standard Operating Procedures (SOPs) for metering and billing.
-  Census demographic data.

Analysis of the data included creating a spatial footprint of the conventional and prepaid meters; linking the physical meters to the meter data recorded in the main billing system used for conventional meters, and the prepaid billing system which is a separate system; analysis of the presence or absence of linked records;

analysis of water volumes read from meters and recorded in the billing system and billed to consumers; water sales versus water billed; and meter data management.

Interpretive reports and presentations were developed to illustrate the workings and shortcomings in meter management, meter reading and billing processes.

An analysis was conducted to evaluate the installation coverage of meters on the ground, versus cadastre parcels, versus accounts in the billing systems. The billing systems did not correlate actively to cadastre or erven data.

SOPs for metering and billing were reviewed to establish whether further recommendations can be made to improve these procedures and efficiencies between municipal departments involved in these operations.

Meters: What the law requires

The South African Regulations relating to Compulsory National Standards and Measures to Conserve Water (GNR.509 of 8 June 2001) under the Water Services Act, 1997 (Act No. 108 of 1997), states:

13. (1) A water services institution must –

- (a) within two years after promulgation of these Regulations, fit a suitable water volume measuring device or volume controlling device

to all user connections provided with water supply services that are existing at the time of commencement of these Regulations; and

- (b) fit a suitable water volume measuring device or volume controlling device to every user connection made after the commencement of these Regulations.



Study area meters: What happens on site

- 🔥 Good quality meters are installed in above ground meter boxes.
- 🔥 Visible pipe, connection and meter leaks.
- 🔥 Leaking meters are fixed by meter readers.
- 🔥 Meter readers are trained to do basic plumbing.
- 🔥 Insufficient or wrong tools and materials are being used to perform effective meter maintenance.

- 🔥 Limited communication between the technical and finance departments.
- 🔥 Meter readers perform meter repairs while reading the meters.

Prepaid metering is often considered by utilities to control the demand. However, the technical and economic challenges are usually greater than the economic and water use benefits.

What did the study find?

KEY FACT: “Revenue for about 61% of the water being supplied by the municipality was not being collected, compared to a world average of 36.6%.”

The study found that Sundumbili is a formal area with good potential for metering, reading, billing and cost recovery.

Most properties are metered although meter maintenance, reading, billing and cost recovery are deficient, resulting in excessive water use and loss of income.

Between 20% and 30% of the meters are conventional meters and the remainder are prepaid meters.

The number of stands, connections and accounts for Sundumbili are summarised as follows:

- Households: 11 325
- Registered stands: 3 405
- Formal and informal connections found: 3 694
- Metered connections: 3 257
- Unmetered connections: 437
- Connected to municipal accounting system (MunSoft): 2 014
- Connected to an account in the prepaid billing system: 3 531
- Not connected to an account in MunSoft: 1 680
- Not connected to an account in the prepaid billing system: 0
- Billed, active accounts from MunSoft: 4 101
- Active accounts from the prepaid billing system: 3 531

It is apparent that discrepancies in these records would need to be resolved to enhance revenue. At least 50% of the connections are considered illegal and often result in leakages. There is no active leakage control programme.

Metering and billing are intensely political issues - consumers who do not pay are disconnected, which is difficult to enforce as 60% of the population is rural.

Results from the data analytics showed that in terms of water balance, the System Input Volume (SIV) of 56.58MI/d equated to a per capita SIV of 103 litres per capita per day. However, at an estimated real loss of 23.3MI/d, this means that only about 61 litres per capita is reaching consumers every day.

Consumers are entitled to a minimum of 25lcd. The iLembe District Municipality’s latest Indigent Policy (draft, 2022/2023) allows for the following: “Each approved household and churches are entitled to receive 10kl of water free per month, and then approved tariffs will apply on the excess of 10kl.”

For planning purposes, the Recommended Unit Average Annual Daily Demands provides for 75 to 150lcd for low-income residential areas served with waterborne sanitation, according to The Neighbourhood Planning and Design Guide by the Department of Human Settlements, 2019.

A key observation was that a large number of the registered stands plotted on the Google Earth geodatabase are not included in the iLembe District Municipality geodatabase. There are currently 3 405 registered stands in the

geodatabase. This area is referred to as Manda Farm.

Manda Farm is a formal urban development, but not yet formalised in terms of cadastre parcel registrations. The housing standards in this area indicate that users should be able to afford payment for water services, but they are not being billed due to the informal, unmetered connections.

The meter asset data was used to plot the meter locations on the GIS and to cross-check the meter records to the meter records in the conventional billing system (MunSoft) and prepaid billing system.

A meter audit conducted in 2015 found that there










were 3 694 formal and informal connections, of which 3 257 were metered and 437 were unmetered.

The metered connections are split between 2 124 intelligent prepaid meters and 1 133 conventional meters. The prepaid meters are not read as it is not required for billing purposes from the MunSoft system.

This means that it is more difficult to process the data and determine consumption for the water balance, as consumers purchase tokens for water during any time of the month.

There are many prepaid accounts with low or zero water purchases for more than a month.

Meters: findings in detail

-  Most properties were metered, but meter maintenance, reading, billing and cost recovery were deficient, resulting in excessive water use and loss of income.
-  About 25 000 prepaid meters were not read and only 50% were operational.
-  Prepaid meters were last read in June 2016. The municipality decided to discontinue the installation of prepaid meters and revert to conventional meters.
-  About 60% of the water connections were considered illegal and often resulted in leakages.
-  The billed consumption was found to be 44% higher than the actual metered consumption, suggesting that the metered consumption estimated for billing purposes was inflated and customers were not billed based on their actual consumption.
-  Analysis of the prepaid water purchases between January and March 2019 indicated the average user spent R236 on water per month, which is about 13 kl/ month.
-  Some users had spent more than R1 000 per month on prepaid water purchases, which could indicate business or commercial use of water.
-  Over 3 000 stands in Manda Farm were being supplied with unmetered water but were not included in the iLembe District Municipality database.
-  Water meters in the municipality were read manually and the recorded data was transferred to the electronic billing system. The transfer process was found to be accurate, with few errors.

Meters: recommended fixes

It was found that consumers with conventional meters were billed monthly.

Consumers on prepaid meters buy tokens for water supply as and when needed.

Many of the meters were not read monthly and consumers on conventional meters were billed based on estimates.

The following recommendations were made to improve the meter reading cycle and ensure consumers are billed based on actual metered volumes:

- Review meter route book numbers to improve groupings per route and eliminate books with 100 meters or less.
- The use of the same code for all instances when a meter cannot be accessed, by all meter readers does not provide sufficient information to operations and management to address meter access issues. Meter readers should use the correct No Access code to provide better information to management and operations to resolve such issues.
- Meter reading exception codes should be clearly understood by the meter readers, billing system operators and technical staff. Meter reading training and refresher training should be provided on an annual or suitable interval.
- Full implementation of the smart metering system to ensure up-to-date electronic data on meter assets and meter readings.

- Read all meters every one to four months depending on budget and staff availability. Customers should be allowed to submit their own readings to limit interim estimates and promote awareness of water consumption.
- The Finance Department should perform a data integrity check to validate the correctness and suitability of data entered such as meter reading dates. The meter readings should inform actual billed consumption volumes.
- Identify and monitor the top 100 consumers to ensure they are billed correctly and costs are recovered.
- Phase out the prepaid meter system and ensure all consumers have operational conventional meters and accounts on MunSoft.
- Manage the meter population, develop and implement a routine meter inspection and replacement programme.
- Routinely analyse consumption to identify consumers with low or zero readings; high water consumption; or where meters may have cycled, to ensure the correct water volumes are recorded and billed.
- Implement an advanced programme to locate potential unauthorised consumption which can include a zero-pressure test on the property by closing all the known connections and then checking each water point on the property to ensure it is dry.

Potential recovered revenue: R7 million per month

A massive R7 000 000 in additional income could be generated every month if all prepaid meters are replaced by conventional meters and read on a regular basis, according to this study.

A meter audit conducted in 2015 found that there was a total of 3 694 formal and informal connections of which 3 257 were metered and 437 were unmetered.

Conventional meters are read manually and the manually recorded data in turn transferred to the electronic billing system. However, analysis of the meter reading dates reveals that the majority of the meters had not been read in the past six months.

The iLembe District Municipality had estimated consumption for billing purposes, but this did not ensure accurate billing when household demographics changed due to altered service levels or occupant numbers.

Only 46% of the meters in Sundumbili were last read in 2019 with the bulk of the Mandeni prepaid meters last read in 2016. In Mandeni, 307 meters were last read between 2015 and 2018, resulting in a potential loss of income to the municipality.

When a meter reader cannot obtain access to a meter, they entered a No Access Code (meter covered; meter removed; dogs; gate locked, etc.) However, analysis of the data indicated that meter readers may use the same code throughout a month.

Analysing the consumption per account, almost half of the 3 257 meters in Sundumbili and three quarters of the 12 685 conventional meters in iLembe District Municipality registered less than one cubic meter (one kilolitre, kl) since the last reading, which is unexpected.

The average consumption for an urban household typically ranges between 10-30 kl/month. It is unlikely that so many households registered less than one kl/month, thus indicating another potential loss of income to the iLembe District Municipality,

The average monthly consumption per household in Sundumbili is 20kl. There are however 437 unmetered accounts, which may translate to apparent losses of R148 580 per month. Furthermore, there are a number of prepaid meters with no or small amounts purchased for recharge.

2022 update

The iLembe District Municipality is in the process of rolling out a smart metering programme. It includes meter reading handheld devices that can also capture the GPS coordinates of meters. Such information can be used to update the asset data in MunSoft for conventional and prepaid (converted conventional) meters.



What can be fixed?

A 12-step plan for more revenue

The study in Sundumbili has produced several recommendations for the iLembe District Municipality to improve operations and procedures for billing and metering.

This list of practical steps to improve revenue collection can be applied by all municipalities providing water services:

1. All consumers with individual water connections should be metered. Accounts should be opened for all consumers who have conventional or prepaid meters. Consider alternative billing options for unmetered consumers, such as a flat rate instead of block tariffs.
2. A data link between the accounts and registered erven parcels should be established to assist in property and account identification, linkage to suburbs and zonal consumption analysis.
3. Meter readers should use the correct No Access code to provide better information to management and operations to resolve such issues.
4. All meters must be read every one to four months depending on budget and staff availability. Customers should be allowed to submit their own readings to limit interim estimates and promote awareness of water consumption.
5. The finance department should perform a data integrity check to validate the correctness of data entered such as meter reading dates. The meter readings should inform actual billed consumption volumes.
6. There should be a routine analysis of water consumption to identify consumers with low or high consumption patterns, or meters that may have malfunctioned, to ensure the correct water volumes were recorded and billed.
7. Unauthorised connections and theft of water - where consumers deliberately tamper with their metered connection to reduce or eliminate flow or connect illegally to existing municipal water services - should be located with an advanced programme to detect unauthorised consumption.
8. Monthly meetings should be scheduled between the technical and finance departments to discuss meters for new consumers, replacement of existing meters due to faults, meters installed for consumers illegally connected to the water supply system, disconnections and reconnections, and meter reading consumption anomalies.
9. Fix all visible leaks within 48 hours of becoming aware of it as stipulated in the Regulations R509. Continue to fix all reported leaks within 48 hours.
10. Allocate days for meter reading and meter repairs by the meter readers. Meter readers should be provided with

the correct materials and tools to undertake meter maintenance and be trained in performing basic plumbing.

- 11. Install and maintain an Automatic Meter Reading (AMR) telemetry system at reservoir sites to limit lengthy daily trips to monitor the status of the

bulk distribution system and ensure accurate reporting for drafting the monthly water balance.

- 12. Implement a smart metering system to ensure up-to-date electronic data was available for billing.

Wanted: Top Billing

The study recommended several standard operating procedures that should be implemented to ensure that the most effective billing systems and procedures are in place:

- Provide every prospective customer with a standard application form that is pre-numbered, pre-printed (or in digital format) and allows for the least manual information input.
- Ensure new applications are linked to a geolocation or registered property.
- Review applications register monthly by selecting a sample of each type of new account and follow through to the supporting documentation.
- Ensure land-use, account type and tariff code correspond.
- Ensure monthly co-ordination meetings are held between the technical and finance departments to ensure new information is processed.
- Maintain a register of all indigent debtors and bill users who are not indigent.
- Prepare letters to customers informing them that their application for indigent classification should be reassessed.
- Inspect the billing run and ensure that indigent debtors are receiving the relief that they qualify for. Read meters



bimonthly or quarterly to ensure consumption is within limits.

- Request a list of new meters from stores and capture on the system. Include information in monthly report.
- Record all faulty meters identified by meter readers such as broken meters, leaking meters and inaccessible meters.
- Review meter reading routes on GIS to ensure they are practical and efficient.
- Develop a meter reading schedule to ensure that each meter is read at least every two months. Prepaid meters and conventional meters should be read at least quarterly.
- Print the meter reading schedules or download routes to be read to the handheld meter reading unit and give to meter reader. This should be possible once the municipality has moved to the new hand-held devices.
- Capture the meter readings onto the billing system. For any reading that differs more than 100% of the previous reading, recapture the reading to ensure correctness.

Conclusion: What this means for the future

The study found there is significant scope to promote political ownership, community engagement and education to address issues around water use, water saving, metering and billing.

The significant benefits for service delivery, infrastructure provision and social and economic development make this central to municipal development agendas.

The Non-Revenue Water Pilot Project at Sundumbili illustrated the existing good operational practices and highlighted several areas and opportunities for improvement.

The extent of the benefit that can be derived from these improvements is clearly indicated in this finding: about R 7 million per month in additional income could be generated if the prepaid meters in the area are read and billed on a regular basis. This could be re-invested to maintain existing infrastructure services to enhance sustainability and improve the level of service to communities.

The average monthly consumption per household in Sundumbili is 20kl. There are however 437 unmetered accounts, which may translate to apparent losses of R148 580 per month. Furthermore, there are a number of prepaid meters with no or small amounts purchased for recharge which need to be investigated.

The study concluded that improved metering, meter reading, record management and analysis

would lead to more accurate consumer billing and water balances.

Managing the meter population requires a dedicated programme and team that works closely between the finance and technical services departments.

The study also recommended that all prepaid meter devices that were installed onto conventional meters should be removed and the conventional metering resumed. This initiative should be accompanied by a communication strategy to inform consumers of the change and the benefits of being put on the municipal billing system that allows them to receive accurate monthly water bills.

An improvement of information management was also recommended. It was suggested that the asset register and prepaid meter information be consolidated to create a single database for meter reading, billing and revenue management.

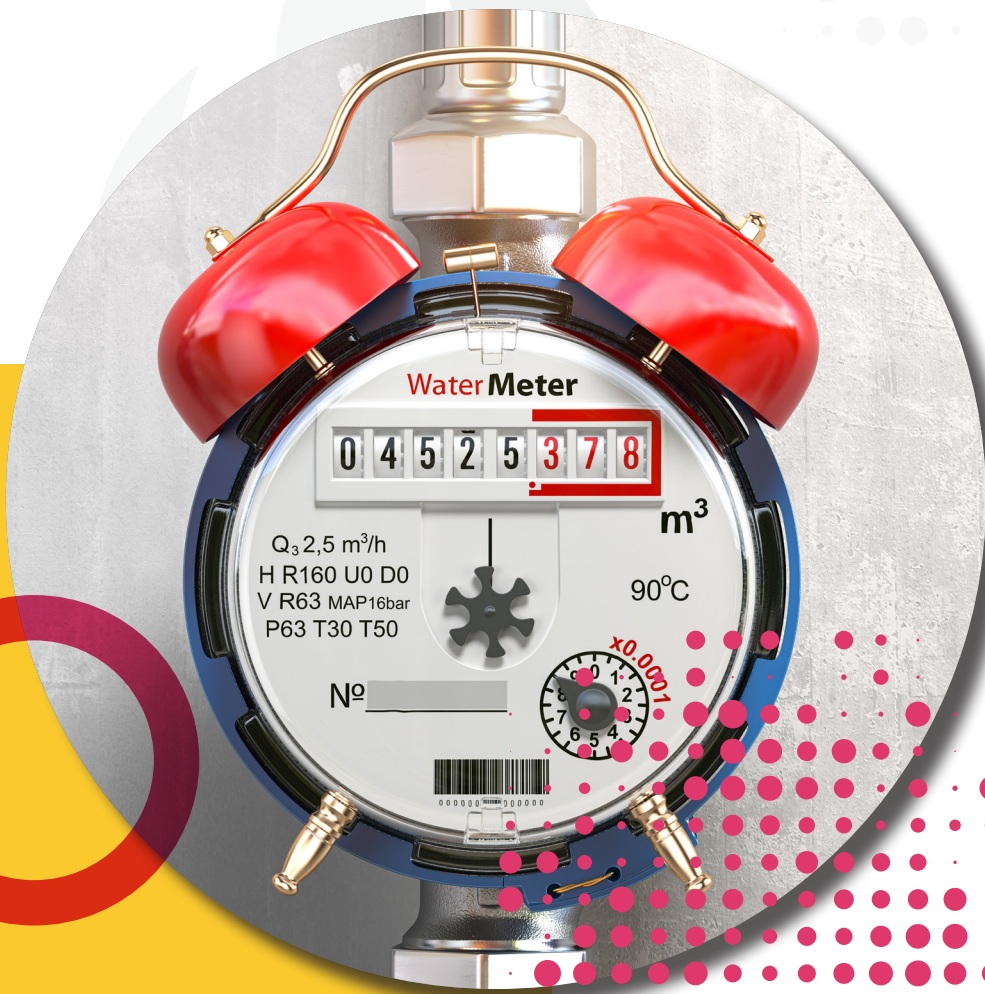
Accurate records will also ensure more accurate reporting and better planning for meeting current and future water demands, considering the environmental impact on scarce water resources and balance development needs. In the long term, it will improve the consumer's trust in the water services provider and ensure the sustainability of water services.

Taking recommendations forward

This case study, its data and analysis, and recommendations have been presented to the senior management of the iLembe District Municipality, which is in the process of establishing how the recommendations can be taken up into operations and implemented. The data sourced and analytical data generated can be used by the iLembe District Municipality's finance, technical services and GIS departments to verify and cleanse the existing data structures for meters and consumer accounts.

The study, under the Vuthela Municipal Infrastructure Component, complements the projects implemented under the Vuthela Public Finance Management Component such as revenue enhancement, indigent management and data management.

Both the case study and its methodology can be applied to any municipality that aims to effect water saving and generate revenue more efficiently, thus addressing two of the most urgent obstacles to efficient service delivery and local economic development.



It's time to effect water saving and generate revenue more efficiently.