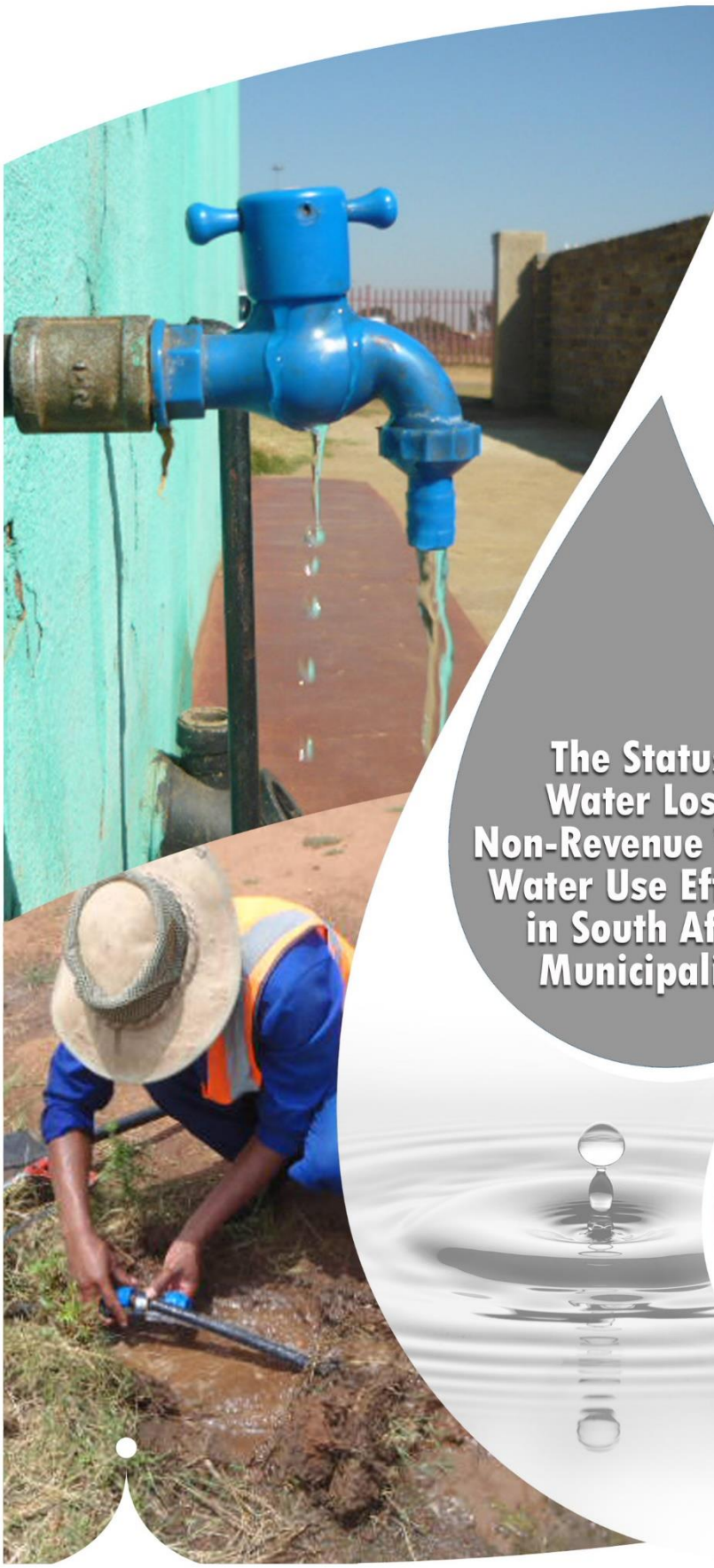


The Status of Water Losses, Non-Revenue Water & Water Use Efficiency in South African Municipalities

(2012/13 to 2022/23)

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

" Water is Life, Sanitation is Dignity "

2030 NDP

This document was prepared and published by

The Department of Water and Sanitation

Private Bag X313

Pretoria

0001

Ndinaye Building

178 Francis Baard Street

Pretoria

South Africa

For more information or comments on this document contact:

Director: Water Use Efficiency

Department of Water and Sanitation (DWS)

Tel: +27 12 336 7886

Fax: +27 12 308 8748 (fax to e-mail)

www.dws.gov.za

DOCUMENT CONTROL SHEET

Project name:	WP11432: Professional service provider under the Water Services Term Contract No.WP11359 to provide specialist and technical support for the No Drop Programme for a period of six months.
Report title:	Status of Water Loss, Water Use Efficiency and Non-Revenue Water in South African Municipalities (2012/13 to 2022/23)
Report date:	November 2023
Revision status:	Final

ACKNOWLEDGMENTS

This study would not have been possible without the valuable contributions of the following institutions and stakeholders:

- Department of Water and Sanitation – National Office
- Department of Water and Sanitation – Provincial Offices
- Water Boards
- Metropolitan, District and Local Municipalities
- Professional Service Providers

Their support, strategic insights, encouragement, participation, and advice are appreciated.

EXECUTIVE SUMMARY

The National Development Plan (NDP) sets out the vision for South Africa by mentioning the balance between the economy, socio-economic development, and environmental sustainability.

The *National Water and Sanitation Master Plan (DWS, 2018)*, in tandem with the macro national vision, issued an ambitious and timely call to action for the water sector, including (i) the provision of equitable access to reliable water supply, (ii) protection, management and development of the nations' water resources in a manner that supports justifiable and ecologically sustainable economic and social development, and (iii) transformative access to water to redress the racial imbalances created by apartheid. The journey towards achieving these objectives begins with understanding the extent and nature of the Non-Revenue Water (NRW) challenges faced by those tasked with its management.

Objectives

The key objectives of this study were as follows:

- Assess the status of water losses in South Africa, to strengthen the efforts of the Water Services Authority (WSA) in managing NRW, and to amplify the need for an effective regulatory and enforcement environment.
- Report on System Input Volume (SIV), NRW, water loss and efficiency trends using 2012/13 to 2022/23 annual municipal data (i.e., 10 financial years).
- Calculate a 2022/23 water balance for each municipality, in the absence of better information.
- Assess municipal water loss and water use efficiency against regulatory compliance requirements and best management practices.

The primary intent of this report is to provide a status update of the levels of NRW, water losses and water use efficiencies in South Africa. While it builds on the regulatory compliance programme which commenced in 2015, this report focusses solely on Sub-criterion 1.2: Water Balance of the No Drop programme.

The status update on NRW in South African municipalities should serve as a catalyst for the next round of the No Drop assessment, with expanded Key Performance Indicators (KPIs) for all municipalities. It is also envisaged that this report will create a higher level of awareness and fast track prioritisation and execution of Water Conservation and Water Demand Management (WC/WDM) initiatives to address prevalent issues in a coherent manner.

Policy and Legislation

The original mandate for efficient and effective distribution of water resources comes from the **Constitution of the Republic of South Africa Act (No. 108 of 1996),** which states that every citizen has, amongst other things, a right to sufficient food and water. Thus, water is placed at the forefront of human development, emphasising the importance of water management and its beneficial use. The **National Water Act (No. 36 of 1998)** recognises that water is a scarce and precious resource that belongs to all the people of South Africa, and that the goal of water resource management is to achieve the sustainable use of water for the benefit of all South Africans. The **Water Services Act (No. 108 of 1997)** provides a framework for the provision of water supply and sanitation services to end users such as households, businesses, and industries, within municipalities. It sets the standards for the local and provincial spheres of government and establishes the norms and standards for tariffs. **The Regulations relating to Compulsory National Standards and Measures to Conserve Water (GNR.509 of 8 June 2001)** under the Water Services Act (No. 108 of 1997) provides for the protection of consumers and WSAs, and for ensuring the application of sound management principles. The ***National Water Resources Strategy III*** (NWRS3, 2023) outlines the importance of WC/WDM and NRW management, and that these will be priority programmes for reaching the 15 % demand reduction target. The ***National Water and Sanitation Master Plan*** (2018) recognises that building a water secure future

will require proactive infrastructure management, effective water infrastructure operations and maintenance, and an overall reduction in future water demand, while considering infrastructure development and augmentation, if necessary. The ***DWS Strategic Plan for the 2020/21 to 2024/25*** **(Vote 41)** sets out a performance target approach to WC/WDM, highlighting its importance as one of the priority implementation areas for the DWS. The Strategic Plan also clarifies that set targets could be met using existing grant mechanisms, considering the impact of WC/WDM on bulk infrastructure requirements.

History of Benchmarking Studies

South Africa has a 20-year benchmarking history, starting with the adaptation of the International Water Association's methodology for calculating and understanding NRW and water losses in 2002, in *Development of a pragmatic approach to benchmark water losses in potable water distribution systems in South Africa*. The first comprehensive national benchmark study was published in 2012 in *The State of Non-Revenue Water in South Africa* (2012). Since 2012, several detailed assessments and updates were undertaken, including the No Drop assessment in 2015. The last national water loss benchmarking study was based on 2021/22 data, published in the *No Drop Watch Report 2023*.

Stakeholder Engagement and Collection of Water Balance Data

The water balance data for this study was collected as part of the 2023 No Drop audits. Information and training sessions were well attended and expected deliverables and due dates were communicated. All communications and follow-up with municipalities were through the Departmental Provincial Offices and standard International Water association (IWA) water balance templates were circulated. The process for completion of the templates was workshopped and discussed during several training sessions in the past 10 years, to entrench standardisation of information gathering and reporting.

Data Submission Statistics

There has been a noticeable improvement in the quality of data for Provinces that have active data collection and collation programmes combined with regular engagements. Municipalities in these Provinces are requested to report on a regular basis at structured forums and reconciliation strategy progress meetings.

To differentiate the useability of data, data were categorised into one of three groups:

- **High confidence level**: Data sets are submitted on a regular basis, show trends, and are credible.
- **Medium confidence level**: One or more data sets were submitted in the past three years and seem credible, with few gaps and/or inaccuracies.
- **Low confidence level**: None or one data set was submitted in the past three years, and the data sets submitted are questionable, with considerable gaps and/or inaccuracies.

A total of 88 datasets (61%) were received from WSAs, which is the highest to date. Less than 50% of WSAs were able to submit water balance data in previous surveys. The confidence levels exclude those for the WSAs that did not submit data, that is, when water balances were calculated, extrapolated, or estimated.

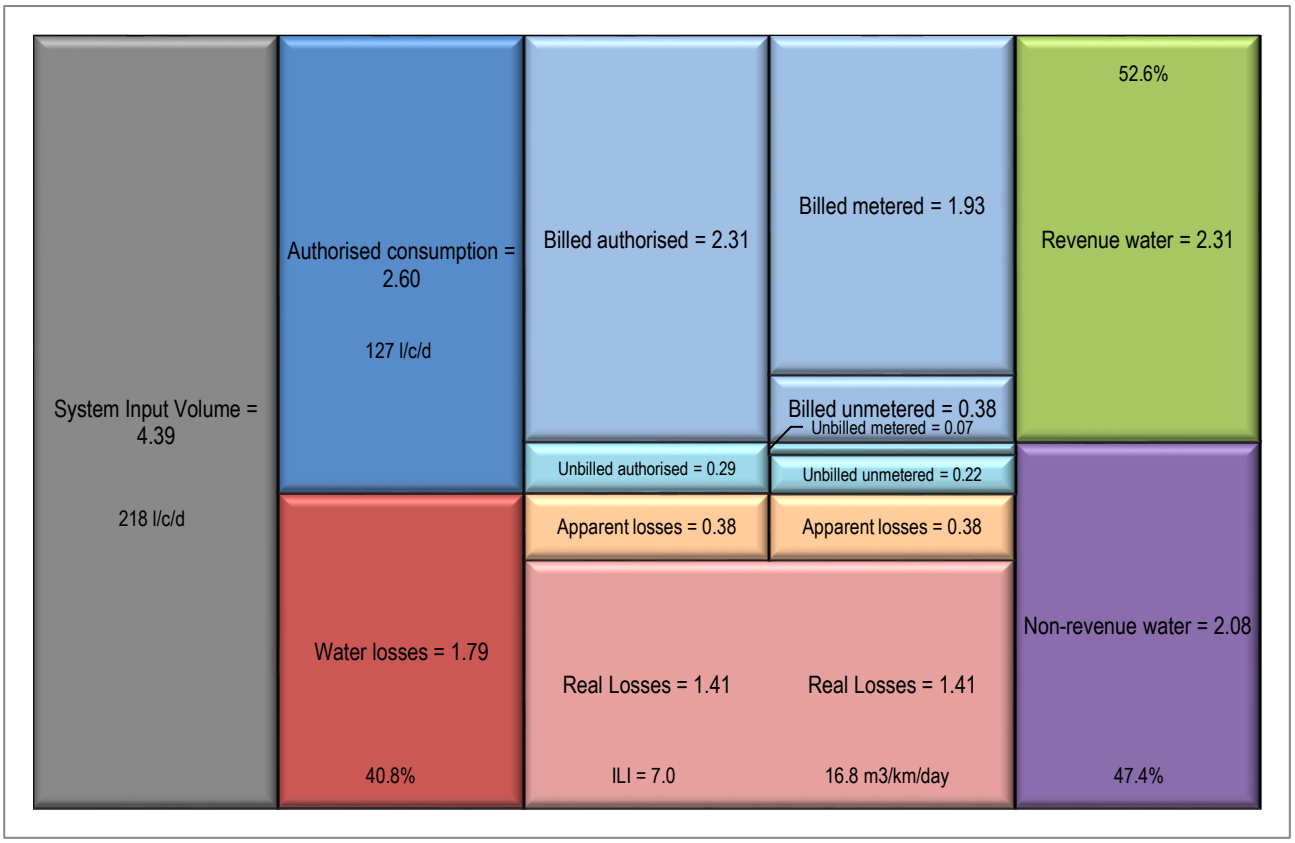
Estimated Water Balance

Prior to the 2017 benchmark report, all reports calculated the national water balance based on extrapolation. The national water balance is highly influenced by and dependent on the metro and secondary city data that have high confidence levels, while data for Category C2, B3 and B4 municipalities have low confidence levels and are poorly represented in the sample. The extrapolated results provided NRW figures between 35% to 40%, depending on the extrapolation methodology followed. To improve understanding of NRW and water losses in South Africa, the extrapolation method was substituted with a bottom-up approach, estimating a water balance for each municipality that could not provide information.

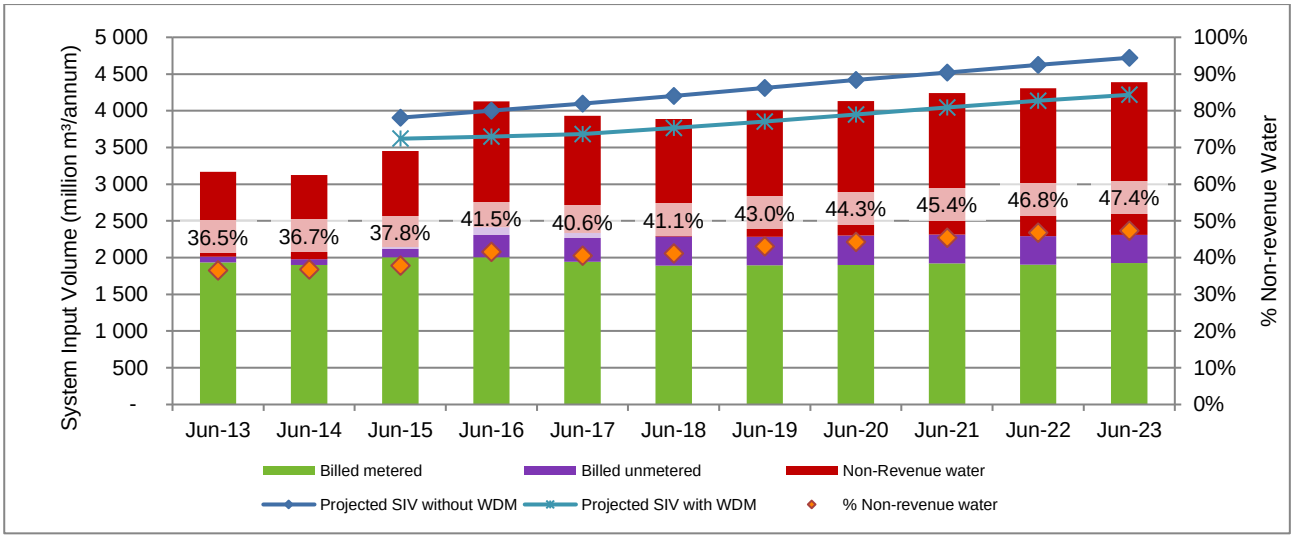
National Water Balance

The national water balance indicates a System Input Volume (SIV) of 4.39 billion m³/annum, NRW of 2.08 billion m³/annum (47.4%) and water losses of 1.79 million m³/annum (40.8%). NRW and water losses have increased by a notable 5.9% and 4.3% respectively from June 2016. However, the greatest increase was in the past two years, attributed to the increased demands and the impact of the COVID-19 pandemic. The fluctuation between 2016 and 2019 was generally less than 1%.

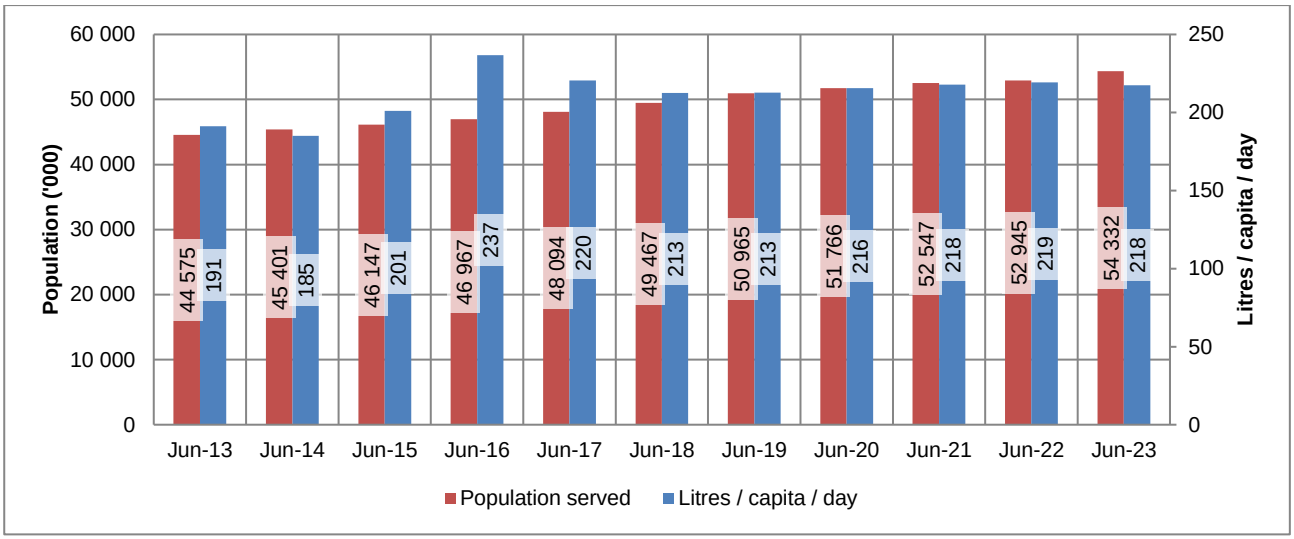
There has been a noticeable increase in billed unmetered consumption because of incorporating Free Basic Water (FBW) supply in the estimated water balances, especially for rural municipalities. Unbilled unmetered consumption remains lower than expected, considering the high number of unbilled properties in South Africa. Municipalities must correct their water balance calculations and show any water use after an accepted connection as authorised consumption, and not as water loss.



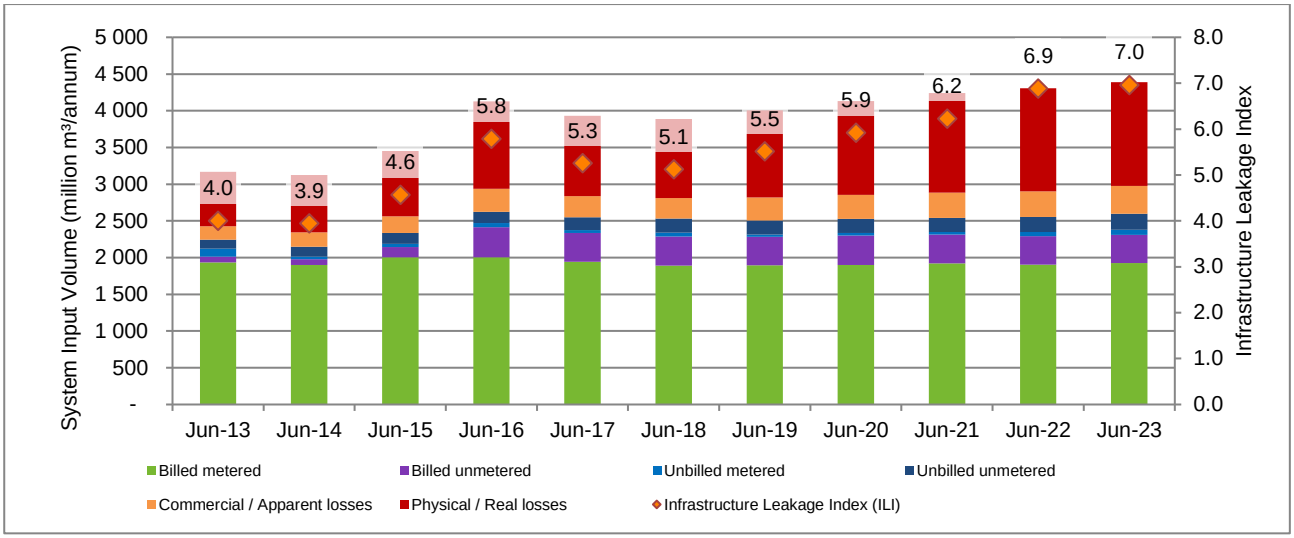
National NRW and water loss trends show a steady increase in NRW over the past 10 years and SIV projections with WC/WDM have been exceeded. The figures are dominated by Category A, B1 and B2 municipalities, some of whom have made significant strides in improving NRW management, reducing water losses, and managing the demand in line with reconciliation strategy targets. There is significant scope for improvement of NRW and all municipalities would benefit from targeted demand management programmes, including community education and awareness, leak repair, infrastructure refurbishment, pressure management, and installation of bulk meters, amongst other measures.



National trends suggest that the per capita consumption has remained constant over the past 10 years, which is commendable. However, WC/WDM efforts must be elevated considering the level and reliability of service and inefficiencies, and that South Africa is one of the 30 driest countries in the world. Nonetheless, the per capita consumption is significantly lower than the previous national average of 237 l/c/d presented in June 2016 because of the prevailing droughts in parts of South Africa, deteriorating infrastructure and service delivery. The subsequent water restrictions and WC/WDM interventions had a significant impact on the SIV, especially in the Western Cape.



The Infrastructure Leakage Index (ILI) deteriorated drastically from 2016 to date, showing signs of improvement in 2017 and 2018. The ILI of 7.0 indicates poorly managed physical losses. The COVID-19 pandemic has played havoc with municipal water losses and this trend is expected to improve once municipalities have returned to normal, eliminated the leak repair back-logs, and improved revenue collection.



The results indicate increased NRW, water losses, and ILI, but a significant decrease in the national per capita consumption. Given the increases on three key NRW metrics, WC/WDM must be implemented as a matter of urgency in all Provinces, especially considering that several Provinces have NRW and water losses above 50%. There is significant scope for improvement in reporting levels, data accuracy and a reduction in SIV, NRW, water losses and improved efficiency across South Africa. Only continuous monitoring and analyses will provide a credible benchmark against which progress made with the implementation of WC/WDM can be measured. Continuous monitoring should also influence interventions required to manage demand, water losses, and NRW.

Conclusions

The following conclusions are drawn from the assessment:

- A total of 88 datasets (61%) were received from WSAs, which is the highest number to date. Less than 50% of WSAs were able to submit water balance data in previous surveys. The confidence level of the data submitted varies between high (55%), medium (18%) and low (27%).
- **Category A** - Metropolitan municipalities continue to report consistently and most can provide a water balance monthly. This is encouraging, considering that metropolitan municipalities represent 53.3% of the total water use and 47.3% of the population.
- **Categories B1 and B2** - Most secondary city and large municipalities can provide a water balance regularly, although there is considerable room for improvement in some Provinces. The secondary city and large municipalities represent 21.4% of the total water use and 20.8% of the population. These municipalities are of economic significance and should have the necessary budgets and resources to implement WC/WDM.
- **Categories C2, B3 and B4 –** 53% of the small and rural municipalities can provide an accurate water balance regularly. Reasons for this include lack of budget, limited skills and capacity, difficultly measuring the supply due to the large number of boreholes, and large indigent consumer bases. These municipalities represent approximately 25.3% of the total water use and 31.9% of the population.
- Water balance information is continuously updated and improved, which means that the data shown in this report differs from the data presented previous benchmarking studies.
- The current focus is to encourage the submission of the most basic water balance regularly, and not focussing on accuracy. Although the DWS highlights and fixes typical errors and anomalies, analysing, interpreting, and improving the water balance can become better over time as the DWS and WSA becomes more acquainted with the methodology and results. The results from this study should be seen as indicative of NRW and water losses in South Africa and improving the level of confidence will require significant time and resources.

- Water losses and NRW have increased in most municipalities since the onset of the Covid-19 pandemic in early 2020. The increase in NRW and water losses are attributed to reduced payment levels, increase supply to curb the spread of the virus, operations and maintenance budget cuts, and lack of capacity in municipalities to undertake repairs due to ill health and deaths.
- The 2022/23 national water balance indicates an SIV of 4 389.3 million m^3/annum, NRW of 2 078.6 million m^3/annum (47.4%) and water losses of 1 789.9 million m^3/annum (40.8%). NRW and water losses have increased by a notable 5.8% and 4.3%, respectively, from 2016. However, the greatest increase was in the past three years and attributed to the COVID-19 pandemic. The fluctuation between 2016 and 2019 was generally less than 1%.
- There has been a noticeable increase in billed unmetered consumption because of incorporating FBW supply in the estimated water balances, especially for rural municipalities. Unbilled unmetered consumption remains lower than expected, considering the high number of unbilled properties in South Africa. Municipalities must correct their water balance calculations and show any water use after an accepted connection as authorised consumption and not as water loss.
- The national NRW and water loss trends show a steady increase in NRW over the past 10 years, and SIV projections with WC/WDM is gradually being exceeded. The figures are highly influenced by the Category A, B1 and B2 municipalities, some of whom have made significant strides in improving NRW management, reducing water losses, and managing the demand in line with reconciliation strategy targets.
- National trends suggest that the per capita consumption of 218 l/c/d has remained constant over the past 8 years, which is commendable. However, WC/WDM efforts must be elevated, considering the level of service and inefficiencies, and that South Africa is one of the 30 driest countries in the world. Nonetheless, the per capita consumption is significantly lower than the previous national average of 237 l/c/d presented in June 2016 because of the prevailing droughts in parts of South Africa and increasing intermittent supply problems. The subsequent water restrictions and WC/WDM interventions had a significant impact on the SIV, especially in the Western Cape.
- The ILI of 7.0 deteriorated dramatically from 2016 to 2023, showing signs of improvement in 2017 and 2018. The COVID-19 pandemic has adversely affected municipal water losses, and this trend is expected to improve once municipalities have returned to normal, eliminated the leak repair back-logs, and improved revenue collection.
- The results indicate increased NRW, water losses and ILI, but a significant decrease in the national per capita consumption. Given the increases on three key NRW metrics, WC/WDM must be implemented as a matter of urgency in all Provinces, especially considering that several Provinces have NRW and water losses above 50%. There is significant scope for improvement in reporting levels, data accuracy, and reduction of SIV, NRW, water losses and improved efficiency across South Africa. Only continuous monitoring and analyses will provide a credible benchmark against which the progress made with the implementation of WC/WDM can be measured.
- All municipalities would benefit from targeted demand management programmes, including community education and awareness, leak repair, infrastructure refurbishment, pressure management, and installation of bulk meters, amongst other measures.
- Based on the functional expenditure and SIV of 127 WSAs, the average cost of supplying water is R 13.07/kl. This ranges from R 17.32/kl for metropolitan municipalities to R 12.06 for Category B3 municipalities. The cost of supplying rural municipalities (Categories B4 and C2) is the highest, ranging from R 14.26/kl to R 17.64/kl. This is a meaningful change from previous assessments that suggested that the cost of supplying water in rural schemes is less than in large municipalities. The higher cost is justified, considering that these schemes often consist of many small systems with boreholes, which are expensive to operate.
- Using the national average and category average tariffs, the estimated cost to supply water in South Africa is between R 60 and R 70 billion per annum and revenue of between R 42 and R 44

billion is generated from water sales. The value of NRW is between R 28 and R 33 billion at R 13.07/kl which is higher than previous estimates. The increase is due to above inflation water tariff increases from water boards, and the under estimation of water supply costs to rural municipalities.

- The results show that approximately R 1 billion per annum could be saved if the SIV is reduced by 2%, and municipalities would generate nearly R 1 billion per annum for every 2% increase in revenue. The nett benefit could be R 10 billion per annum if revenue is increased by 10% and the SIV is reduced by 10%. Reducing the SIV by 10% and increasing the revenue by 10% would reduce the national NRW figure to 35.7%, and the per capita consumption to 195 l/c/d.
- The estimated water balances increase the national percentage NRW by approximately 5.5% and reduces the l/c/d by approximately 23 l/c/d. The estimated water balances increases the national figures, and it is highly unlikely that the NRW in reporting municipalities would be lower than in non-reporting municipalities.

Recommendations

The following recommendations are made to build on the progress made with reporting and the implementation of WC/WDM in the municipal environment:

- All Provincial Offices should establish reporting templates, schedule meetings with municipalities to confirm targets, analyse the water balance information, and provide feedback. The reporting structures in well performing Provinces are now well established and managed by the Provinces, and most municipalities are reporting quarterly. The initiative was supported by Regulations and sending directives to municipalities who did not respond. A similar approach could be followed for all Provinces to improve communications and water balance reporting.
- The national NRW assessment suggests that 40% of municipalities cannot provide basic information such as monthly consumption figures and only 44% can provide information with a medium to high confidence level. One of the key challenges with gathering the information is the poor communication channels with municipalities, which include resigned staff and a considerable number of private e-mails. Discussions also indicate that in some cases municipalities are unwilling to provide the information as it reflects badly on them, or they feel that the information has already been submitted through the WSDP and various questionnaires. Government should reconsider communication channels with municipalities. Communication should be more formal, avoid duplication, and target senior management in the organisation. In this regard, the circulars from National Treasury provide clear guidelines to municipalities and communications are only with the mayor, municipal manager, and CFO.
- Maintenance of the reconciliation strategies must continue and should be used to monitor the progress made with the implementation of WC/WDM.
- Ongoing monitoring and reporting of municipal NRW and water loss performance by DWS against determined targets and baselines are critical.
- DWS Provincial Offices / Catchment Management Agencies (CMA) / Water Boards must increase their skills and capacity to provide WC/WDM support to municipalities, for monitoring and reporting.
- Budgets are allocated towards new infrastructure projects through WSIG, RBIG, MIG, and other funding programmes, but the management of these funds is fragmented, with emphasis on new infrastructure and insufficient focus on WC/WDM.
- The No Drop incentive-based regulation programme should be rolled-out as planned, alongside the other Drop programmes, to elevate WC/WDM regulation in the municipal environment. DWS should also enforce its regulatory mandate to penalise municipalities that do not comply.

- The recommendations of South Africa's National Development Plan (Vision for 2030) (National Planning Commission, 2013) must be implemented, including the call for clear national and local targets to be achieved by 2022.
- The Regulations Relating to Compulsory National Standards and Measures to Conserve Water (GNR.509 of 8 June 2001) states that a water services institution must fit a suitable water volume measuring device or volume controlling device to every user connection to control demand. Many municipalities do not comply with this regulation, which results in excessive leakages on private properties through leaking taps and toilets as there is no incentive for consumers to fix the leaks. DWS should consider a policy whereby water services institutions are compelled to either measure and control or fix leaks on private properties, as government cannot continue to fund new infrastructure projects to supplement leakage. DWS is already encouraging the fixing of leaks through various programmes.
- The National Water and Sanitation Master Plan (DWS, 2018) states that South Africa is facing a water crisis caused by insufficient water infrastructure maintenance and investment, recurrent droughts driven by climatic variation, inequities in access to water and sanitation, environmental degradation and resource pollution, and a lack of skilled water engineers. This crisis is already having significant impacts on economic growth and on the well-being of everyone in South Africa. The recommendations of the National Water and Sanitation Master Plan should be implemented as a matter of urgency.
- Too many local municipalities are not aware of the reconciliation strategies or expect DWS to provide the necessary funding to implement these strategies. Municipalities must be reminded of their responsibilities in terms of the Water Services Act (No. 108 of 1997) and actively participate, budget through the Integrated Development Planning process, and implement the results from the reconciliation strategies.
- Municipalities should encourage consumers to appreciate the value of water and enforce the user pays principal, through on-going awareness programmes.
- Municipalities should continue their effort to capitalise on the awareness created and sustain the savings achieved during the drought.
- Municipalities must actively participate and report at the reconciliation strategies meetings and use the outcomes to prioritise resources and budgets.
- Monitoring and reporting on water balances by municipalities could become more self-regulatory if a policy is implemented that no new infrastructure projects will be funded unless the municipality can provide actual consumption figures and proof that their water losses are under control. The IWA water balance should become the backbone of all water related management and decision support systems, especially grant application and awarding processes.
- Municipalities should increase their efforts to achieve the targets set under the reconciliation strategies to ensure water security, and targets must be reviewed regularly.
- Municipalities should increase their efforts to reduce NRW and the negative impact it has on their ability to generate income and operate a viable water service.
- Municipalities should resolve metering and billing issues to increase payment levels, encourage consumer fixing of leaks, prosecute illegal water connections, and reduce theft of water.
- Municipalities should resolve intermittent supply as it is a prerequisite for an effective WC/WDM programme. Intermittent supply is ineffective (consumers adapt), corrupts meter readings and billing data, expensive to operate, damage pipe seals with subsequent increased leakage and is disruptive.
- The recommendations of the Second Edition of the National Water Resource Strategy (DWA, June 2013) must be implemented, including the call for greater emphasis on meeting specific targets to reduce water loss. WC/WDM measures will have multiple benefits in terms of the postponement of infrastructure augmentation, mitigation against climate change, support for economic growth, and ensuring that adequate water is available for equitable allocation.

- Municipal asset management needs to be improved to ensure greater sustainability of water supply services.
- There is close correlation between operations, maintenance, low water losses and NRW. Municipalities should implement proactive operations and maintenance programmes to coincide with WC/WDM programmes.
- Closer involvement and collaboration with National Treasury are critical to ensure issues related to funding of WC/WDM programmes, and metering, reading and billing issues are resolved with municipal finance departments.
- Greater involvement of the private sector through public-private partnership, stewardship, and performance-based contracts should be encouraged to improve service delivery and expedite the implementation of WC/WDM interventions. National Treasury should review the procurement of these contracts to eliminate bottlenecks and attract private investment.
- On-going provision of mentorship to municipalities through the DWS Provincial Offices, Department of Cooperative Governance and Traditional Affairs (CoGTA), the South African Local Government Association (SALGA) and other institutions is critical.
- Closer involvement and collaboration with CoGTA and SALGA are critical to ensure issues related to human resources skills and capacity in municipalities, payment for services, and unauthorised water use are resolved.
- Closer collaboration is required with other national, provincial, and local government departments that are big water users. These include Departments of Education, Correctional Services, Health, Public Works, and Housing, to ensure leakages and wastage are brought under control.
- Every citizen has a right to, amongst other things, sufficient food, and water, placing water at the forefront of human development and therefore emphasizing the importance of its management and beneficial use. This human right comes with a responsibility and every citizen must use water sparingly, pay for water services, fix household leaks, report municipal leaks, and promote water use efficiency at home, work, and public facilities.

TABLE OF CONTENTS

List of figures

List of tables

ABBREVIATIONS

BD	Blue Drop
CARL	Current Annual Real Losses
DWS	Department of Water and Sanitation
FBW	Free Basic Water
GD	Green Drop
ILI	Infrastructure Leakage Index
IWA	International Water Association
KPA	Key Performance Area
KPI	Key Performance Indicator
MNF	Minimum Night Flow
MIIF	Municipal Infrastructure Investment Framework
MTREF	Medium Term Revenue and Expenditure Framework
ND	No Drop
NDP	National Development Plan (2011)
NRW	Non-Revenue Water
NWRS1	National Water Resource Strategy 1 (2004)
NWRS2	National Water Resource Strategy 2 (2013)
NWSKS	National Water Services Knowledge System
RDP	Reconstruction and Development Programme
RPMS	Regulatory Performance Management System
SIV	System Input Volume
SLA	Service Level Agreement
SWPN	Strategic Water Partners Network
UARL	Unavoidable Annual Real Losses
UFW	Unaccounted for Water
WC/WDM	Water Conservation Water Demand Management
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSP	Water Services Provider
WTW	Water Treatment Works
WUL	Water Use License

1 INTRODUCTION

1.1 BACKGROUND

The *National Water and Sanitation Master Plan (DWS, 2018)*, in tandem with the macro national vision, issued an ambitious and timely call to action for the water sector, including (i) the provision of equitable access to reliable water supply, (ii) protection, management and development of the nations' water resources in a manner that supports justifiable and ecologically sustainable economic and social development, and (iii) transformative access to water to redress the racial imbalances created by apartheid. The journey towards achieving these objectives begins with understanding the extent and nature of the Non-Revenue Water (NRW) challenges faced by those tasked with its management.

The No Drop programme, like the Blue and Green Drop programmes, was designed to elevate the profile of NRW management, and the urgency with which the considerable water loss challenges must be addressed. Furthermore, the severe loss of revenue from both water being lost, and the overall revenue collection process needs a coordinated and coherent plan of action. This plan should assist in changing the dire circumstances which have led to a progressive decline in the state of infrastructure and the sustainability of municipalities.

The regulatory programme was established to encourage and acknowledge continuous improvements in water loss management, and institutionalise NRW in municipalities across South Africa, with the view that such a measure would help Water Services Authorities (WSAs) to face the nature and extent of the NRW challenges head on. It would also assist the municipalities to develop a business approach to water services to improve the overall sustainability of WSAs.

This study seeks to report the progress made in terms of NRW, water losses, and efficiency in the South African municipal sector. Progress can only be accurately determined through a concerted effort by all WSAs to report their water balances, as stipulated in the Regulations relating to Compulsory National Standards and Measures to Conserve Water (GNR.509 of 8 June 2001), under the Water Services Act (No. 108 of 1997). The work presented in this report builds on the previous No Drop and benchmarking assessments, from 2002 until 2023 when the last benchmarking update was undertaken. For the current and future benchmarking studies, the following factors are critical:

- Consistent and regular reporting on the NRW water balance to facilitate coherent and accurate water balance calculations.
- Regular and consistent communication between the municipalities and the Department of Water and Sanitation (DWS) Provincial Offices to timeously identify municipalities that require urgent assistance.
- Concerted budget allocation and a programmatic approach to implementing NRW interventions, including the installation of bulk meters to measure and monitor progress and develop a credible water balance, allowing for well informed decision making regarding reducing NRW in the municipalities.

1.2 OBJECTIVES

The key objectives of this study were as follows:

- Assess the status of water losses in South Africa, to strengthen the efforts of the WSA in managing NRW, and to amplify the need for an effective regulatory and enforcement environment.
- Report on System Input Volume (SIV), NRW, water loss and efficiency trends using 2012/13 to 2022/23 annual municipal data (i.e., 10 financial years).
- Calculate a 2022/23 water balance for each municipality, in the absence of better information.
- Assess municipal water loss and water use efficiency against regulatory compliance requirements and best management practices.

The primary intent of this report is to provide a status update of the levels of NRW, water losses and water use efficiencies in South Africa. While it builds on the regulatory compliance programme which commenced in 2015, this report focusses solely on Sub-criterion 1.2: Water Balance of the No Drop programme.

The status update on NRW in South African municipalities should serve as a catalyst for the next round of the No Drop assessment, with expanded Key Performance Indicators (KPIs) for all municipalities. It is also envisaged that this report will create a higher level of awareness and fast track prioritisation and execution of Water Conservation and Water Demand Management (WC/WDM) initiatives to address prevalent issues in a coherent manner.

1.3 IWA WATER BALANCE

A modified International Water Association (IWA) water balance was accepted as the standard reporting format for NRW and water losses in South Africa in the late 1990s. The IWA water balance is now generally accepted by most countries as the standard and most robust and comprehensive approach to report on NRW and water losses. The IWA water balance was slightly modified for South Africa to include free basic water (FBW), as shown in **Figure 1**.

<table>
<tr><td rowspan="8">System input volume

(Water security and efficiency)</td><td rowspan="4">Authorised Consumption (All water use and wastage after connection on user side)</td><td rowspan="2">Billed authorised</td><td>Billed metered</td><td rowspan="2">Revenue water (Includes free basic water)</td></tr>
<tr><td>Billed unmetered</td></tr>
<tr><td rowspan="2">Unbilled authorised</td><td>Unbilled metered</td></tr>
<tr><td>Unbilled unmetered</td></tr>
<tr><td rowspan="4">Water Losses

(All losses before the connection on municipal side)

(Environmentally and financially unattractive)</td><td rowspan="3">Commercial or Apparent losses</td><td>Unauthorised consumption</td><td rowspan="4">Non-Revenue water

(Financial sustainability of the Water Service Authority and promotion of water use efficiency)</td></tr>
<tr><td>Meter inaccuracies</td></tr>
<tr><td>Transfer errors</td></tr>
<tr><td rowspan="3">Physical or Real losses</td><td>Leakage on distribution pipes</td></tr>
<tr><td>Leakage & overflows on storage tanks</td></tr>
<tr><td>Leakage on connection pipes up to point of connection</td></tr>
</table>

Figure 1: Modified IWA water balance in South Africa

Each component of the water balance is significant as it highlights various important issues. SIV provides an indication of water security, if compared to the water use license, and the water use efficiency in terms of litres per capita per day (l/c/d). Water losses are financially and environmentally unattractive and cannot be allowed, while NRW provides an indication of the financial sustainability of the WSA. Payment for water services promotes water use efficiency as it has been shown that people who pay for water tend to use it more sparingly.

The following definitions have been adopted from the *State of Non-revenue Water in South Africa* (Seago & McKenzie, 2007):

- *System input volume (SIV)* represents the potable volume input to the water supply system from the water utility's own sources, as measured at the water treatment works (WTW) outlet as well as any water imported from other sources, both corrected for known bulk metering errors.

- *Authorised consumption* is the volume of metered and / or unmetered water used by registered customers, the water utility, and others who are implicitly or explicitly authorised to do so by the water utility, for residential, commercial, and industrial purposes.
- *Water losses* are the sum of the physical and commercial losses and is calculated as the difference between the SIV and authorised consumption. In most countries, water losses include unaccounted for water (UFW), although the exact definition of UFW can vary from country to country.
- *Billed authorised consumption* is revenue water and is the volume of authorised metered and unmetered consumption which is billed by the water utility and paid for by the customer.
- *Unbilled authorised consumption* is the volume of authorised metered and unmetered consumption that is not billed or paid for.
- *Commercial losses or apparent losses* include unauthorised consumption (theft or illegal use), and all technical and administrative inaccuracies associated with customer metering. If commercial losses are reduced, more revenue is generated by and for the water utility.
- *Real losses* are the physical water losses from the pressurised system, up to the point of measurement of customer use. If real losses are reduced, more water is available for distribution to customers, or the total system input volume is reduced. In most cases, real losses represent the unknown component in the overall water balance. Therefore, the purpose of most water balance models is to estimate the magnitude of real losses so that the water utility can gauge whether it has a serious leakage problem. Real losses are calculated as the difference between total losses and estimated commercial losses.
- *NRW* is the volume of water supplied by the water utility but for which it receives no income. NRW incorporates unbilled (metered or unmetered) authorised consumption, apparent / commercial losses, and real / physical losses.

Once the water balance has been calculated, various KPIs can be calculated to measure the performance of the water supply system. With the water balance and KPIs available, the water utility can determine which components must be targeted first to improve efficiency, and reduce commercial losses, physical losses or NRW. Once the main water loss contributing components have been identified and quantified, it is important to identify the most effective WC/WDM intervention to address these losses. Therefore, it is important to understand the impact various WC/WDM interventions would have, to ensure that targets are achieved.

Key assumptions

- A connection is defined as any point of water supply by the WSA and can be formal, informal, or unauthorised. Formal connections are installed by the WSA and controlled with service level agreements. Informal connections are installed by users but are accepted by the WSA. Therefore, all users who are supplied with potable water by the utility should be included in the water balance and should have either a metered or unmetered connection. All informal connections that are accepted, and, therefore, authorised by the WSA, should be classified as unmetered connections, unless the WSA intends to remove them. Connections that are not accepted by the WSA should be classified as unauthorised (illegal) and removed or formalised, which usually involves a legal process of informing the user, imposing a fine and the possibility of prosecution.
- Any losses on the reticulation network, before metered or unmetered connections, should be classified as commercial or physical losses, whereas any leakage and water use after the connection should be classified as authorised consumption. The objective with this approach is to highlight unbilled or unmetered consumption and should not be confused with commercial or physical losses that occur on the reticulation network.
- The water balance is based on the potable water supplied to the system and does not make allowance for water treatment and raw water transmission losses. Water treatment losses are

typically between 5% and 10% of system input volume and must not be included in the water balance.

- FBW (Free Basic Water) is classified as metered or unmetered consumption billed at a zero rate, and forms part of the billed consumption and revenue water. Care must be taken not to duplicate FBW where it has already been included in the billed consumption.
- NRW and water losses are distinct. Water losses are a function of real and commercial losses and are resolved by fixing visible leaks and improving metering and billing efficiencies. NRW is a function of real losses, commercial losses and unbilled consumption and is resolved by addressing water losses and unbilled consumption.

1.4 OBJECTIVES OF THE NO DROP PROGRAMME

The No Drop Certification scorecard seeks to select the key areas (institutional, social, technical, economical, and legal proficiency) required for the sector that, if strengthened, will help improve the current level of water losses and NRW in the municipal sector in South Africa. In addition, No Drop endeavours to:

- Develop an incentive based, regulatory environment to improve service delivery and water security, and reduce water losses and NRW.
- Provide a guideline to water services institutions to reduce water losses and NRW and improve efficiency.
- Incorporate the full water services cycle of the WSA by targeting political and management levels, finance and technical departments, and users.
- Align with and complement the Blue Drop and Green Drop programmes.

1.5 MUNICIPAL CATEGORISATION

The data were categorised according to the Municipal Infrastructure Investment Framework (MIIF) and in DWS Provinces. The DWS Provinces are the equivalent of South Africa's provinces. The MIIF categorisation is as follows:

Category	Number	Short description	Long Description
A	8	Metros	Metropolitan municipalities
B1	19	Secondary cities	Local municipalities with the largest budgets
B2	27	Large cities	Local municipalities with a large town as core
B3	110	Small towns	Local municipalities with a small population and a significant proportion of urban population but with no large town as core
B4	70	Mostly rural	Local municipalities which are rural with, at most, one or two small towns in their area
C1	23	Districts without WSA status	District municipalities which are not WSAs
C2	21	Districts with WSA status	District municipalities which are WSAs

2 LITERATURE REVIEW

The World Economic Forum Report 2017 identified water as the third highest global risk in terms of impact, and it has featured in the top five global risks for the past five years. In addition, the World Economic Forum Report 2020 listed infectious diseases and livelihood crises as the top two prevailing threats, both inextricably linked to water. In this respect, water remains one of the key challenges globally. The South African water sector faces similar challenges, including NRW, resulting in a rapid decline in the delivery of basic services across municipalities in South Africa. The pressure on basic resources is compounded by increasing demands on the economy, population growth, socio-economic demands, and deteriorating water quality, and limited resources limit growth. These dynamics limit the extent and opportunities for growth in South Africa.

WC/WDM features prominently in planning, strategy, and policy documents, including the South African Constitution and relevant legislation. It is paramount that the objectives contained in these documents are achieved to contribute to the national goals of a better life for all through job creation and inclusive economic growth. South Africa has a 20-year benchmarking track record to measure the progress made with the implementation of these goals. The next sections summarise the key policies and legislation related to NRW and water loss control and the history of benchmarking reports to date.

2.1 POLICY AND LEGISLATION

The original mandate for efficient and effective distribution of water resources comes from the **Constitution of the Republic of South Africa Act (No. 108 of 1996),** which states that every citizen has, amongst other things, a right to sufficient food and water. Thus, water is placed at the forefront of human development, emphasising the importance of water management and its beneficial use. The Constitution provides the foundation for sound water management and the view that the resource must be used carefully to meet the condition of sufficiency for all.

The **National Water Act (No. 36 of 1998)** recognises that water is a scarce and precious resource that belongs to all the people of South Africa, and that the goal of water resource management is to achieve the sustainable use of water for the benefit of all South Africans. The Act aims to develop, protect, use, conserve, manage and control water resources overall, promoting the integrated management of water resources with the participation of all stakeholders. Therefore, the National Water Act addresses the development of strategies to facilitate adequate water resource management, alongside related legislation.

The **Water Services Act (No. 108 of 1997)** provides a framework for the provision of water supply and sanitation services to end users such as households, businesses, and industries, within municipalities. It sets the standards for the local and provincial spheres of government and establishes the norms and standards for tariffs. The main objectives of the Water Services Act (No. 108 of 1997) are to provide for:

- The right of access to basic water supply and the right to basic sanitation, by securing sufficient water and an environment not harmful to human health or well-being.
- Setting of national standards and norms as well as standards for tariffs in respect of water services.
- Preparation and adoption of water services development plans (WSDPs) by WSAs.
- A regulatory framework for water services institutions and water services intermediaries.
- Establishment and disestablishment of Water Boards and water services committees and their duties and powers.
- Monitoring of water services, and intervention by the Minister or by the relevant Provincial government departments.
- Financial assistance to water services institutions.
- Gathering information in a national information system and the distribution of that information.
- Accountability of water services providers (WSPs).
- The promotion of effective water resource management and conservation.

The Regulations relating to Compulsory National Standards and Measures to Conserve Water (GNR.509 of 8 June 2001) under the Water Services Act (No. 108 of 1997) provide for the protection of consumers and WSAs, and for ensuring the application of sound management principles. Key clauses related to the preparation of the IWA water balance are the following:

Regulation 10 – Water services audit as a component in the WSDP

10 (1) A water services authority must include a water services audit in its annual report on the implementation of its Water Services Development Plan (WSDP) required in terms of section 18(1) of the Act.

10(2) A water services audit must contain details for the previous financial year and, if available, comparative figures for the preceding two financial years of:

(a) the quantity of water services provided.

(b) the levels of services rendered.

(d) cost recovery.

(e) meter installation and meter testing.

(g) water conservation and demand management including at least:

(i) the results of the water balance as set out in regulation 11.

(ii) the total quantity of water unaccounted for (water losses).

(iii) the demand management activities undertaken.

(iv) the progress made in the installation of water efficient devices.

Regulation 11: Water and effluent balance analysis and determination of water losses

11 (1) Within two years of the promulgation of these Regulations, a water services institution must every month:

(a) measure the quantity of water provided to each supply zone within its supply area.

(b) determine the quantity of unaccounted for water by comparing the measured quantity of water provided to all user connections within that supply zone.

11 (2) A water services institution must -

(a) take steps to reduce the quantity of water unaccounted for (water losses).

(b) keep record of the quantities of water measured and of the calculations made.

The legislative framework presented above provides a clear pathway for municipalities to ensure effective management of NRW. With respect to data collection, the following issues must be noted:

- WSAs are required to produce monthly water balances.
- WSAs have had 22 years during which to become accustomed to the practice of NRW data collection as the Regulations were promulgated in 2001.
- Irrespective of the monitoring and enforcement of the Regulations by the DWS, the development of a water balance for all water supply systems should be an ongoing and consistent practice, to identify areas requiring immediate action and to inform appropriate resource allocation for municipalities.

- The Regulations refer to monitoring cost recovery. This implies that the data collection process requires coordinated effort from both the technical and financial departments of municipalities to achieve a common goal, namely, improved NRW management and long term, sustainable water service provision.

The ***National Water Resources Strategy III*** (NWRS-3, 2023) builds on the second National Water Resource Strategy (NWRS-2, 2013). The purpose of the NWRS-3 is to ensure that national water resources are protected, used, developed, conserved, managed, and controlled in an efficient and sustainable manner. The NWRS-3 has been aligned to the National Development Plan (NDP), which seeks to eliminate poverty and reduce inequality by 2030. It also incorporates water supply and sanitation aspects in order to give effect to the National Water and Sanitation Master Plan (NW&SMP), which is subsidiary to, and operationalizes the NWRS-3. The NWRS-3 acknowledges that reducing water demand and increasing efficiency of water supply, meaningfully reduce water demand by effectively implementing WC/WDM measures, implement cost reflective water and sanitation tariffs, implementing the No Drop certification tool and implementing the War on Leaks Programme remain the key ongoing challenges related to reducing water losses, NRW and inefficiencies.

The ***National Water and Sanitation Master Plan*** (2018) recognises that building a water secure future will require proactive infrastructure management, effective water infrastructure operations and maintenance, and an overall reduction in future water demand, while considering infrastructure development and augmentation, if necessary. Management of NRW is central to the achievement of these objectives, based on the principle that measurement and monitoring of water resources is the foundation of sound decision making, allocation of resources, and effective implementation.

The ***DWS Strategic Plan for fiscal years 2020/21 to 2024/25*** **(Vote 41)** sets out a performance target approach to WC/WDM, highlighting its importance as one of the priority implementation areas for the DWS. The Strategic Plan also clarifies that set targets could be met using existing grant mechanisms, considering the impact of WC/WDM on bulk infrastructure requirements. The strategy includes a requirement for the development of individual sector WC/WDM strategies for agricultural, water services and industrial, mining, and power generation, with targets set for each water use sector.

2.2 BENCHMARKING STUDIES

The history of water loss benchmarking in South Africa over the past 20 years is summarised in **Figure 2.** The foundations of the current methodology for calculating and understanding NRW and water losses were established in 2002, in *Development of a pragmatic approach to benchmark water losses in potable water distribution systems in South Africa*, based on an adaptation of the IWA principles of calculating water losses. The first comprehensive national benchmark study, *The State of Non-Revenue Water in South Africa*, was published in 2012. Since then, several detailed assessments and updates were undertaken, including the No Drop assessment in 2015 and the No Drop Watch Report in 2023. The No Drop Watch Report is the last national water loss benchmarking study, based on preliminary 2021/2022 data and published in 2023. These studies have enabled the DWS and other stakeholders to better understand water losses, NRW, and water use efficiency in South Africa.

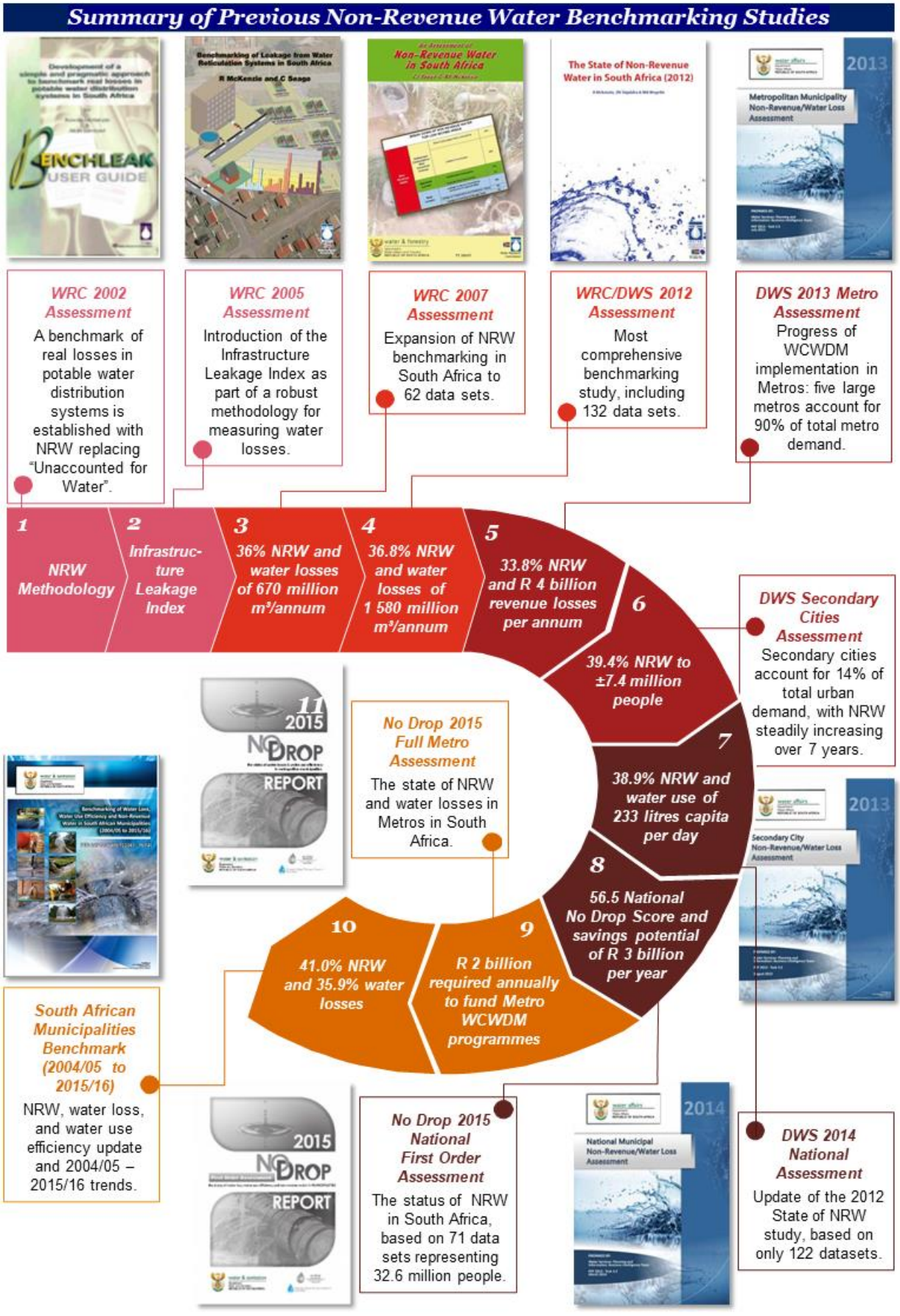


Figure 2: History of NRW benchmarking studies undertaken in South Africa

3 METHODOLOGY

3.1 STAKEHOLDER ENGAGEMENT AND COLLECTION OF WATER BALANCE DATA

The water balance data for this study was collected as part of the 2023 No Drop audits. Information and training sessions were well attended and expected deliverables and due dates were communicated. All communications and follow-up with municipalities were through the DWS Provincial Offices and standard IWA water balance templates were circulated. The process for completion of the templates was workshopped and discussed during several training sessions in the past 10 years, to entrench standardisation of information gathering and reporting.

3.2 WATER BALANCE REPORTING TEMPLATE

A two-page water balance reporting template was prepared for each municipality and is included in **Appendix A**. Cognisance should be taken of the following:

- All information was provided by the respective WSAs as part of the 2023 No Drop audits, unless otherwise indicated.
- The information was corrected, where necessary, to obtain a realistic water balance for each municipality. Typical corrections included incorrect calculations, changing units of measurement, extrapolating partial datasets to a full year, muddled monthly and annual datasets and gap filling.
- The water balance reporting template was divided into four sections to ease capturing and display of information. The four sections were input data, water balance calculations, KPIs and graphics.
- White cells required an input value, while yellow cells were calculated automatically.
- Each municipality had to provide only 11 values per year, and 8 values per month, to complete the reporting template.
- The values were categorised as basic information, such as the population served, and water balance information. Basic information was used to calculate KPIs. The water balance component followed the format of the IWA water balance.
- All volumes were reported in kl/annum (kl = m^3 = 1 000 litres), per municipal fiscal year (July to June). For example, results for “Year ending - Jun-21” means water supply and demand figures from July 2020 to June 2021.
- All underlined values were calculated using trends and / or averages based on previous years.
- Projected SIV with and without WC/WDM were based on the all town or reconciliation strategies, developed by the DWS Chief Directorate: Integrated Water Resource Planning. Further discussions, evaluation, interpretation, monitoring, and analysis are required to comment on the discrepancies and progress made with the implementation of WC/WDM.
- The provincial and district water balances were based on the sum of the municipalities located within the province or district.
- Unless plausible population and households served figures were provided by municipalities, figures were obtained from the DWS National Water Services Knowledge System (NWSKS) (http://ws.dwa.gov.za/wsks/). These figures are compiled by the DWS, in close collaboration with Statistics South Africa, and are used for all planning purposes, including the development of WSDPs. Any household with access to potable water, regardless of the reliability, was classified as served.

IWA Water Balance Diagram

An example of an IWA water balance is shown in **Figure 3**. The SIV unit consumption (182 l/c/d in the example) is based on SIV (2.127 million m^3/annum) divided by the population served (N = 28 552), the authorised

consumption unit consumption (132 l/c/d in the example) is based on the authorised consumption (1.376 million m³/annum) divided by the population served (N = 28 552), and water losses (24%), revenue water (61.7%) and NRW (38.3%) are shown as percentages of the SIV**.** The Infrastructure Leakage Index (IILI) and losses per km of mains per day are real or physical loss indicators.

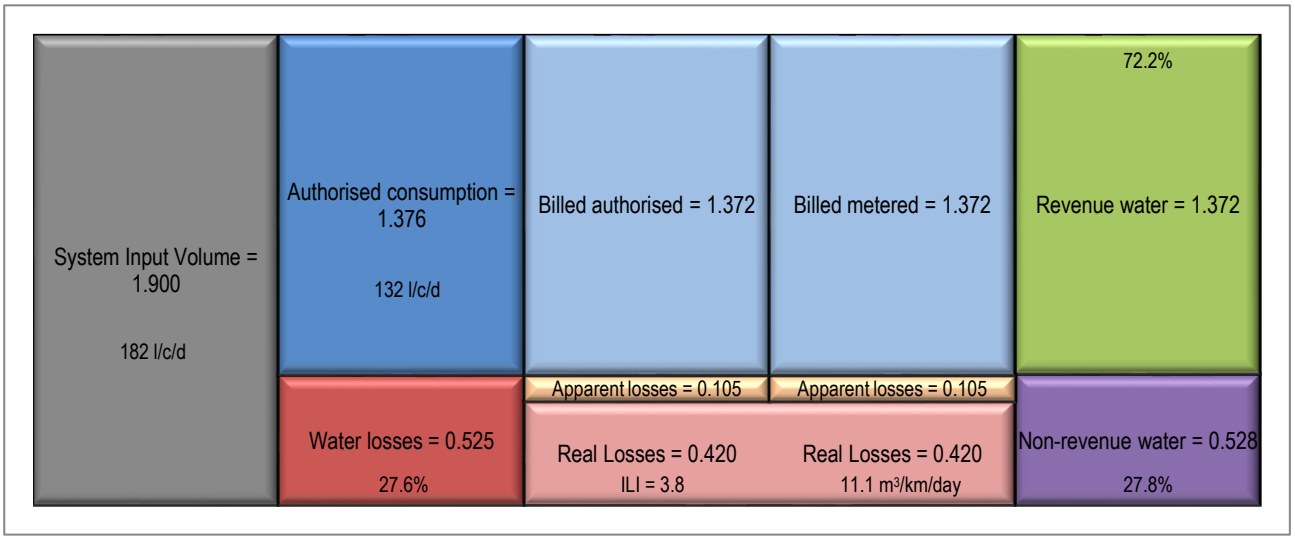


Figure 3: IWA water balance (million m³/annum)

SIV and NRW Trend

NRW consists of all unbilled authorised consumption, and water losses. The NRW trend graph shows the increase or decrease in volume and percentage NRW. It also shows the projected demand with and without WC/WDM as included in the reconciliation or all town strategies, unless otherwise indicated.

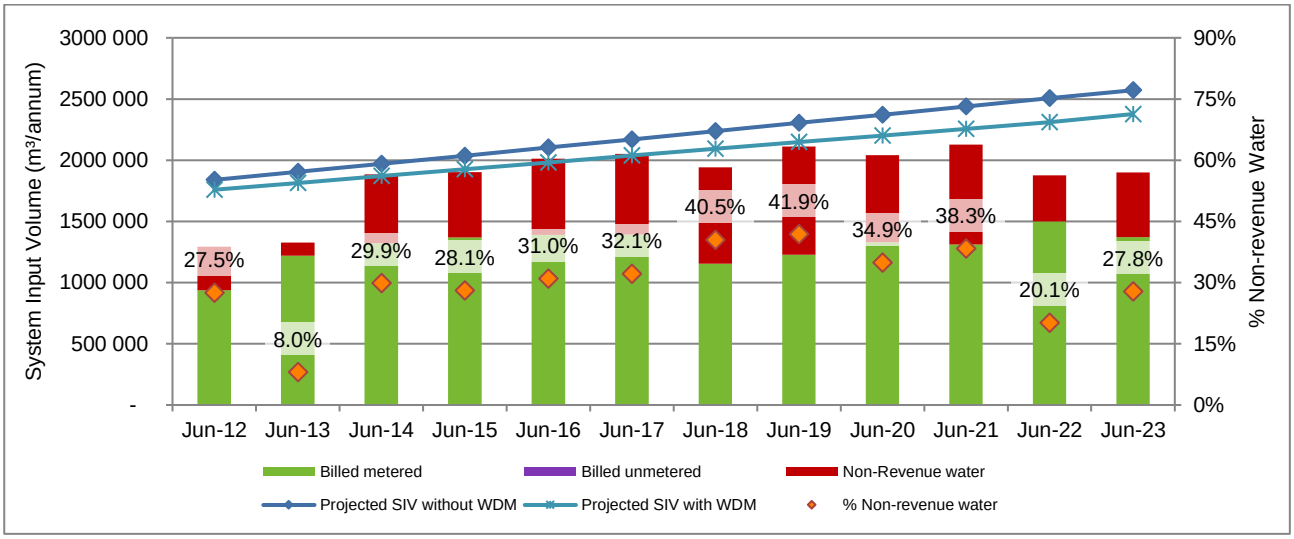


Figure 4: SIV and NRW trend

Population and per Capita Consumption (l/c/d) Trend

The per capita consumption (l/c/d) is based on the SIV divided by the population served. The SIV includes commercial and industrial demand.

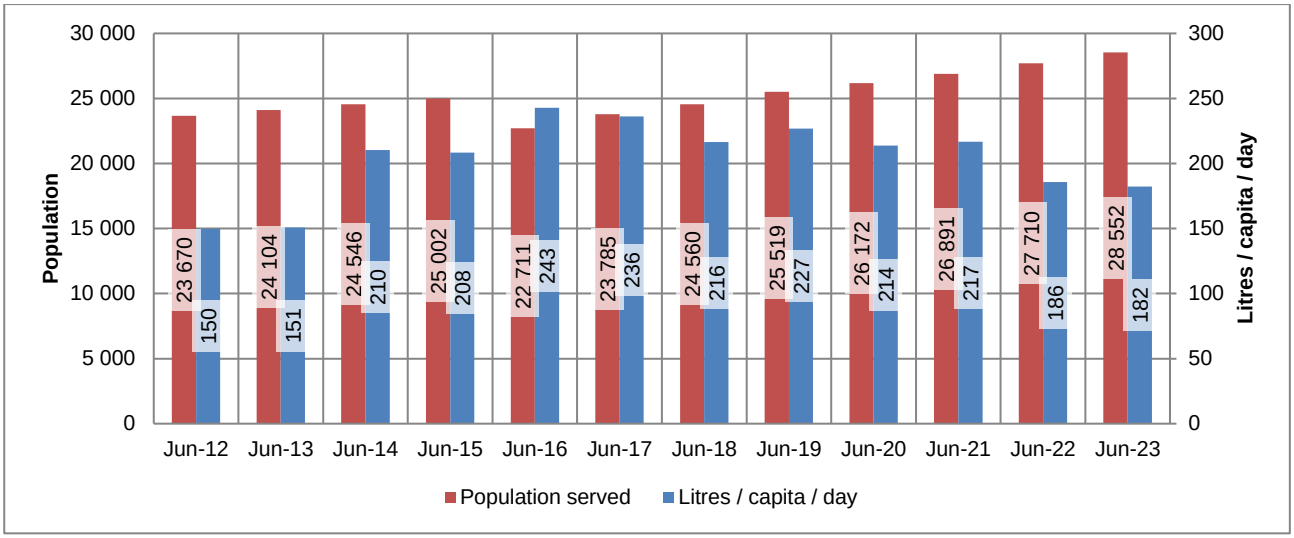


Figure 5: Population and l/c/d trend

Water Losses Trend

Water losses consist of apparent or commercial losses and real or physical losses, and typically include all losses on the municipal side (up to the consumer meter) of the reticulation system. However, some municipalities include internal plumbing losses as part of their water losses, although this should be indicated as unbilled authorised consumption. Therefore, the water losses trend graph indicates the increase or decrease in volume, apparent or commercial losses, and real or physical losses. The ILI, which is an indication of the physical leakage, is shown on the right-hand axis.

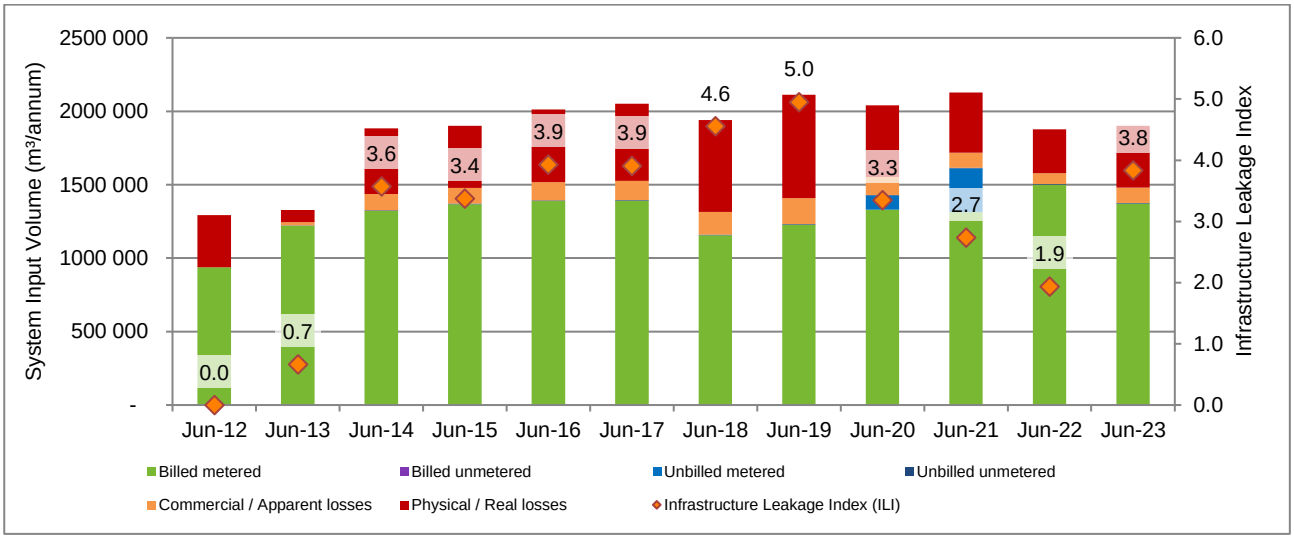


Figure 6: Water losses trend

3.3 DATA SUBMISSION STATISTICS

There has been a noticeable improvement in the quality and quantity of data for Provinces that have active data collection and collation programmes combined with regular engagements. Municipalities in these Provinces are requested to report on a regular basis at forums and reconciliation strategy progress meetings.

To differentiate the useability of data, data were categorised into one of three groups:

- **High confidence level**: Data sets are submitted on a regular basis, show trends, and are credible.
- **Medium confidence level**: One or more data sets were submitted in the past three years and seem credible, with few gaps and/or inaccuracies.
- **Low confidence level**: None or one data set was submitted in the past three years, and the data sets submitted are questionable, with considerable gaps and/or inaccuracies.

A total of 88 datasets (61%) were received from WSAs, which is the highest to date. Less than 50% of WSAs were able to submit water balance data in previous surveys. The confidence level of the data submitted varies between Provinces and municipal categories, as summarised in **Table 1**.

Table 1: Summary of data submissions and confidence levels

Province/ Category	WSA	Submissions	%	High	Medium	Low	% of SIV	% of Population
EC	14	7	50%	2	1	4	7.3%	8.8%
FS	19	10	53%	0	2	8	5.6%	5.8%
GT	9	8	89%	6	2	0	35.8%	29.3%
KZN	14	12	86%	11	0	1	19.5%	18.5%
LP	10	3	30%	1	2	0	7.0%	7.6%
MP	17	8	47%	2	2	4	6.5%	7.6%
NC	26	9	35%	5	3	1	2.4%	2.2%
NW	10	6	60%	0	2	4	5.5%	7.0%
WC	25	25	100%	21	2	2	10.4%	13.3%
Total	**144**	**88**	**61%**	**48**	**16**	**24**	**100.0%**	**100.0%**
A	8	8	100%	7	1	0	53.3%	47.3%
B1	19	17	89%	11	2	4	17.1%	16.3%
B2	17	10	59%	8	1	1	4.3%	4.6%
B3	71	37	52%	14	10	13	6.6%	8.3%
B4	8	5	63%	0	2	3	2.8%	4.0%
C2	21	11	52%	8	0	3	15.9%	19.6%
Total	**144**	**88**	**61%**	**48**	**16**	**24**	**100.0%**	**100.0%**
%				**33%**	**11%**	**17%**		

The confidence levels include those for the WSAs that did not submit data, that is, when water balances were calculated, extrapolated, or estimated. The following is observed from the data submission statistics:

Eastern Cape – Data quality and frequency of submissions from the Eastern Cape are improving. Although few data sets are in the high and medium confidence category, which is a notable shift from the poor records reported in previous benchmarking studies. The Province still has substantial room for improvement in its journey to consistent and credible reporting. This prevents adequate trend analysis.

Free State – Record-keeping and reporting are severely deficient, with approximately 80% of the WSAs in the low confidence level category for the data submitted. This closely resembles the pattern of data submission in previous benchmarking studies, which is perpetuating an upward trend in NRW and water losses in the Province. Water balance information is estimated for most WSAs.

Gauteng – The Gauteng Province has maintained its record of good reporting practices and sound data management. All but one WSA submitted data for the study and regularly provide reports to the Provincial Office, enabling adequate trend analysis. The Provincial Office has a coherent and coordinated reporting

system in place and has continued its commendable efforts to maintain a sound relationship with the municipalities and monitoring activities. The efforts of the Provincial Office are strongly supported by Rand Water that also provide and require regular feedback through its Project 1600 programme.

KwaZulu Natal – The KwaZulu Natal Province has made excellent progress in the past few years through consistent efforts and regular forums to improve reporting. The Province continues to adhere to a strong and proactive reporting regime, with an 86% submission rate and all but one WSA submitting records with a high confidence rating. The Provincial Office, with the support of Umgeni Water, has demonstrated strong leadership in supporting municipal WC/WDM programmes and a consistent and effective monitoring programme.

Limpopo – Limpopo Province has historically had significant challenges with data collection and reporting on NRW. However, improvement is noted, with the water balance for the Province based on a 30% submission rate. Data quality remains a concern, with only one WSAs in the high confidence data category. The next step for the Province would be to promote the submission of the most basic water balance and improve data quality, to ensure that results are based on credible data that reflect the true state of NRW, particularly with the proportionately larger number of rural municipalities. This would facilitate an understanding of the true nature and extent of NRW in rural environments, which constitute a critical part of the NRW management picture in South Africa, and the water management and distribution discourse overall.

Mpumalanga – Mpumalanga Province presents a severely deficient reporting regime. The NRW water balance for the Province is based on a 47% submission rate, with most data sets in the low confidence category. The Province requires a robust and consistent reporting and monitoring programme for NRW initiatives. NRW reporting must be institutionalised in this Province to effect improvement.

Northern Cape – The Northern Cape Province shows significant variance in data quality across WSAs. Less than half of the municipalities (35%) submitted data, which a significant decrease from previous studies. The Province could benefit from improved data reporting efforts and a coherent system of monitoring and verification. A closer working relationship between the Provincial Office and the municipalities is required to improve data generation and reporting practices.

North West - The North West Province has seen significant growth in reporting in the past few years, driven by a few WSAs that have taken ownership of their WC/WDM programmes. However, the data quality for the Province remains in the medium and low confidence categories. The upward trend should be continued along with more robust and consistent data monitoring and verification programmes. NRW reporting must be institutionalised in this Province to ensure improvement.

Western Cape – The Western Cape Province has historically had an excellent NRW data reporting programme in place, and this continues to be the case. Most WSAs submitted NRW data in the high confidence category. This trend should be continued, as this level of credible data coming from the Province helps to create a realistic understanding of the nature and extent of NRW in South Africa.

It is positive to note that the three Provinces with the highest water use, namely, Western Cape, Gauteng, and KwaZulu-Natal, also provide the most credible information. These three Provinces represent 65.7% of the water use and 61.1% of the population served.

Category A - Metropolitan municipalities continue to report consistently and most can provide a water balance monthly. This is encouraging considering that metropolitan municipalities represent 53.3% of the total water use and 47.3% of the population served.

Category B1 and B2 - Most secondary cities and large municipalities can provide a water balance regularly, although there is considerable room for improvement in some Provinces. The secondary cities and large municipalities represent 21.4% of the total water use and 20.8% of the population served. These municipalities are of economic significance and should have the necessary budgets and resources to implement WC/WDM.

Category C2, B3 and B4 – Only 53% of the small and rural municipalities can provide an accurate water balance regularly. Reasons for this include lack of budget, difficultly measuring the supply due to the substantial number of boreholes, and large indigent consumer bases. These municipalities represent approximately 25.3% of the total water use and 31.9% of the population served.

Although the water balance calculation seems simple, the No Drop audits showed that it is the most complex part of the No Drop scorecard and took at least half a day per metro to analyse and interpret. Many WSAs state that the water balance calculations are too convoluted and that they do not have the time, skills, or resources to compile a water balance every month. Thus, the current focus is to encourage the submission of the most basic water balance regularly instead of focussing on accuracy. Although the DWS highlights and fixes typical errors and anomalies, analysing, interpreting, and improving the water balance will take time as the DWS and WSAs become better acquainted with the methodology and results. Providing feedback on the most basic water balance, helps to improve quality and credibility. The results from this study should also be seen as an indication of NRW and water losses in South Africa and improving the levels of confidence will require considerable time and resources.

3.4 ESTIMATED WATER BALANCES

Prior to the 2017 benchmark report, all reports calculated the national water balance based on extrapolation. The national water balance is highly influenced by and dependent on metro and secondary city data that have high confidence levels, while data for Category C2, B3 and B4 municipalities have low confidence levels and are poorly represented in the sample. The extrapolated results provided NRW figures between 35% to 40%, depending on the extrapolation methodology followed. To improve understanding of NRW and water losses in South Africa, the extrapolation method was substituted with a bottom-up approach, estimating a water balance for each municipality that could not provide information as explained in **Table 2**. The water balance was calculated and calibrated, if necessary, based on available information.

Table 2: Water balance estimation guideline

Municipal category	Average l/c/d consumption above RDP** level	Average l/c/d consumption below RDP level	Design guideline*	Billing efficiency
A	300	55	Very high development level = 260 to 480 l/c/d Yard connections = 55 l/c/d (typical)	90%
B1	250	55	High development level = 130 to 280 l/c/d Yard connections = 55 l/c/d (typical)	70%
B2	200	55	High development level = 130 to 280 l/c/d Yard connections = 55 l/c/d (typical)	50%
B3	150	55	Moderate to high development level = 80 to 145 l/c/d Yard connections = 55 l/c/d (typical)	30%
B4 and C2	100	25	Yard connections = 50 to 100 l/c/d Standpipe = 10 to 50	10%

* The Neighbourhood Planning and Design Guide (Part II) - Section J: Water supply (Department of Human Settlements, 2019)

** Reconstruction and Development Programme

The water balance components were calculated as follows:

- SIV = Average consumption x population served

  The population served was obtained from the DWS NWSKS

- FBW = 6 kl x number of indigent households

The number of indigent households were obtained from the Division of Revenue Bill (2016/17 to 2018/19)

- Billed consumption = (Total households - indigent households - unserved households) x average consumption x billing efficiency

  The number of households was obtained from the DWS NWSKS

  Average consumption and billing efficiency were obtained by applying the specifications in **Table 2**

- NRW = SIV - FBW - billed consumption

In most cases, historical data, the calculated value, and the all town or reconciliation strategy results were similar. For larger municipalities and municipalities supplied by bulk service providers, the average consumption tended to be higher than expected. These communities are often supplied from large water supply schemes that are at a more advanced level of development.

The estimated water balance calculations require further refinement and improvement. There are also discrepancies between the estimated water balance and the all town and reconciliation strategy results. Reasons for these discrepancies include reference to different supply areas, and the inclusion of mining, irrigation, and other large water users in the water resource balance. Mining, irrigation, and other large water users are excluded from the IWA water balance unless supplied by the municipality.

3.5 BENCHMARKS AND TARGETS

Interpreting the results from the water balance calculation and KPIs is critical to assess the performance of the water supply system. The results vary significantly across WSAs, depending on the level of service and development, as shown in **Table 3**.

Table 3: Basic information typical range

KPI	Metros	Local municipalities
Population	1 000 000 to 6 000 000	7 000 to 1 000 000
Length of mains (km)	5 000 to 15 000	50 to 5 000
Pressure (m)	30 to 60	30 to 60
Households / connection	1.0 to 3.0	1.0 to 1.5
Density of connections	40 to 80	30 to 70

Commercial or apparent losses are made up of unauthorised connections (theft), plus all technical and administrative inaccuracies associated with user metering and billing. If commercial losses were to be reduced, more revenue would be generated by and for the WSA. Traditionally, commercial losses were accepted as 20% of water losses but this assumption was revised in the Water Research Commission Report TT300/07 (WRC, Jan 2007) as shown in **Table 4**, which provides a more pragmatic approach to calculating commercial losses.

Table 4: Percentage commercial loss guideline

Unauthorised connections	%	Meter age and accuracy	Good water	Poor water	Data transfer	%
Very high	10%	> 10 years	8%	10%	Poor	8%
High	8%					
Average	6%	5- 10 years	4%	8%	Average	5%
Low	4%					
Very low	2%	< 5 years	2%	4%	Good	2%

Source: WRC Report TT300/07, 2007

The percentage of commercial water losses is calculated as follows:

$$\% \text{ Commercial water loss} = \sum (\text{unauthorised connections, meter age \& accuracy, data transfer})$$

The No Drop performance based regulatory programme has adopted the key performance area criteria shown in **Table 5,** which are in line with international best practice. The key performance area criteria should be used to establish targets that are realistic based on the existing water balance. Depending on the performance of the WSA, an improvement of one or two levels over a 5-year period would be realistic.

Table 5: No Drop key performance areas

ILI (physical water loss) performance categories

	>8	Extremely high physical water loss
	6-8	Poor performance in physical water loss
	4-6	Average physical water loss performance
	2-4	Good physical water loss performance but some improvement may be possible subject to economic benefit
	<2	Excellent physical water loss management

NRW (%) performance categories

	>40%	Extremely poor non-revenue water management
	30-40%	Poor non-revenue water performance
	20-30%	Average performance with potential for marked improvement
	10-20%	Good performance but some improvement may be possible subject to economic benefit
	<10%	Excellent non-revenue water management

Water Use Efficiency (l/c/d) performance categories

	>300	Extremely high per capita water use
	250-300	Poor per capita water use
	200-250	Average per capita water use with potential for marked improvement
	150-200	Good per capita water use but some improvement may be possible subject to economic benefit
	<150	Excellent per capita water use management

The results for most utilities fit into the performance categories and should be used to assess the performance of the WSA. If the results are not within these ranges, the water balance calculations should be checked or there should be reasons for the anomaly.

3.6 INTERMITTENT SUPPLY

There has been a noticeable increase in reported intermittent or rationed water supply by municipalities. Resolving intermittent supply is a prerequisite for an effective WC/WDM programme. Intermittent or rationed water supply should be avoided at all costs for the following reasons:

- Positive and negative (vacuum) pressures damage pipe seals and shorten the design life of the pipelines. These pipe seals can only be repaired through total pipe replacement.
- Air drawn into the distribution network during depressurisation is released mainly through consumer meters. Air passing through a consumer meter does not only damage the meter but also corrupts the meter reading. Corrupted meter readings will impair the metering and billing system and upset consumers.
- Dirt, sewage and other contaminants can enter the water distribution network when depressurised with a subsequent high risk of causing water borne diseases.

- Increased burst frequency and discomfort to consumers.
- Intermittent supply is expensive to operate and maintain through increased overtime and number of bursts.
- Infrastructure, such as isolating valves, is damaged when operated outside its intended use.
- Over time it becomes increasingly difficult for the municipality to pressurise the distribution system. It is almost impossible to fill pipes, reservoirs and towers when users leave taps open in anticipation of filling buckets, bathtubs and tanks.
- Users quickly adapt to their new supply conditions and inevitably revert to on-site storage to mitigate the inconvenience caused by the disruption in supply. Once on-site storage is established, consumers revert to their usual lifestyle, oblivious of the disruption in supply, with very little reduction in actual demand.
- Intermittent supply affects the local economy as businesses cannot plan and operate as intended.
- Intermittent supply impacts on KPIs. Unrealistically high or low values are often obtained if reliability of supply drops below 70%.

4 WATER BALANCE TRENDS

4.1 GENERAL

The water balance trends for all the Provinces are presented in the following sections. The following general comments apply to all the Provinces:

- The population served is a combination of the NWSKS data and figures provided by the municipalities. For the purposes of this study, population served at and above RDP standards, which is approximately 89% of the population, was used to calculate the per capita consumption. According to the NWSKS, only 68% of households have access to reliable water supply as summarised in **Table 6**. Very few municipalities include intermittent supply / reliability in their calculations, which can have a significant impact on the water balance and KPIs.

Table 6: Summary of households served (NWSKS, April 2023)

Province	Total Households	Access to Water Infrastructure Households	Access to Water Infrastructure Households %	Total At and Above RDP Level Water Infrastructure Households	Total At and Above RDP Level Water Infrastructure Households %	Reliable Water Households	Reliable Water Households %
Eastern Cape	1 748 487	1 312 702	75.08	1 214 441	69.46	784 442	44.86
Free State	1 049 686	1 035 143	98.61	1 028 244	97.96	737 615	70.27
Gauteng	5 985 580	5 951 793	99.44	5 919 358	98.89	4 926 896	82.31
KwaZulu-Natal	3 315 092	2 908 910	87.75	2 673 662	80.65	1 935 233	58.38
Limpopo	1 625 371	1 484 278	91.32	1 219 543	75.03	801 096	49.29
Mpumalanga	1 468 761	1 372 475	93.44	1 270 327	86.49	904 125	61.56
North West	1 469 867	1 384 000	94.16	1 238 953	84.29	872 843	59.38
Northern Cape	374 485	369 835	98.76	354 467	94.65	256 278	68.43
Western Cape	2 112 156	2 108 413	99.82	2 105 157	99.67	1 767 613	83.69
National	**19 149 485**	**17 927 549**	**93.62**	**17 024 152**	**88.9**	**12 986 141**	**67.81**

- The sudden increase in water balance data between 2015 and 2016 is because until 2015, only water balance information received from municipalities were included. From 2016, water balance was estimated for each municipality if no or poor data were received.
- The jump in 2016 population figures is because of corrections made by the DWS following the results from the 2016 Community Survey published by Statistics South Africa.
- Water balance information is continuously updated and improved, which means that the data shown in this report differs from the data presented in the previous benchmarking reports.
- Water losses and NRW have increased in most municipalities since the onset of the Covid-19 pandemic in early 2020. These increases are attributed to reduced payment levels, increased water use to curb the transmission of the virus, operations and maintenance budgets cuts, and lack of capacity in municipalities to undertake repairs due to ill health and deaths.

4.2 EASTERN CAPE PROVINCE

The water balance and trends for the Eastern Cape Province are based on 7 plausible data sets (50% of 14 WSAs). The water balance information is dominated by the Nelson Mandela Bay, Buffalo City, King Sabata Dalindyebo (Mthatha), and Enoch Mgijima (Komani, formerly Queenstown) municipalities, accounting for approximately 68% of the demand.

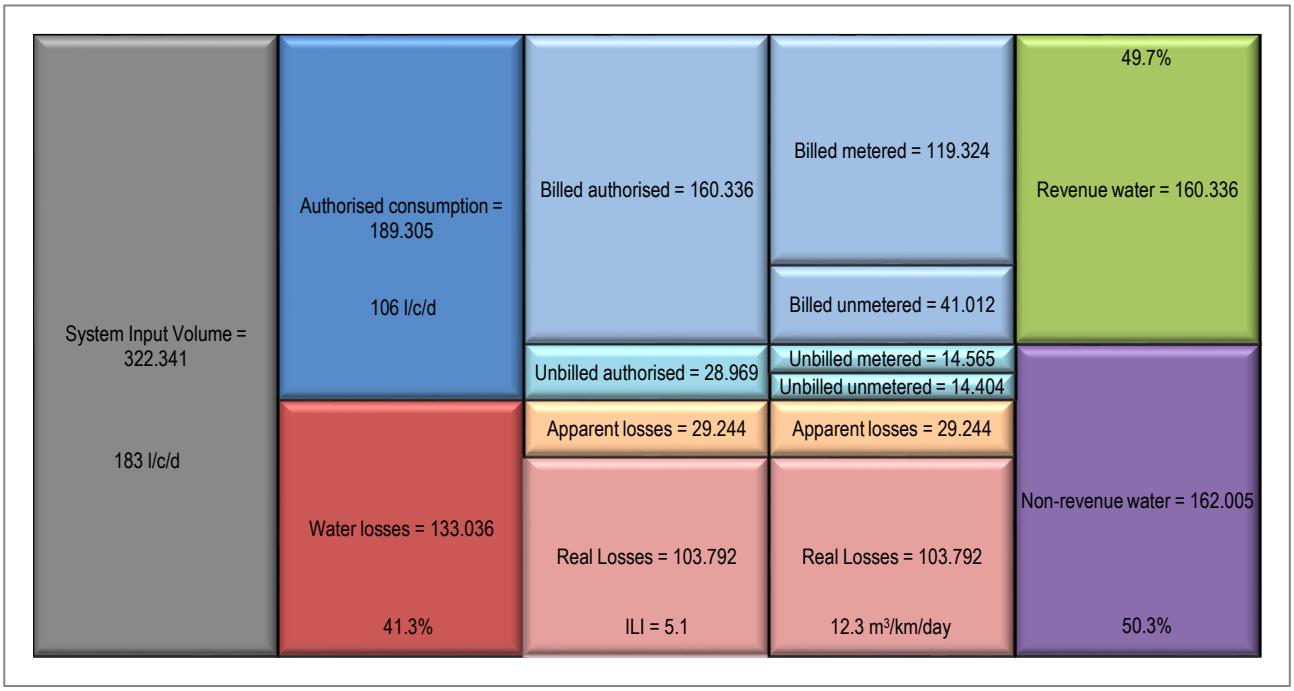


Figure 7: Eastern Cape Province water balance (million m³/annum)

Current results indicate NRW of 162.0 million m³/annum (50.3%) and corresponding water losses of 133.0 m³/annum (41.3%).

The NRW has improved slightly from 2020 until 2022. However, in 2023 NRW reached its highest level and half of the potable water supplied is not generating revenue. The billed metered and unmetered consumption has deteriorated in the past six years. The SIV has reduced slightly in parts of the Eastern Cape Province, and the estimated SIV is below the projected demand with WC/WDM. The lack of growth in the water demand is attributed to a combination of intermittent supply, imposed water restrictions, failing infrastructure and limited WC/WDM activities.

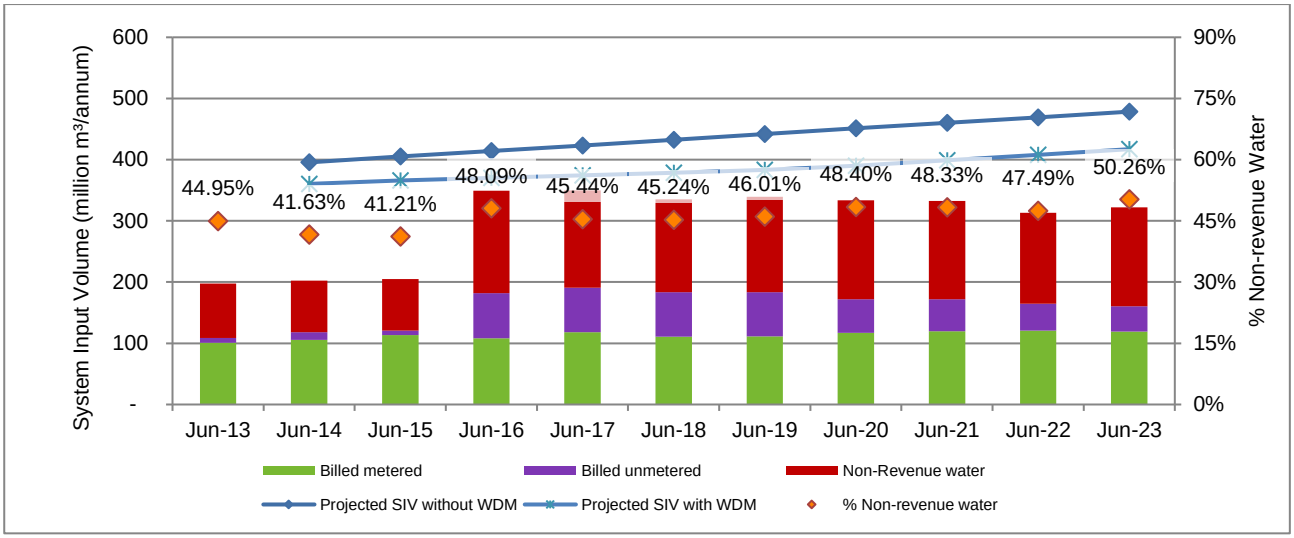


Figure 8: Eastern Cape Province SIV and NRW trend

The improved water use efficiency from 2019 is mainly because of the drought in Nelson Mandela Bay, intermittent supply, and a marginal variance in per capita consumption was observed in most other municipalities over the past six years, as shown below.

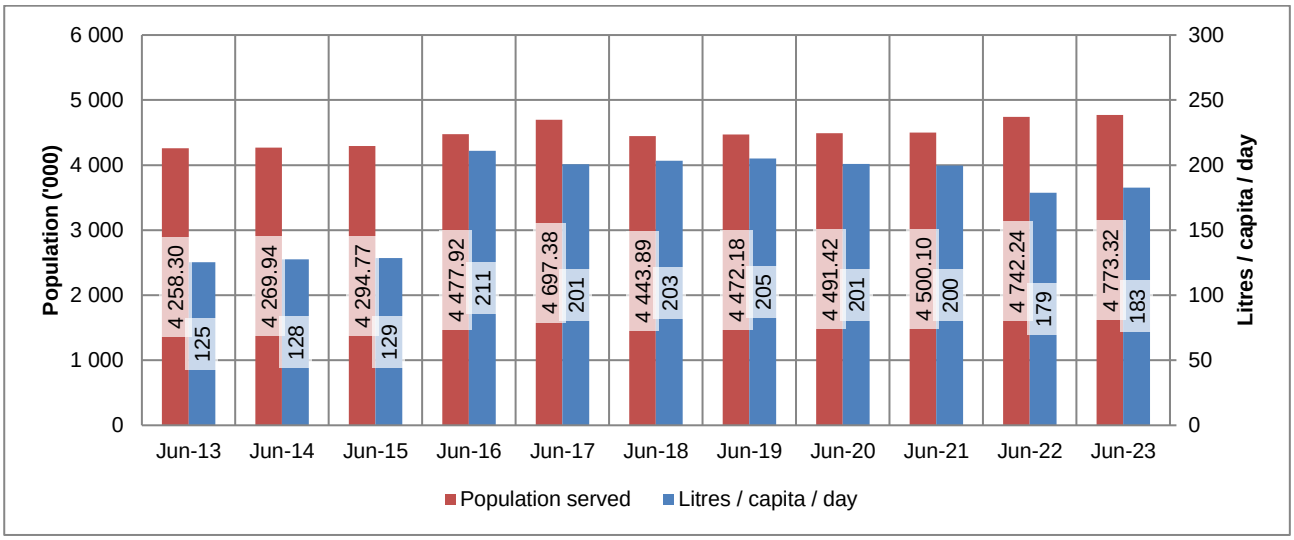


Figure 9: Eastern Cape Province population and l/c/d trend

Leakage levels remain an enduring challenge for the Eastern Cape Province with physical losses hovering around 103 million m³/annum over the past few years or 12.3m³/km/day. With water losses at approximately 133 million m³/annum and the ILI at 5.1, urgent review of the state of the water infrastructure and use across the Eastern Cape is required to address the unabated water losses that hamper the sustainability of the municipalities in the Province.

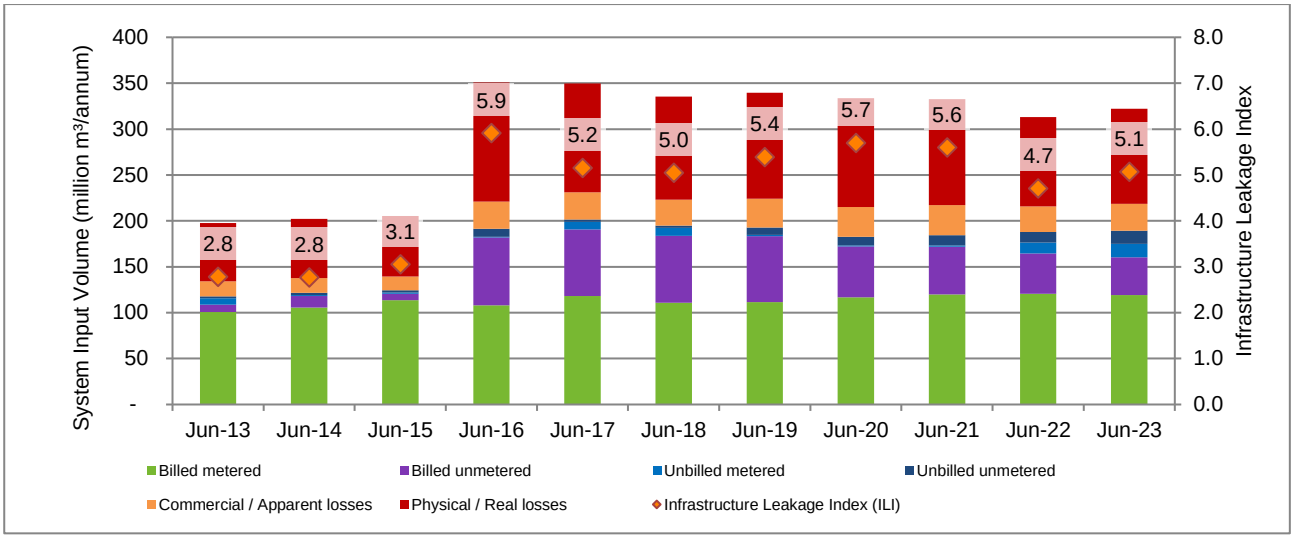


Figure 10: Eastern Cape Province water losses trend

4.3 FREE STATE PROVINCE

The Free State Province is based on a sample of 10 submissions (53% of 19 WSAs). The Province continues to have exceptionally poor levels of reporting, as was observed in previous assessments. The water balance information is dominated by the Mangaung, Matjhabeng, Dihlabeng, Maluti-a-Phofung, Moqhaka, and Metsimaholo municipalities, accounting for approximately 76% of the demand. The water balances for Dihlabeng, Maluti-a-Phofung, and Metsimaholo municipalities were estimated.

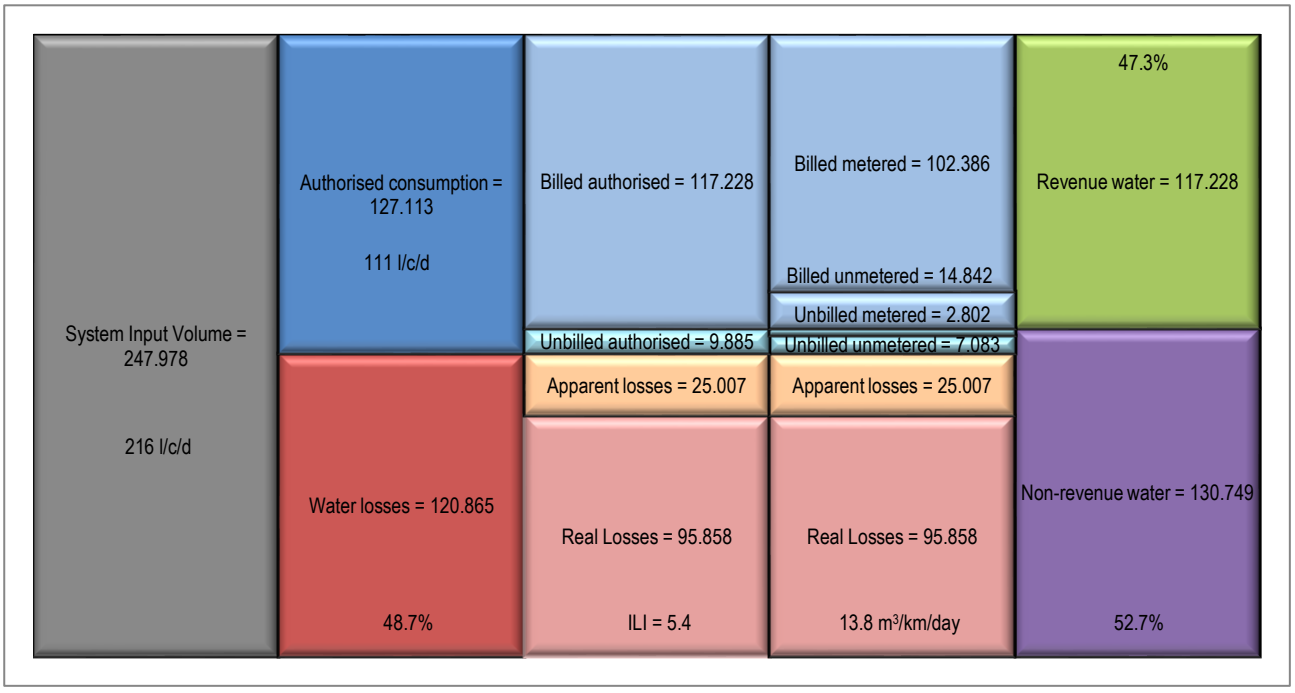


Figure 11: Free State Province water balance (million m³/annum)

The water balance indicates that NRW is at approximately 130.7 million m³/ annum (52.7%) and water losses at 120.9 million m³/annum (48.7%). The SIV has remained constant over the past five years and is below the projected demand with WC/WDM. The steady SIV is indicative of the severe droughts and water restrictions

imposed in the area, especially in Mangaung municipality. Intermittent supply and poor services delivery also contribute to the constant SIV.

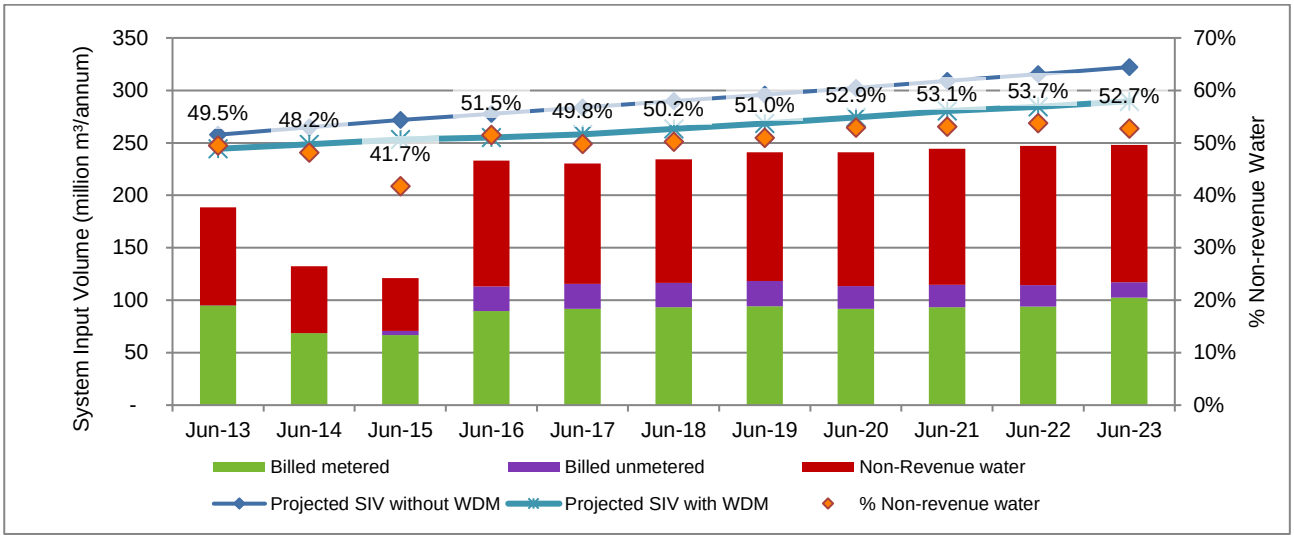


Figure 12: Free State Province SIV and NRW trend

NRW has fluctuated between 50% and 53% over the past six years. The variability before 2016 is because of inconsistent water balance submissions by municipalities. The data credibility must be improved, and the reporting managed more effectively, before the accuracy and extent of NRW in the Province can be evaluated.

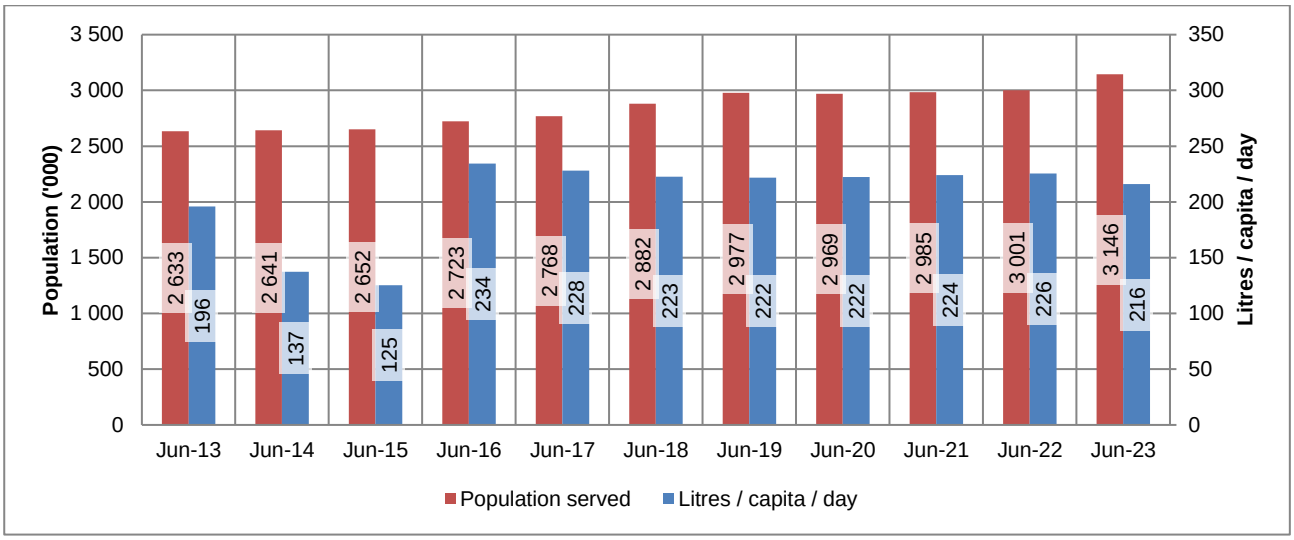


Figure 13: Free State population and l/c/d trend

The per capita consumption in the Free State Province shows a slight downward trend over the past six years. Current per capita consumption for the Province is 216 l/c/d, mainly because of the drought, imposed water restrictions, collapsing infrastructure, intermittent supply, and to a limited extent, water loss reduction intervention programmes. Given the level of service in the Province, there is significant scope for improvement in water use efficiency.

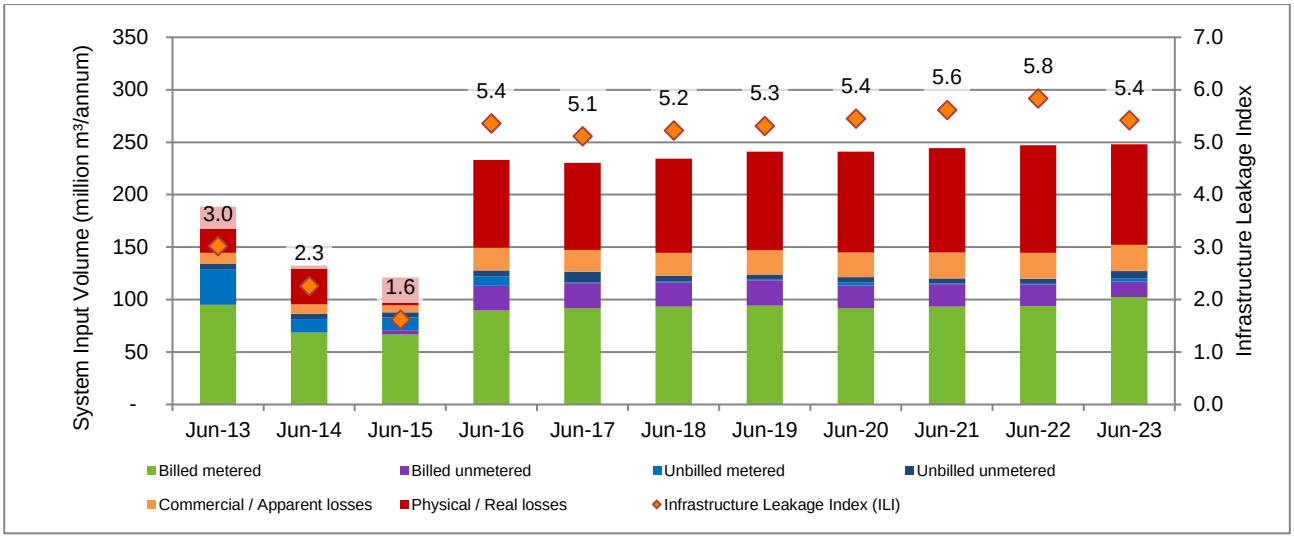


Figure 14: Free State water losses trend

The ILI in the Free State Province has improved slight in the past year, after it reached an unprecedented high of 5.8 in 2022. Real losses seem to be a main contributor to the high water losses in the Province and is estimated at 95.9 million m³/annum or 13.8 m³/km/day. The Province could benefit from a focused effort to repair and rehabilitate aging and deteriorating water infrastructure.

4.4 GAUTENG PROVINCE

The Gauteng Province water balance shows NRW of 667.5 million m³/annum (42.5%) and water losses of 545.3 million m³/annum (34.7%). This is based on 8 (89%) plausible data sets, which provides an accurate picture of the state of NRW in the Province. The water balance information for the Gauteng Province is dominated by the City of Johannesburg, City of Ekurhuleni, City of Tshwane, and Emfuleni municipalities, accounting for approximately 94% of the demand.

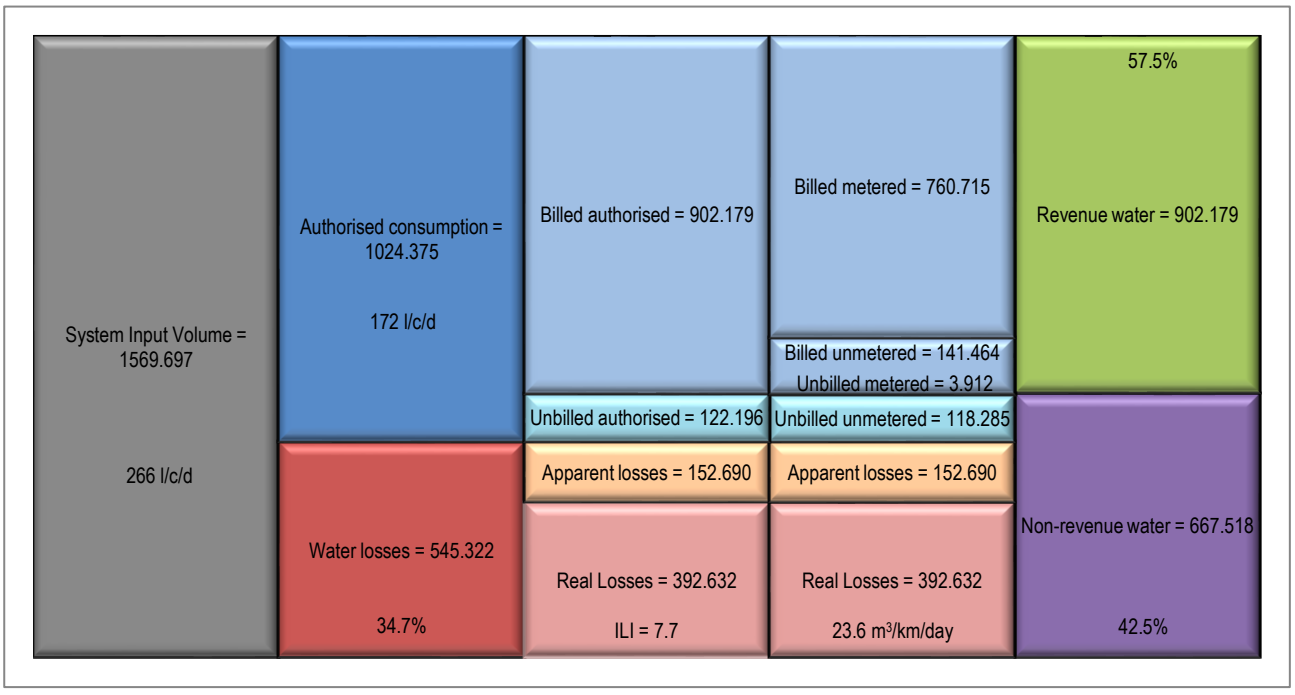


Figure 15: Gauteng water balance (million m³/annum)

The SIV, water losses and NRW have steadily increased over the past 10 years and municipalities have exceeded the projected demand with WC/WDM. More than 40% of the Province's water does not generate revenue and 27.5% is lost through physical losses. Given the importance of the Province as the economic hub of South Africa, water supply cannot be allowed to fail.

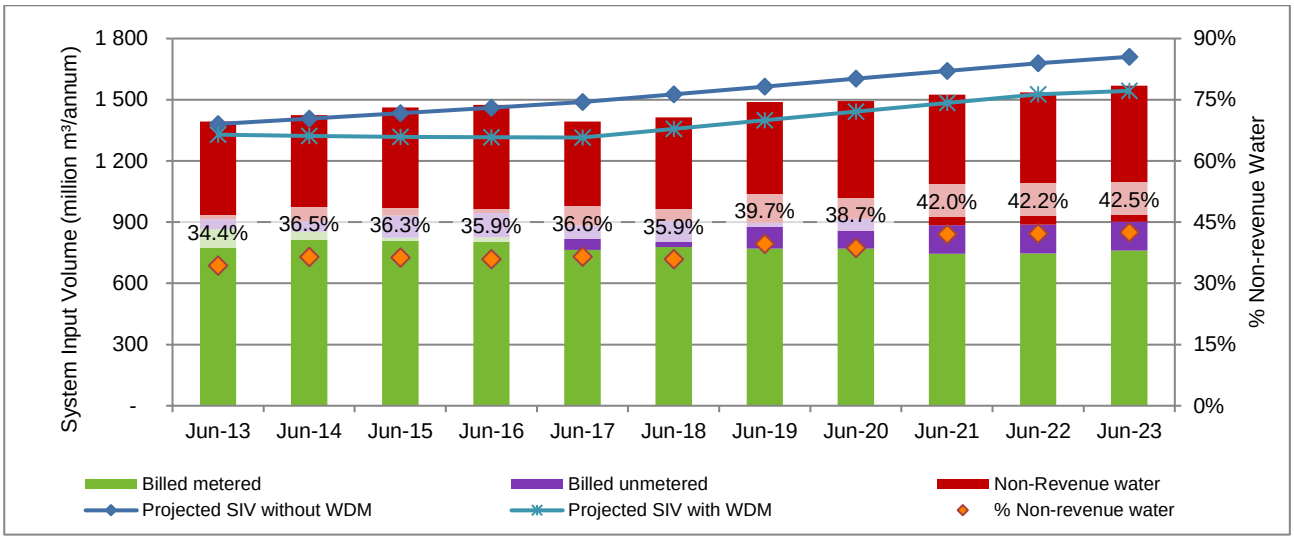


Figure 16: Gauteng SIV and NRW trend

The Province has been unable to reduce its water demand and water losses, as required by the reconciliation targets. The targets from the Vaal River System reconciliation strategy required that municipalities within this system had to reduce their demand by a minimum of 15%. This directive was issued almost 15 years ago, which was superseded by Project 1600 of Rand Water in 2017. Therefore, the municipalities must upscale their WC/WDM efforts rapidly to improve the security of supply. The SIV reduced in 2017 and 2018 with the enforcement of water restrictions due to the ongoing drought but returned to previous levels once the restrictions were lifted.

The per capita consumption for the Province shows a consistent trend until 2016, when water restrictions were imposed. WSAs have been able to lower the per capita consumption because of limited water loss reduction programmes, the population growth exceeding the growth in supply, and infrastructure reaching its design capacity or infrastructure failure. The per capita consumption is based on the total SIV and includes industrial and commercial use. City of Ekurhuleni is the metro with the highest number of wet industries in South Africa, with a current per capita consumption of 257 l/c/d.

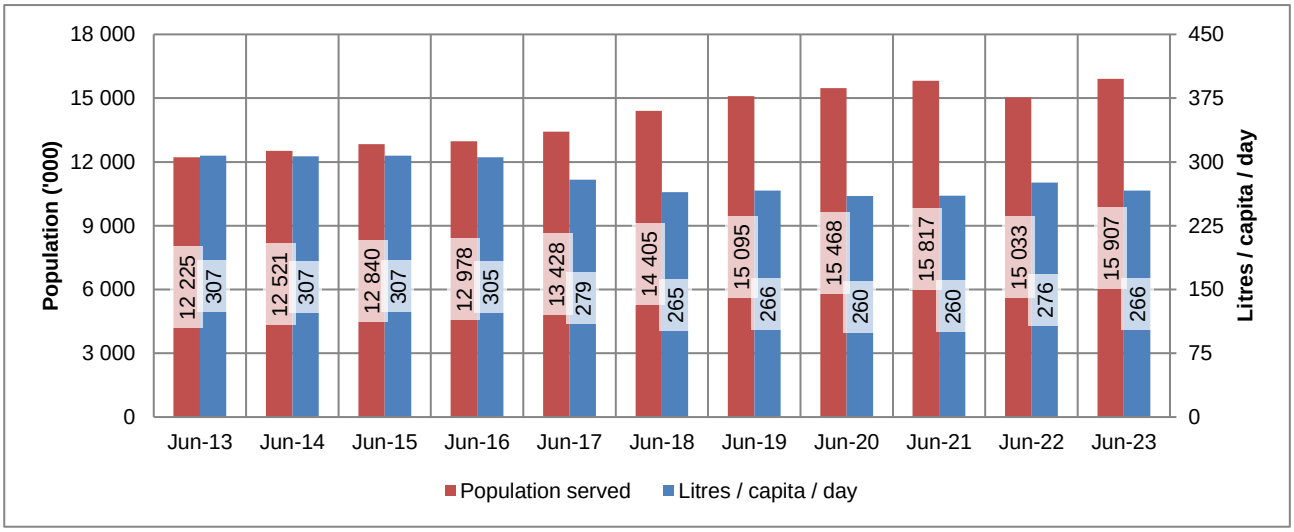


Figure 17: Gauteng population and l/c/d trend

Gauteng Province has been unable to reduce the demand in the past 10 years, although water use efficiency seems to have improved over the past six years. The NRW levels are at an unprecedented high, which places increasing pressure on the already strained Integrated Vaal River Supply System. The increased ILI is attributed to the COVID-19 pandemic, gradual reduction in billed consumption, and increased real losses. However, it seems municipalities are slowly recovering from the COVID-19 pandemic with a slight improvement in the real loss indicators over the past year. In terms of the No Drop KPIs, an ILI above 8 indicates extremely high physical water losses. The urgent implementation of appropriate WC/WDM measures and exceeding the 15% reduction target should be fast tracked to safeguard the security of water supply in the Province. There is significant scope for improvement in efficiency and the reduction of SIV, NRW, and water losses.

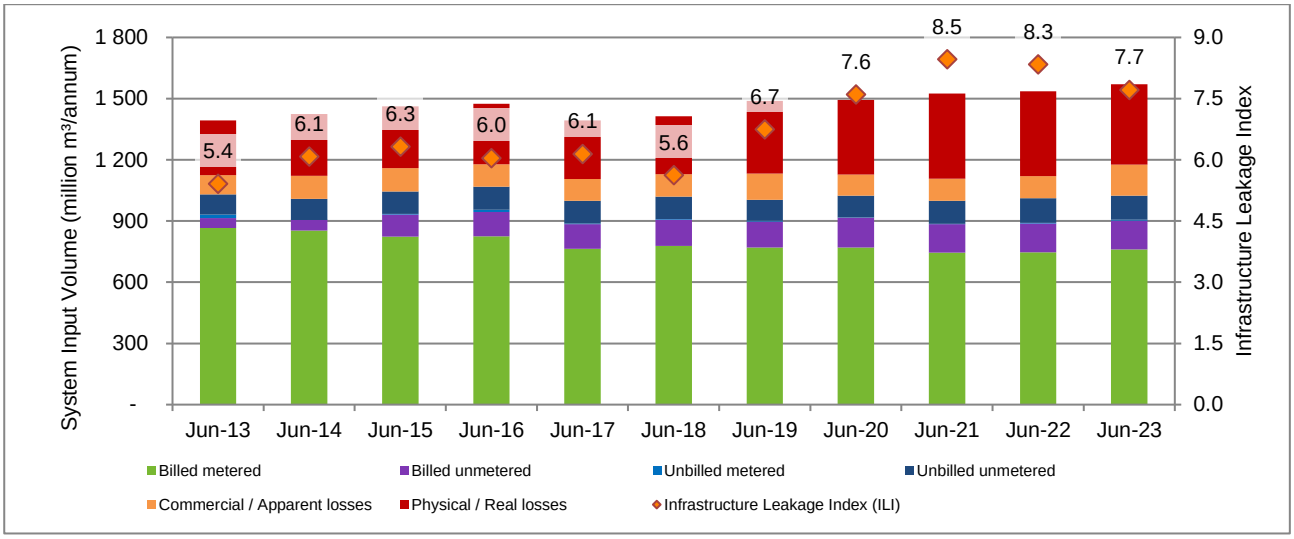


Figure 18: Gauteng water losses trend

4.5 KWAZULU NATAL PROVINCE

The water balance trends for the KwaZulu Natal Province are based on 12 plausible data sets (86% of 14 WSAs). The water balance information is dominated by the eThekwini, Msunduzi, Newcastle, and City of uMhlathuze municipalities, accounting for approximately 68% of the demand. The KwaZulu Natal Provincial Office has done excellent work to improve the monitoring of water losses in the Province.

The current water balance shows NRW of 486.9 million m³/annum (56.7%) and water losses of 401.6 million m³/annum (46.8%). While the NRW and water losses have gone up excessively in the past 2 years, the level of data accuracy has increased significantly, which should lead to improved decision making and water security.

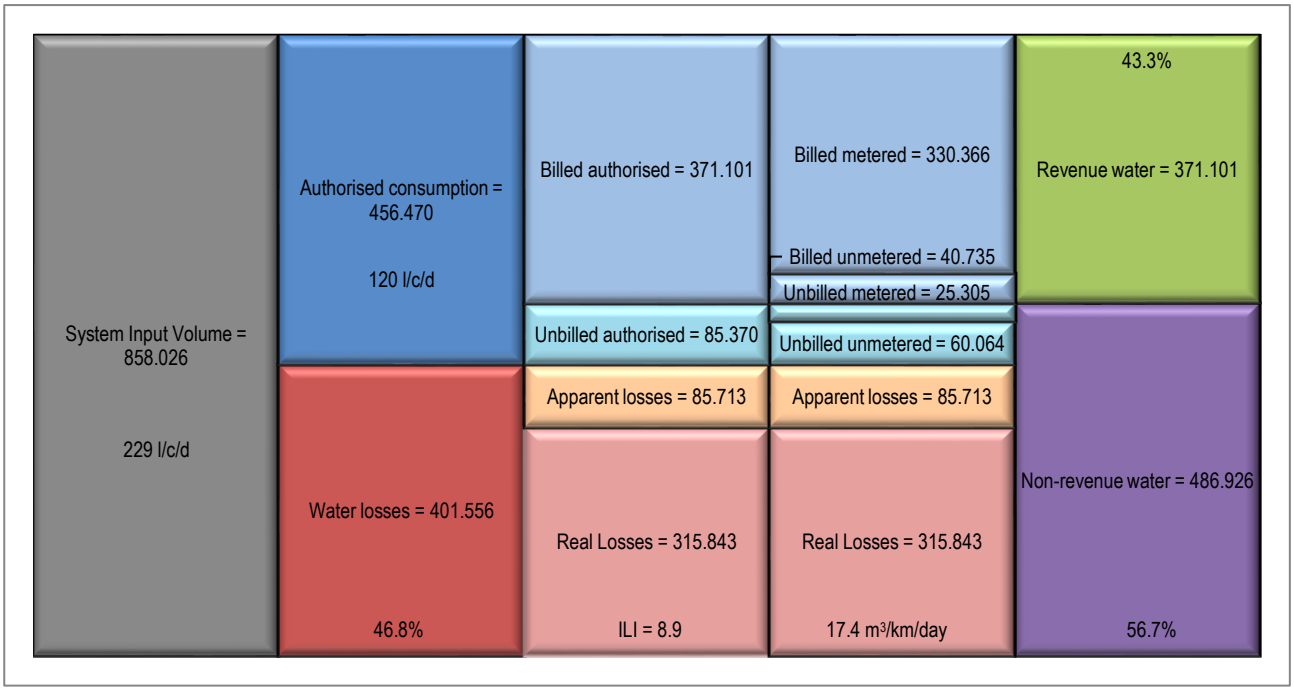


Figure 19: KwaZulu Natal water balance (million m^3/annum)

The trend since 2016 provides a reasonable indication of the situation in the KwaZulu Natal Province. The SIV and NRW reduced in 2017 and 2018 with the introduction of water restrictions, but these savings were negated over the past four years, and NRW reached an unprecedented high of 56.7% in 2023. The increase is attributed to the COVID-19 pandemic, deteriorating infrastructure, and metering and billing challenges. The projected demand with and without WC/WDM is significantly lower than the actual demand because water demand projections are not available for some WSAs.

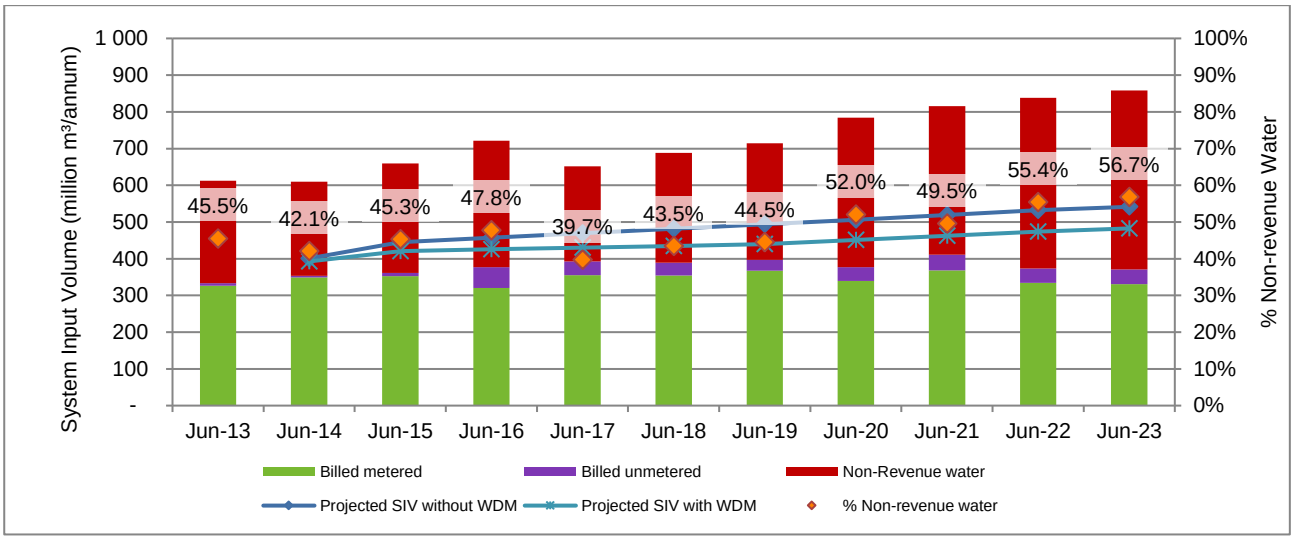


Figure 20: KwaZulu Natal SIV and NRW trend

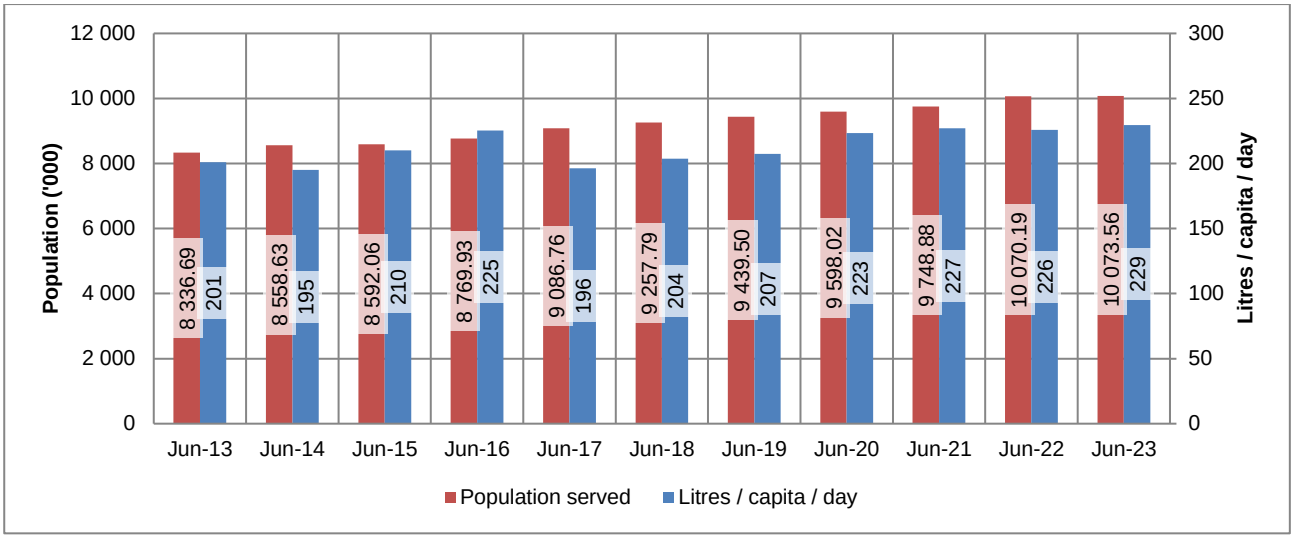


Figure 21: KwaZulu Natal population and l/c/d trend

The per capita consumption in the KwaZulu Natal Province reached an all-time high in 2023. It is important that municipalities in KwaZulu Natal Province return to pre-COVID-19 water balance levels to prevent water restrictions. It is encouraging to note that WSAs are increasingly reporting water balance information per water supply system and per local municipality, thus improving the resolution of the NRW data in the Province.

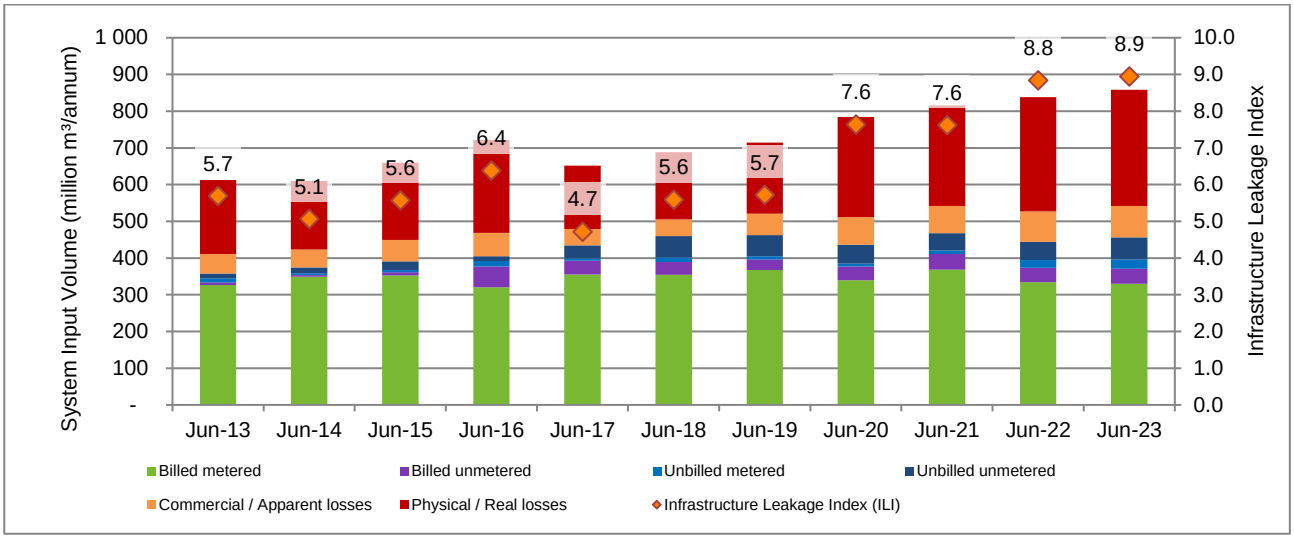


Figure 22: KwaZulu Natal water losses trend

The distribution losses have increased notably over the past five years, and the current ILI for the KwaZulu Natal Province is at a record high. The current ILI for the Province is poor, and signals the need for significant attention to monitoring, and investment in infrastructure repair, maintenance, and rehabilitation.

4.6 LIMPOPO PROVINCE

The water balance trends for the Limpopo Province are based on 3 plausible data sets (30% of 10 WSAs). Polokwane is the only secondary city included in the data set and together with the Greater Tzaneen, Ba-Phalaborwa, Thulamela (Thohoyandou), and Makhado municipalities account for 53% of the total demand.

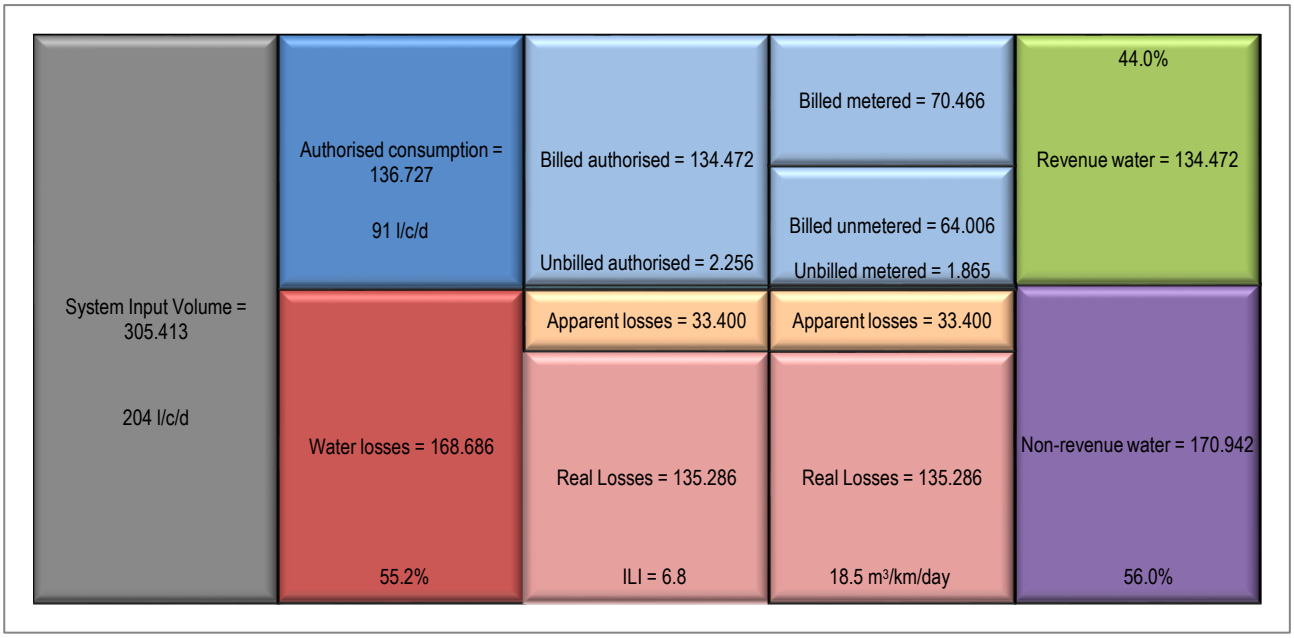


Figure 23: Limpopo water balance (million m³/annum)

The water balance indicates NRW of 170.9 million m³/annum (56.0%) and water losses of 168.7 million m³/annum (55.2%). The water balance trends for the Limpopo Province have remained consistent over the past six years. However, the data have low confidence levels. The analysis highlights the need for aggressive WC/WDM implementation, given that NRW is at exceptionally high levels and impacts on the financial sustainability of municipalities, and water security.

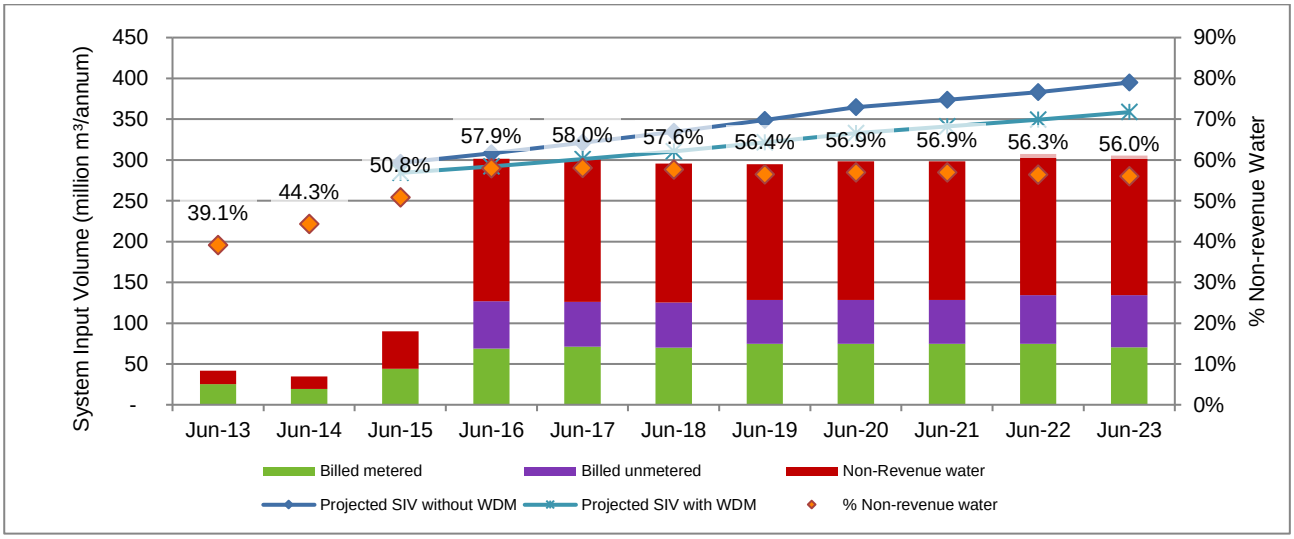


Figure 24: Limpopo SIV and NRW trend

The water balance trend also indicates that water demand is below the projected demand with WC/WDM. This trend needs further investigation as the population served has remained constant and reliability of supply is below 50% in the Province. A proactive revenue enhancement programme will be required to address NRW and the financial sustainability of WSAs. While it is acknowledged that the Province comprises a large rural component, which impacts significantly on the metering and billing ability of municipalities, it is in the best interest of the Province to ensure effective metering and billing wherever feasible. Flat rate billing in areas where billed metered consumption is not immediately possible may be a practical first step while municipalities work to formalise connections, or work on an appropriate strategy to effect metering, billing, and cost recovery in the long term.

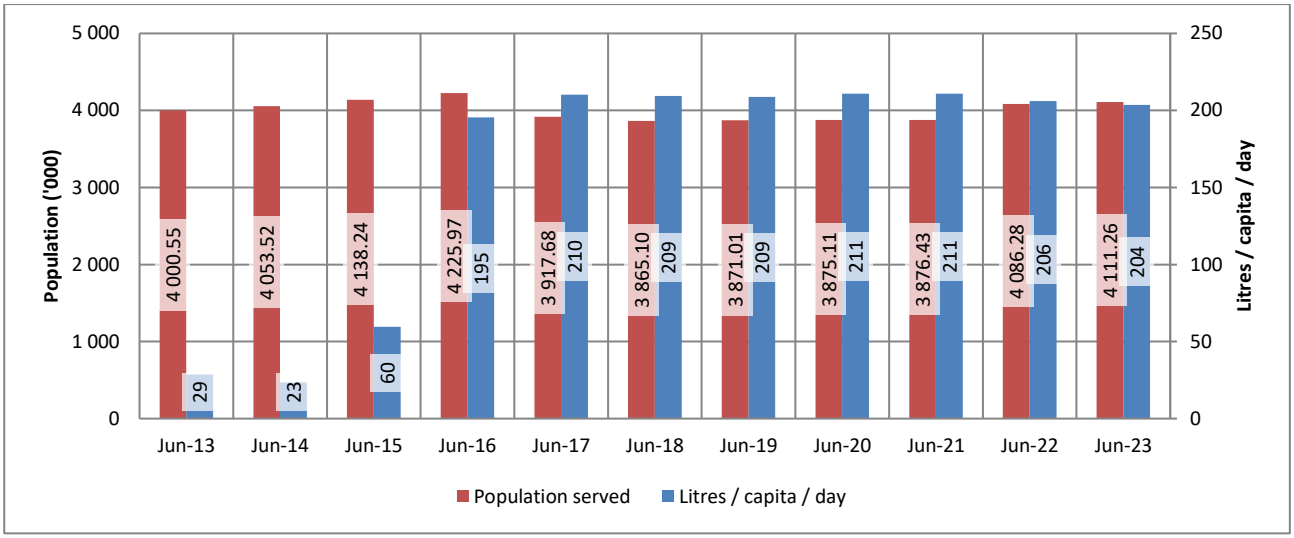


Figure 25: Limpopo population and l/c/d trend

The per capita consumption for the Limpopo Province has remained almost constant over the past six years because of the high number of estimated water balances. Given that the Province is mostly rural, the per capita consumption is high, considering the level of service and development in the Province. Water supply in these rural schemes is characterised by some users having an abundant supply and wasting water, while other users have limited access due to infrastructure failures, intermittent supply, and rationing. Improved reliability of water supply could encourage users to pay, which would discourage inefficient use. Effective tools to manage demand and improve efficiency could include community education and awareness, ideally extended to schools and commercial consumers. Measures such as pressure management could also help to reduce leakage during off peak periods and prolong the useful life of the distribution infrastructure and household plumbing fixtures.

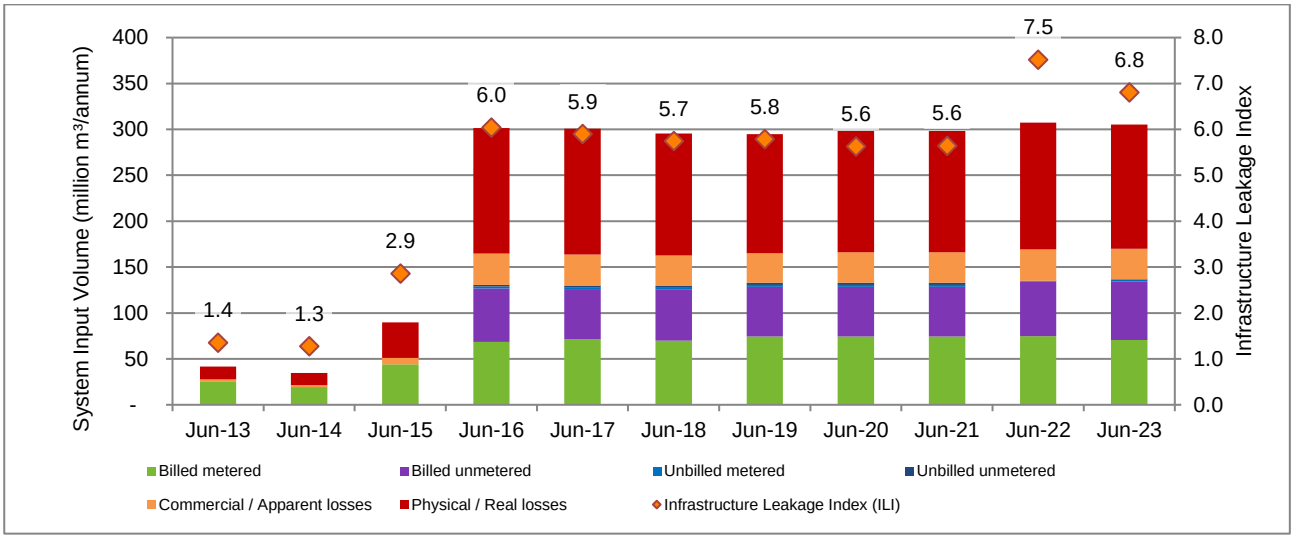


Figure 26: Limpopo water losses trend

The levels of leakage and water losses have increased over the past two years. Current trends indicate a record high ILI of 6.8, which is classified as poor performance on the No Drop scorecard. Further data verification and monitoring is required to determine the true extent of the distribution losses, which could be improved through increased bulk metering and monitoring to verify the data. This will assist in developing a cogent and effective WC/WDM implementation strategy.

4.7 MPUMALANGA PROVINCE

The water balance trends for the Mpumalanga Province are based on 8 plausible data sets (47% of 17 WSAs). The water balance information is dominated by the four secondary cities of Govan Mbeki, Emalahleni, Nkomazi, and City of Mbombela, accounting for 54% of the demand. The three large rural municipalities of Dr JS Moroka, Thembisile Hani, and Bushbuckridge account for 20% of the demand. Together, these seven municipalities account for 74% of the demand in the Province and should be the focus of ensuring water security and economic growth in the Province. The data are poor in the Province, and there are no active reporting systems in place, with 50% of data sets falling in the low confidence category. The status quo is untenable and requires urgent action to improve water security and sustainability through the development of a WC/WDM strategy and implementation programme.

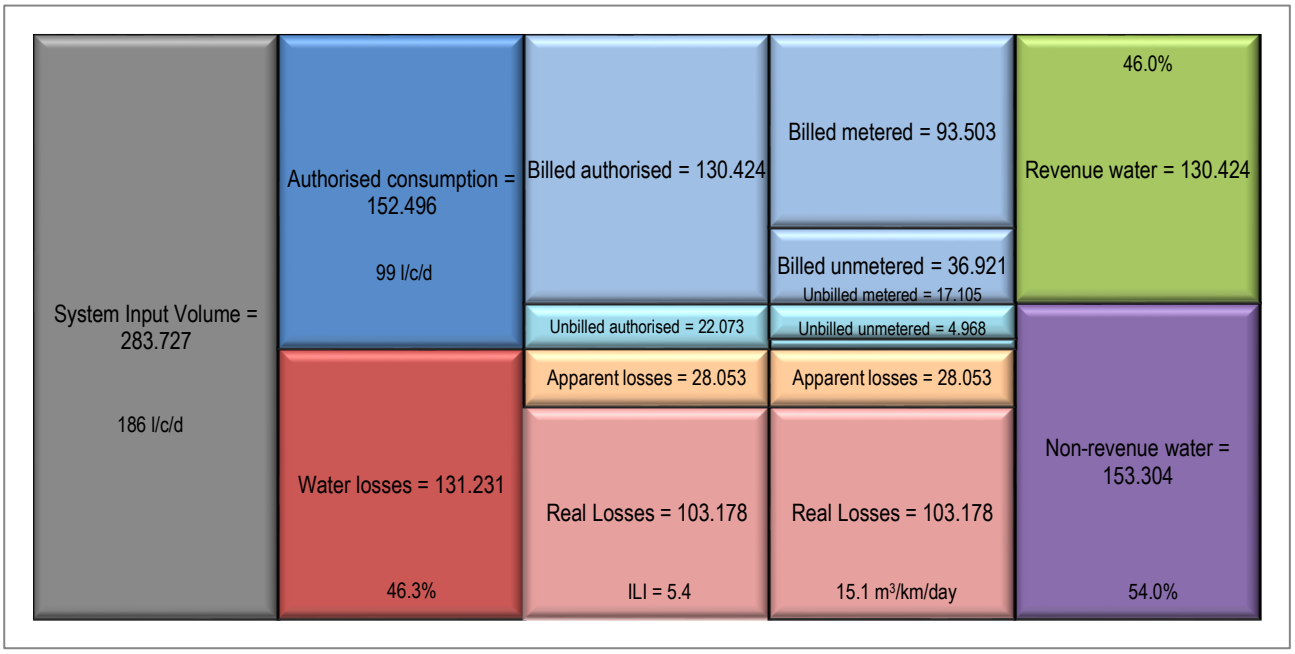


Figure 27: Mpumalanga water balance (million m³/annum)

The water balance indicates NRW of 153.3 million m³/annum (54.0%) and water losses of 131.2 million m³/annum (46.3%). The trends in the Province show a steady increase in SIV and NRW over the past eight years and is currently at its highest level in 10 years.

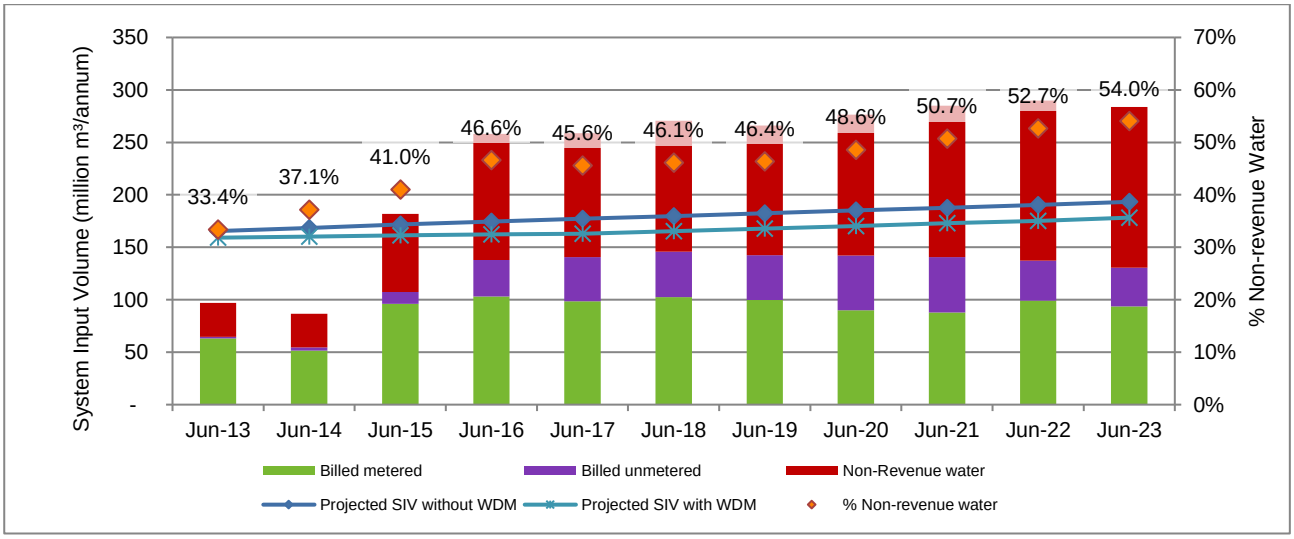


Figure 28: Mpumalanga SIV and NRW trend

One of the priority areas for the Mpumalanga Province will be to improve the quality of data and frequency of reporting, to develop coherent trends that can provide sound intelligence on the nature and extent of NRW and water losses in the Province. The SIV is much higher than the projected demand with and without WC/WDM because of the unavailability of demand projections for some municipalities. The Province must accelerate and upscale its WC/WDM programme implementation to curb the growing water losses and NRW in the Province. Key demand centres such as City of Mbombela, Govan Mbeki, Emalahleni, and Steve Tshwete municipalities require ongoing demand management programmes to significantly reduce water losses and pave the way for the other municipalities to do the same.

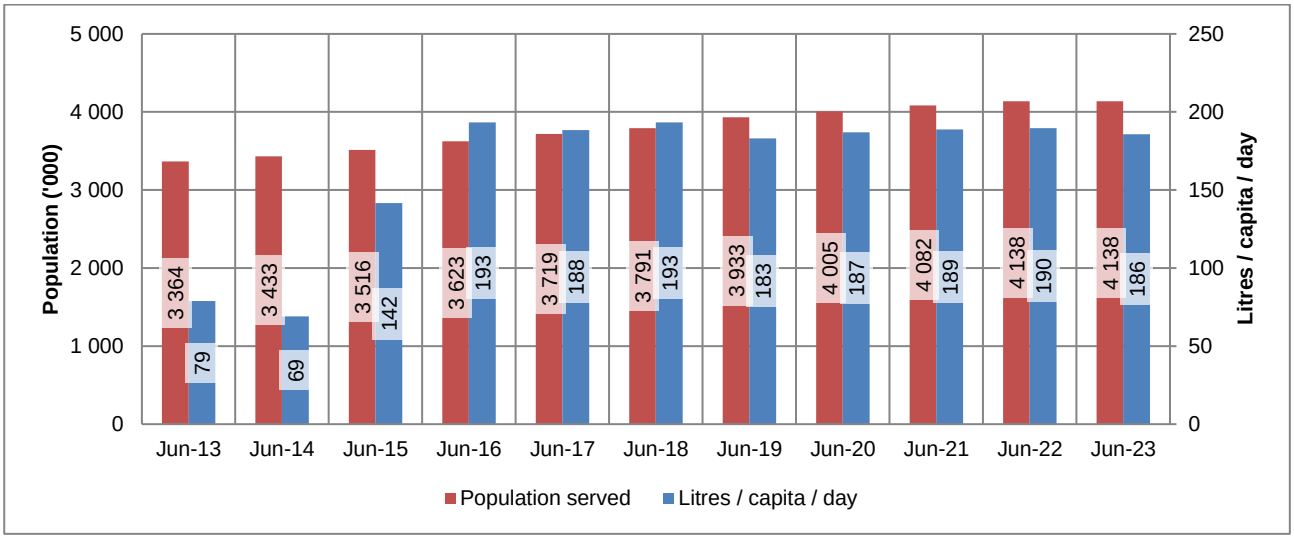


Figure 29: Mpumalanga population and l/c/d trend

Per capita consumption has remained constant over the past six years due to the high number of estimated water balances and lack of reporting by WSAs. The per capita consumption is good compared with the No Drop scoring criteria, but there is room for improvement considering the high number of rural schemes and level of services in the Province.

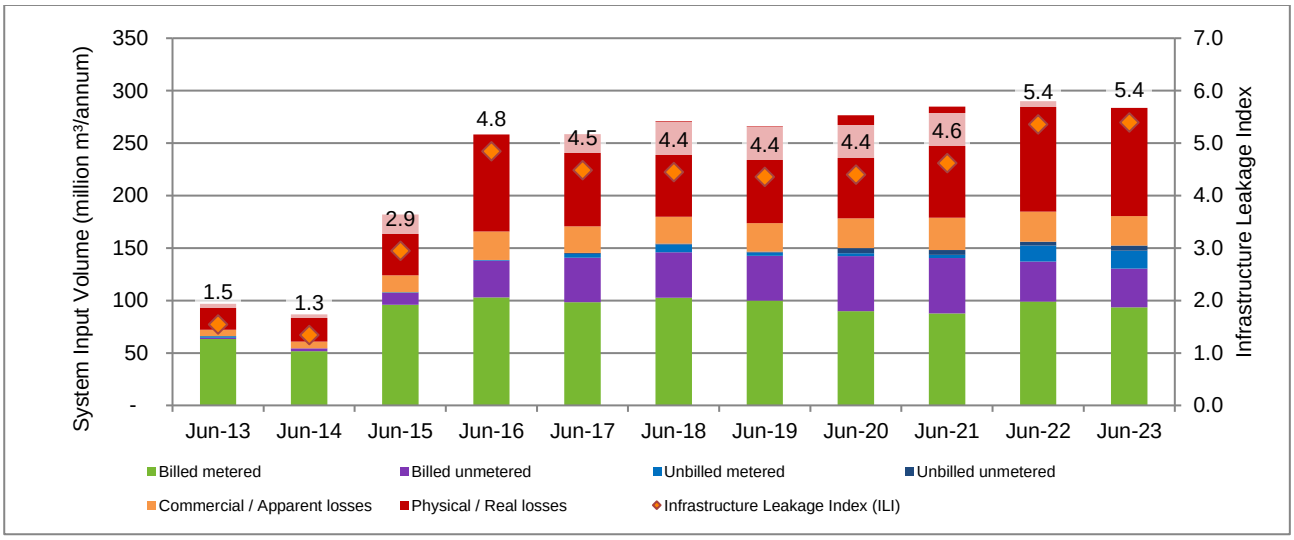


Figure 30: Mpumalanga water losses trend

The water loss trend for the Mpumalanga Province shows a steady increase in NRW, SIV, and water loss between 2016 and 2023. The billed metered consumption shows a gradual reduction which is cause for concern, and the ILI is at an all-time high of 5.4, which is similar to the trend in the other Provinces.

4.8 NORTH WEST PROVINCE

The water balance for the North West Province, indicates NRW of 121.1 million m³/annum (50.4%) and water losses of 116.1 million m³/annum (48.4%). These trends are based on 6 datasets (60% of 10 WSAs). The water balance information is dominated by the Madibeng, Rustenburg, Mahikeng, City of Matlosana, and JB Marks municipalities, accounting for 66% of the water demand. Only Rustenburg and JB Marks, submitted water balance information, but the results are questionable and further improvements will be required. Both the NRW and water losses indicate poor performance in terms of the No Drop scoring criteria, and WSAs must enhance revenue to assist in improving sustainability and extending the delivery of services to un-serviced communities, given the imperatives of the NDP.

Figure 31: North West water balance (million m³/annum)

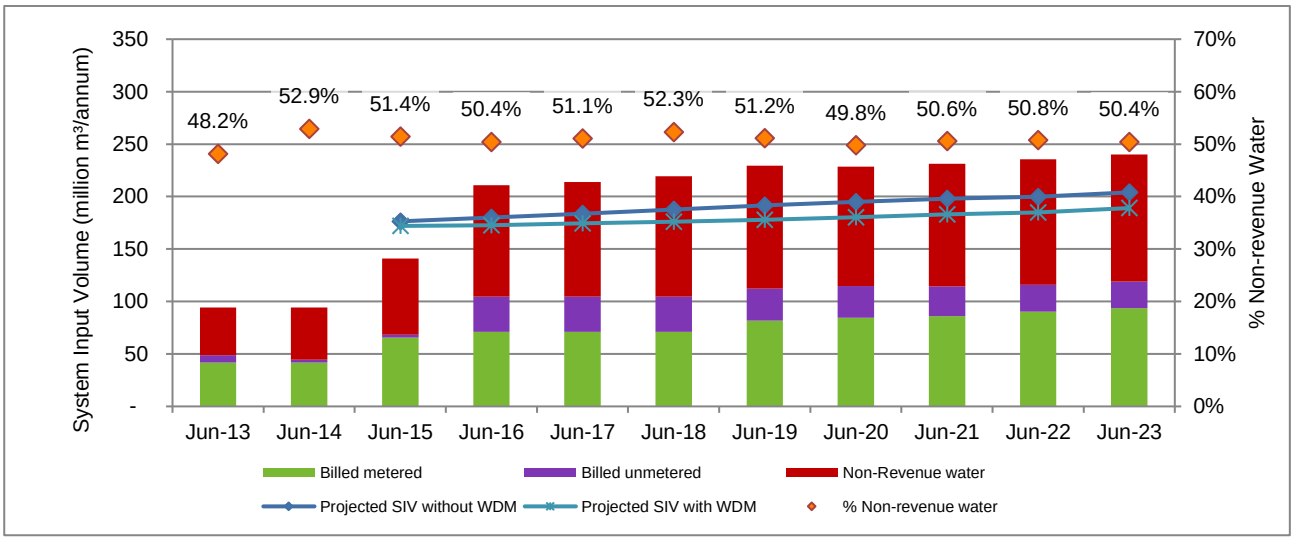


Figure 32: North West SIV and NRW trend

Water losses and NRW has remained constant between 2016 and 2023 with slight decreases observed between 2019 and 2021. The SIV is above the projected demand with and without WC/WDM because there are no strategies available for certain municipalities, and in other instances, due to data discrepancies.

Alignment between the water balance data and all town strategy results will be required to address this problem.

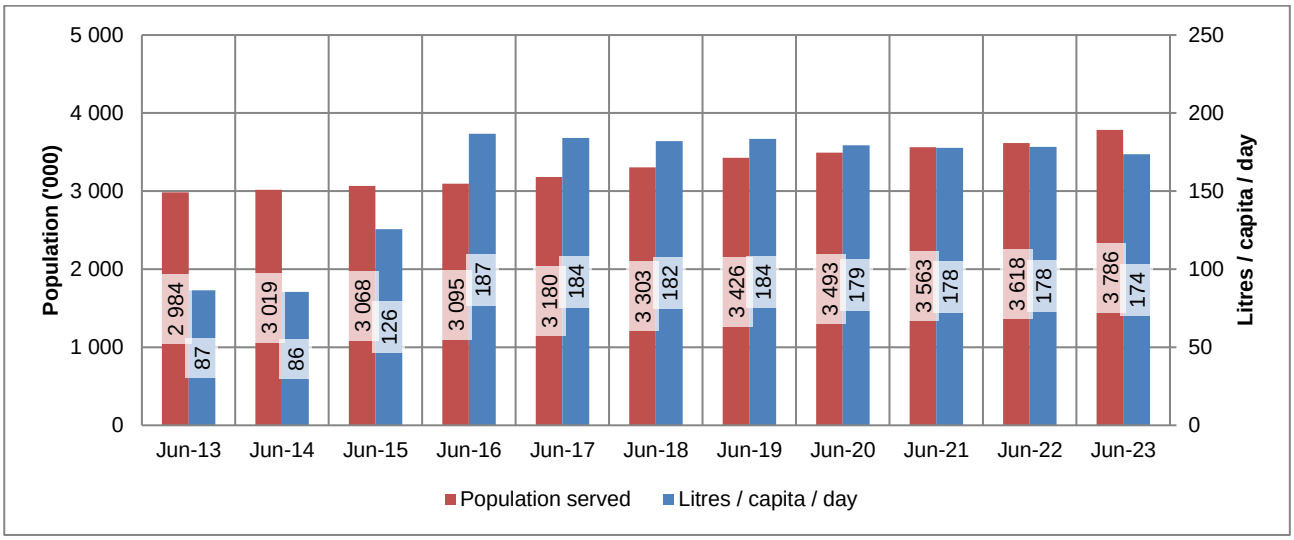


Figure 33: North West population and l/c/d trend

The per capita consumption in the North West Province has shown a slight improvement from its peak of 187 l/c/d in 2016. The improvement warrants further investigation due to the high number of estimated water balances in the Province and the poor reliability of the supply system.

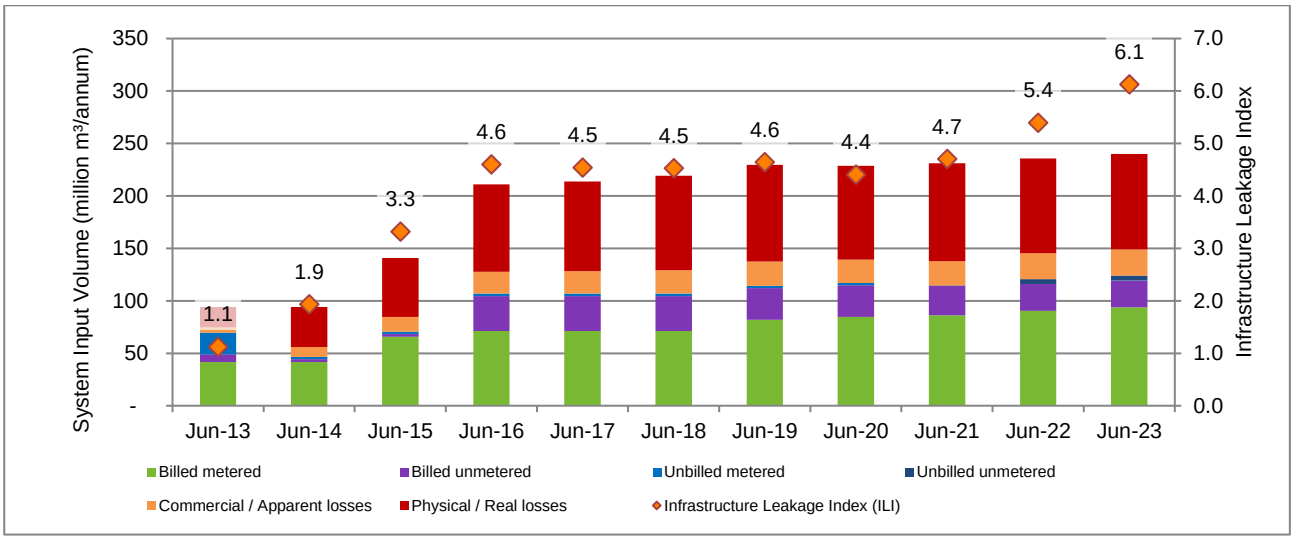


Figure 34: North West water losses trend

The North West Province has been unable to reduce its demand or water losses for the past six years despite an increase in billed metered consumption. WSAs must reduce their physical losses to reap the benefits of the revenue enhancement programmes. Real losses are at an all time high with an ILI of 8.1 or 10.8 m^3/km/day.

4.9 NORTHERN CAPE PROVINCE

The water balance and trends for the Northern Cape Province are based on 6 plausible data sets (35% of 26 WSAs). The water balance information is dominated by the Dawid Kruiper and Sol Plaatje municipalities, accounting for approximately 52% of the demand. Both municipalities have been able to submit water balance information for the past two years.

The current water balance indicates NRW of 59.4 million m³/annum (55.3%) and water losses of 57.0 million m³/annum (53.1%).

Figure 35: Northern Cape water balance (million m³/annum)

The current water balance trends indicate that the SIV and NRW have been steadily increasing over the past few years. The NRW and water losses in excess of 55% are cause for concern, particularly given the extremely dry climatic conditions in the Province. Robust WC/WDM programmes will be required in all the municipalities to reduce water losses and secure the sustainability of water supply. The SIV is below the projected demand with WC/WDM due to the high projections in municipalities that include mine water use. Alignment of the all-town strategies and the actual water balance information are required to assess if the targets are realistic and to measure progress made with the implementation of water loss reduction and efficiency programmes. NRW increased significantly in the past two years and peaked at 55.4% in 2021, a trend that has also been noticed in other provinces. This peak is attributed to the COVID-19 pandemic.

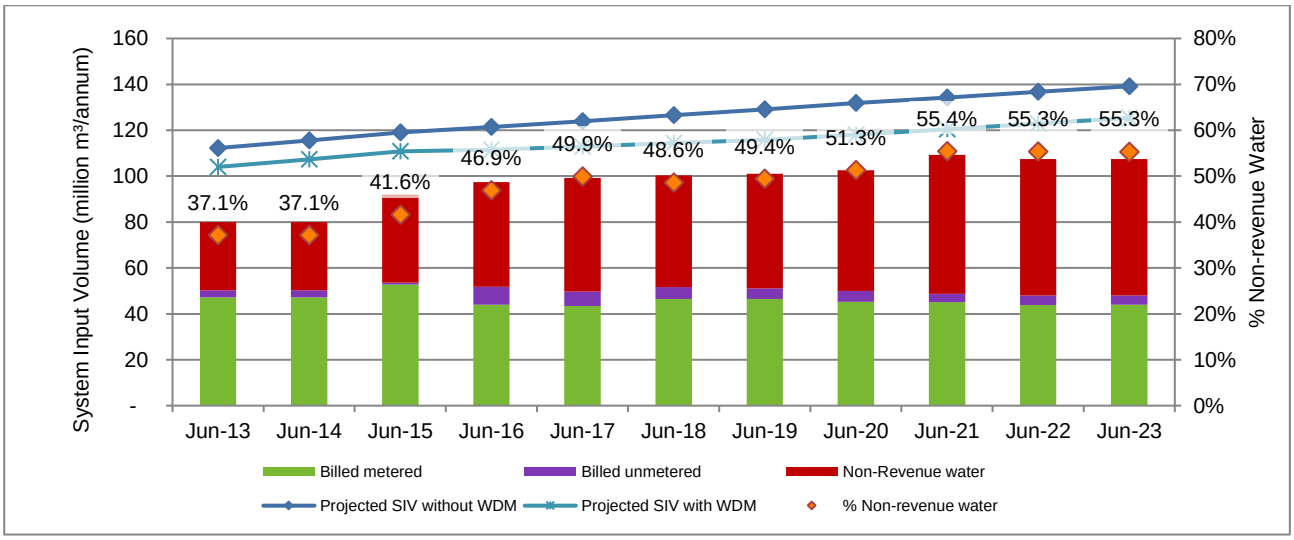


Figure 36: Northern Cape SIV and NRW trend

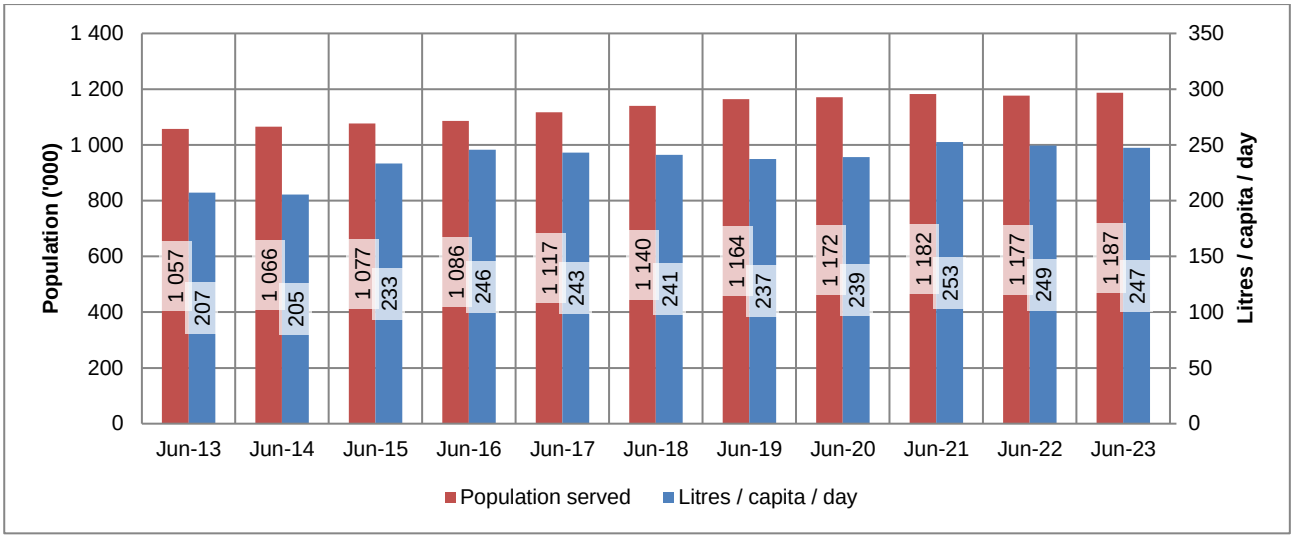


Figure 37: Northern Cape population and l/c/d trend

The current per capita consumption of 247 l/c/d is high in terms of the No Drop scoring criteria and level of service in the Province. It will be necessary for the municipalities to collectively assess their reconciliation targets to ensure that the demand and population growth pressures do not exceed available supply.

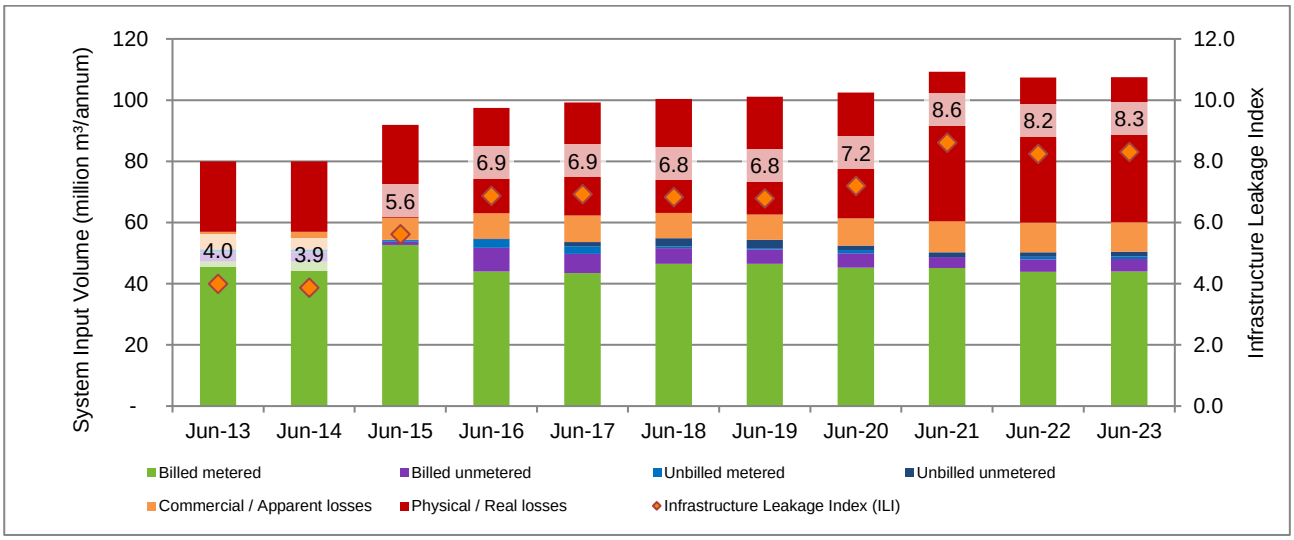


Figure 38: Northern Cape water losses trend

The ILI peaked at 8.6 in 2021, with signs of improvement in 2022 and 2023. The ILI reflects poor performance by WSAs that must increase their efforts to reduce visible leakage.

4.10 WESTERN CAPE PROVINCE

The water balance and trends for the Western Cape Province are based on 26 plausible data sets (100% of 26 WSAs). The Western Cape Province is commended for being the only Province that has a 100% water submission rate. The water balance information is dominated by the City of Cape Town, Drakenstein, Stellenbosch, Saldanha Bay, Breede Valley, and George municipalities, accounting for approximately 83% of the demand. The water balance data quality for the Western Cape Province is exceptionally good and is testament to the consistent efforts of the municipalities, effectively promoting and implementing WC/WDM and NRW management measures. The DWS Provincial Office is also lauded for its efforts to implement active monitoring and reporting mechanisms and issuing directives if municipalities do not report.

The water balance for the 26 data sets shows NRW of 126.7 million m³/annum (27.9%) and water losses of 116.2 million m³/annum (25.5%).

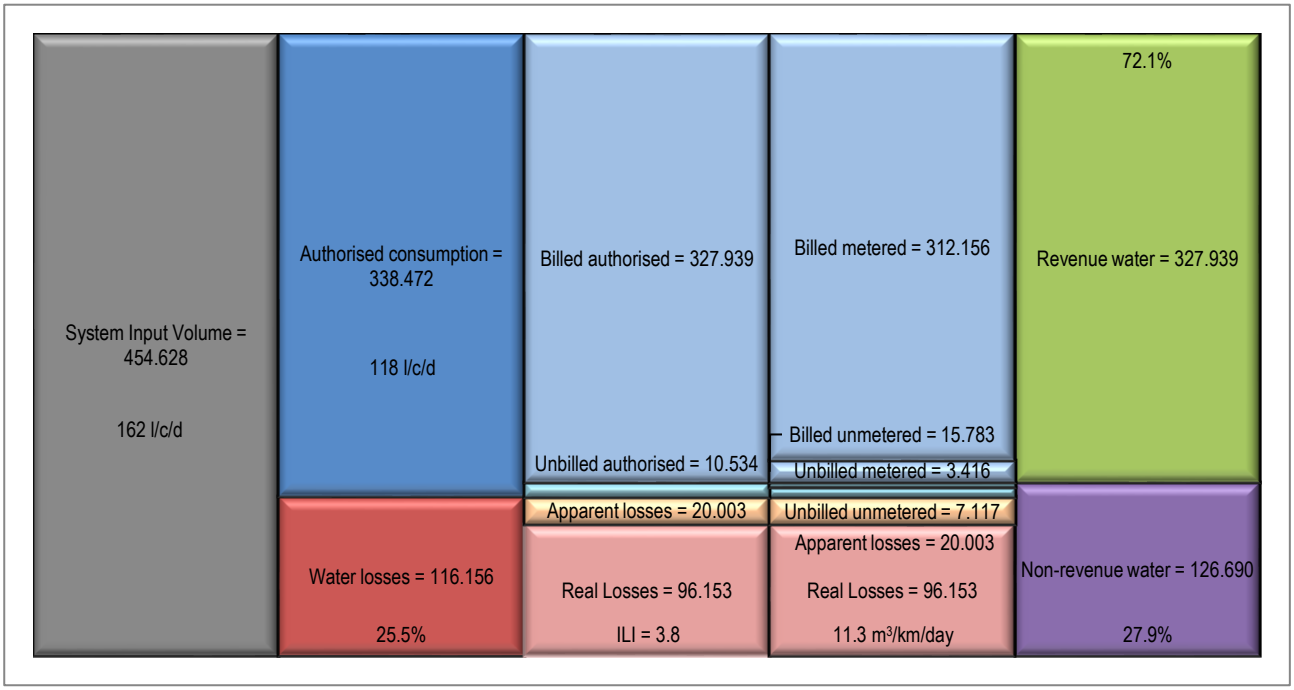


Figure 39: Western Cape water balance (million m³/annum)

It is commendable that municipalities in the Western Cape Province managed to reduce their SIV in 2018 and 2019 by approximately a third, without using intermittent supply to curb the impact of the severe drought and the looming "day zero". The SIV and NRW have increased steadily since then, but the trend remains well below the projected demand with WC/WDM. The consistently low NRW can also be attributed to the continuous execution, monitoring, and reporting, by both the DWS Provincial Office and municipalities.

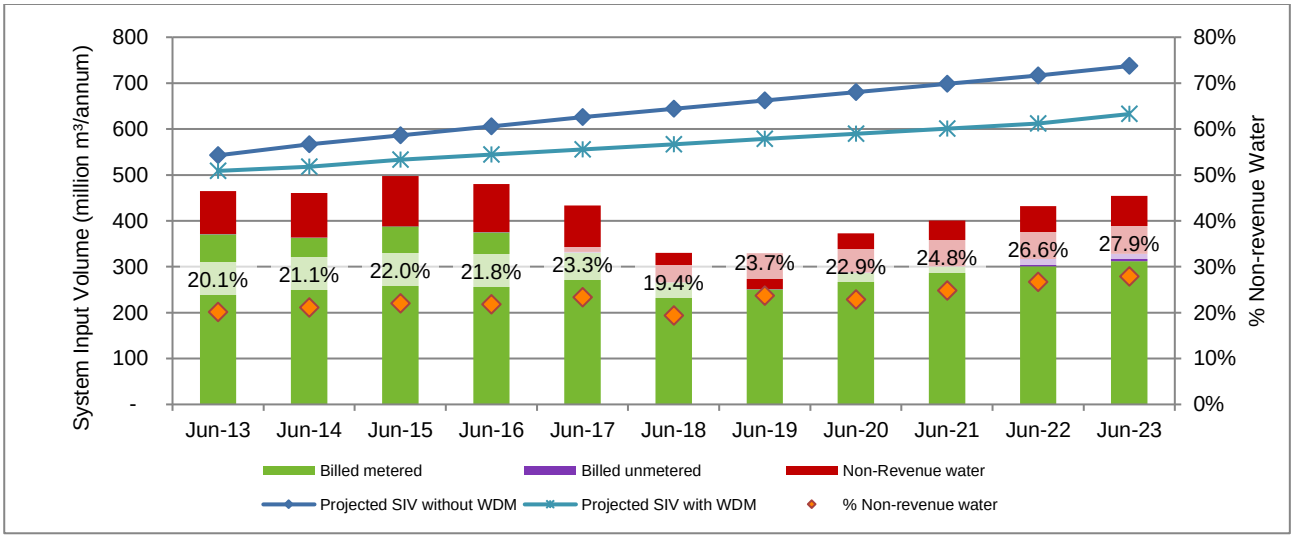


Figure 40: Western Cape SIV and NRW trend

The per capita consumption for the Western Cape Province consistently decreased between 2015 and 2019, with record lows during 2018 and 2019. The per capita consumption increased since 2029 but continues to track well below the population growth trends, indicating high water use efficiency in the Province.

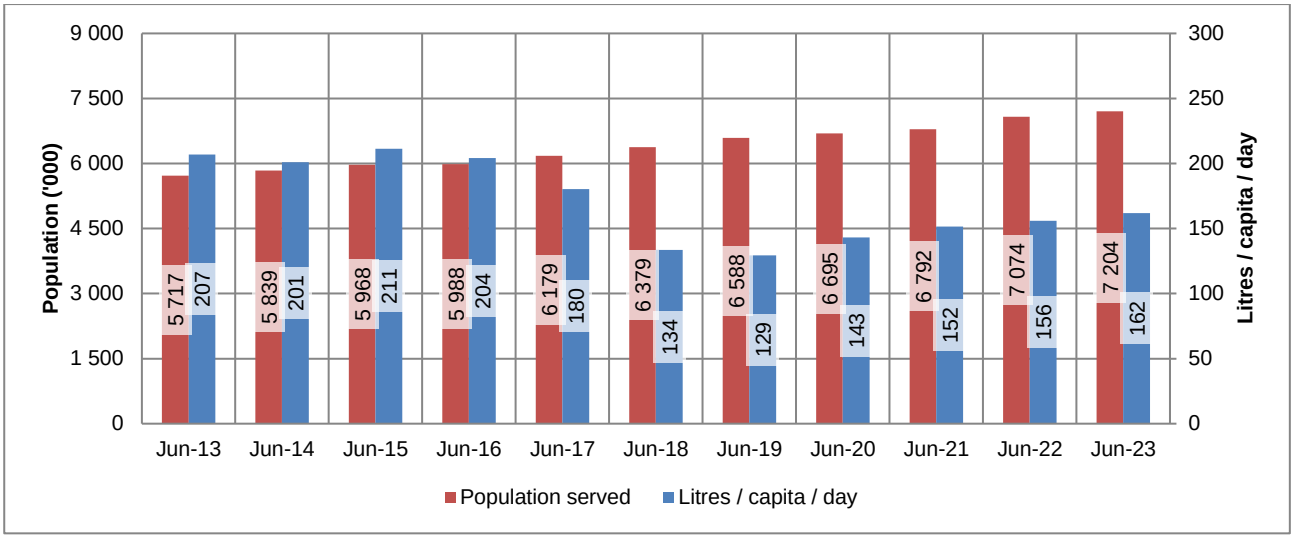


Figure 41: Western Cape population and l/c/d trend

Based on the current trends, water losses have increased considerably in the past two years with the ILI peaking at 3.8. Given the notable gains of the past few years, the municipalities in the Province should continue their efforts, avoiding complacency in keeping up the maintenance and management of the water supply infrastructure, and mitigate the devastating impact of changing climatic conditions observed in the Province in recent times.

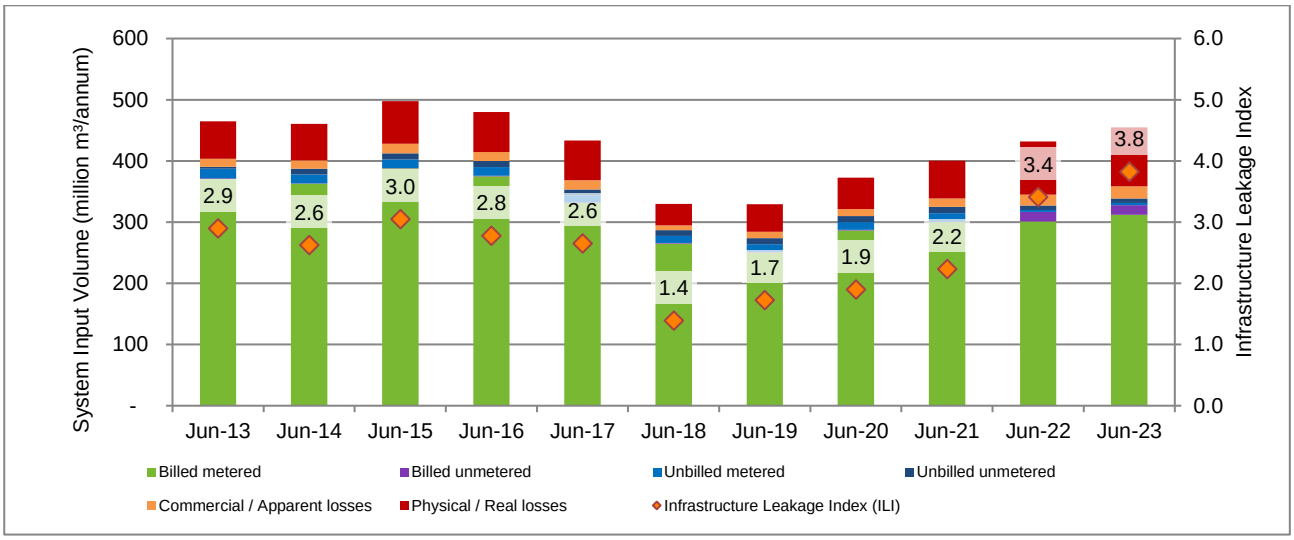


Figure 42: Western Cape water losses trend

4.11 NATIONAL WATER BALANCE

The national water balance indicates a SIV of 4 389.3 million m³/annum, NRW of 2078.6 million m³/annum (47.4%) and water losses of 1 789.9 million m³/annum (40.8%). NRW and water losses have increased by a notable 5.9% and 4.3% respectively from June 2016. However, the greatest increase was in the past two years, attributed to the impact of the COVID-19 pandemic. The fluctuation between 2016 and 2019 was generally less than 1%.

There has been a noticeable increase in billed unmetered consumption because of incorporating FBW supply in the estimated water balances, especially for rural municipalities. Unbilled unmetered consumption remains lower than expected, considering the high number of unbilled properties in South Africa. Municipalities must

correct their water balance calculations and show any water use after an accepted connection as authorised consumption, and not as water loss. An improved and increased estimation of the unbilled unmetered consumption will increase the authorised consumption and reduce water losses. It will also move the focus from leak detection and repair to improved metering and billing.

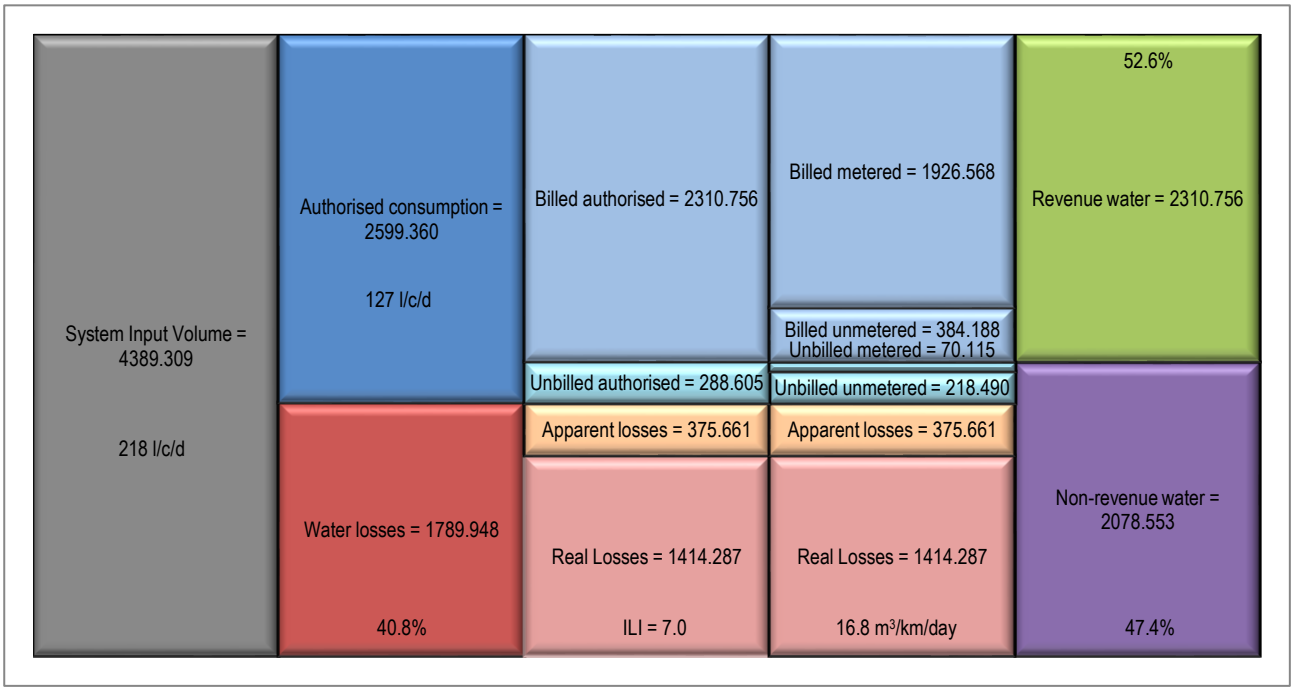


Figure 43: National water balance (million m³/annum)

National NRW and water loss trends show a steady increase in NRW over the past 10 years and SIV projections with WC/WDM have been exceeded. The figures are dominated by Category A, B1 and B2 municipalities, some of whom have made significant strides in improving NRW management, reducing water losses, and managing the demand in line with reconciliation strategy targets. There is significant scope for improvement of NRW and all municipalities would benefit from targeted demand management programmes, including community education and awareness, leak repair, infrastructure refurbishment, pressure management, and installation of bulk meters, amongst other measures.

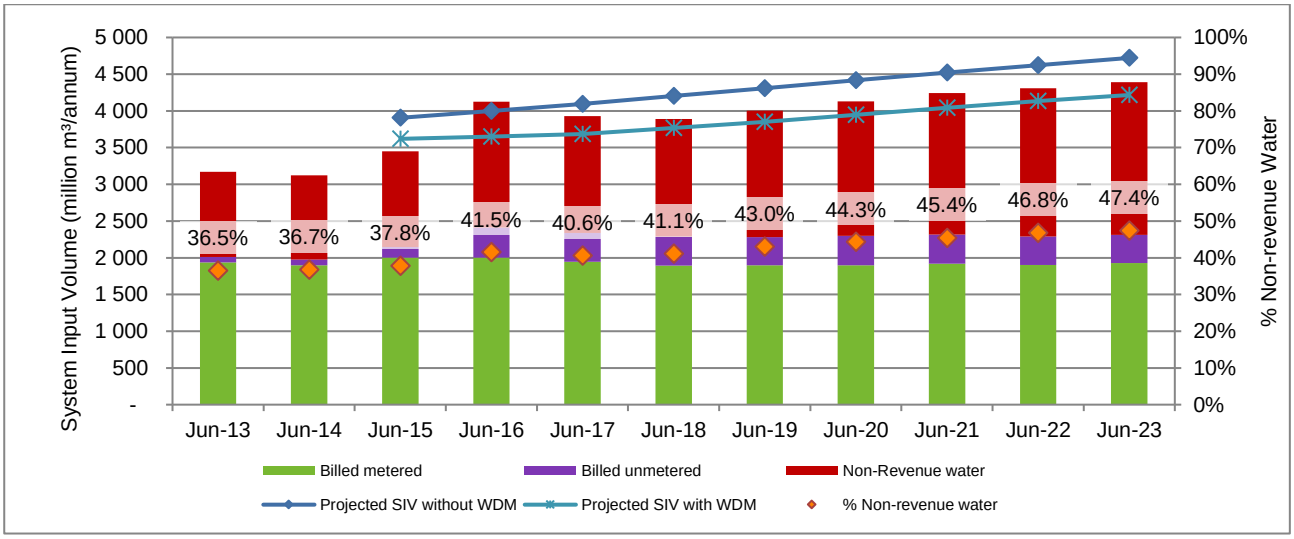


Figure 44: National SIV and NRW trend

National trends suggest that the per capita consumption has remained constant over the past 10 years, which is commendable. However, WC/WDM efforts must be elevated considering the level of service and inefficiencies, and that South Africa is one of the 30 driest countries in the world. Nonetheless, the per capita consumption is significantly lower than the previous national average of 237 l/c/d presented in June 2016 because of the prevailing droughts in parts of South Africa, deteriorating infrastructure and service delivery. The subsequent water restrictions and WC/WDM interventions had a significant impact on the SIV, especially in the Western Cape.

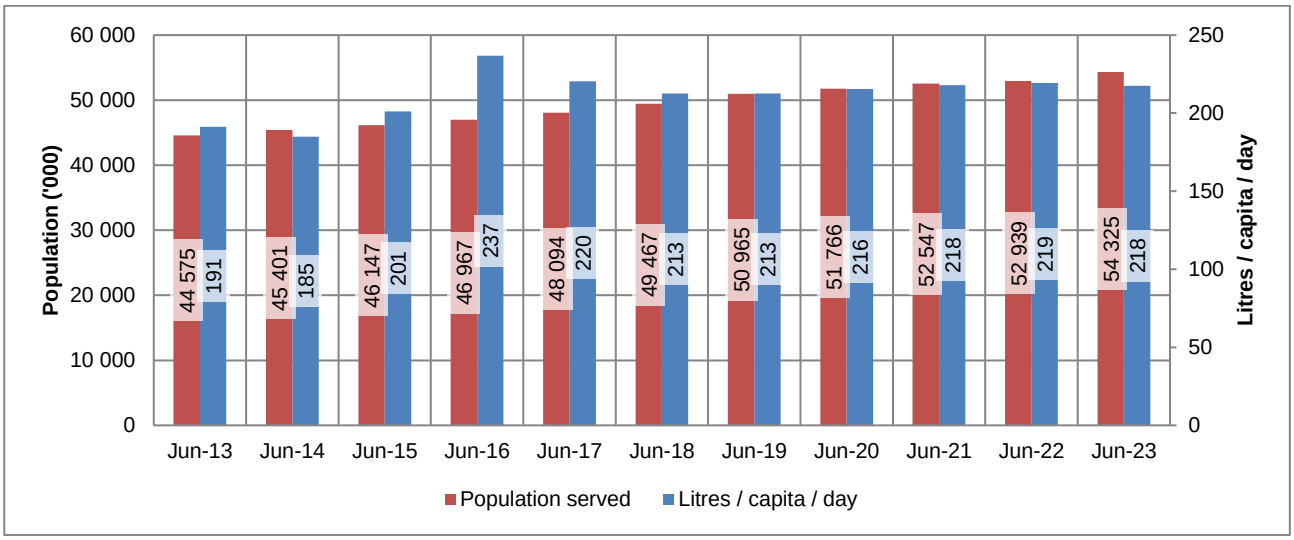


Figure 45: National population and l/c/d trend

The ILI deteriorated drastically from 2016 to date, showing signs of improvement in 2017 and 2018. The ILI of 7.0 indicates poorly managed physical losses. The COVID-19 pandemic has played havoc with municipal water losses and this trend is expected to improve once municipalities have returned to normal, eliminated the leak repair back-logs, and improved revenue collection.

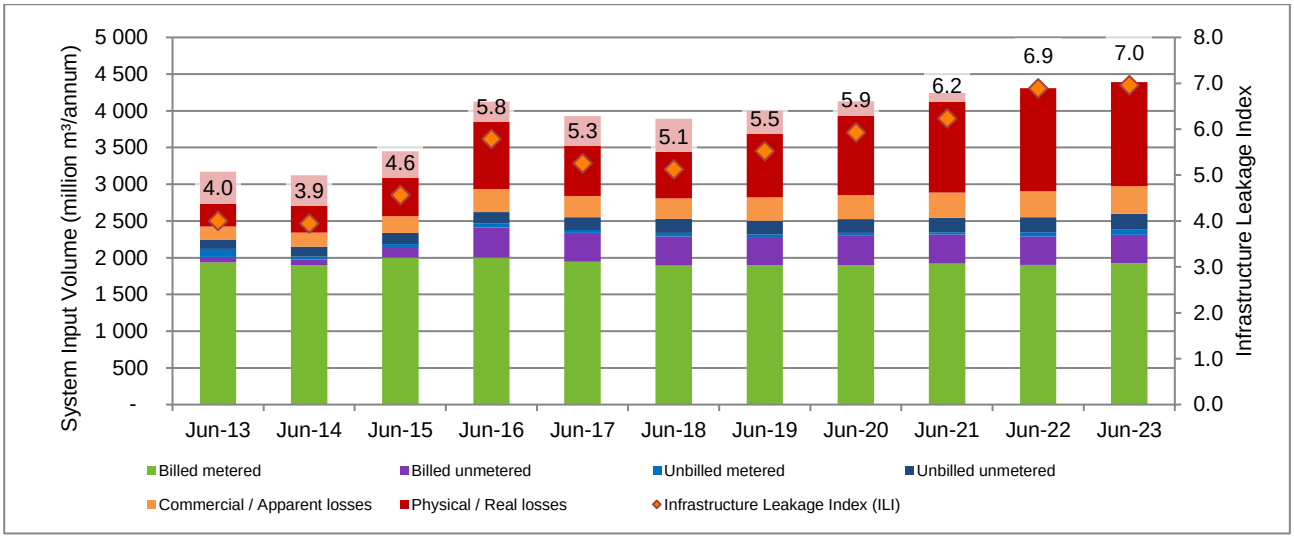


Figure 46: National water losses trend

The results indicate increased NRW, water losses, and ILI, but a significant decrease in the national per capita consumption. Given the increases on three key NRW metrics, WC/WDM must be implemented as a matter of urgency in all Provinces, especially considering that several Provinces have NRW and water losses above 50%. There is significant scope for improvement in reporting levels, data accuracy and a reduction in SIV, NRW, water losses and improved efficiency across South Africa. Only continuous monitoring and analyses

will provide a credible benchmark against which progress made with the implementation of WC/WDM can be measured. Continuous monitoring should also influence interventions required to manage demand, water losses, and NRW.

5 BENCHMARKS

5.1 INTRODUCTION

SIV, volume NRW, percentage NRW, l/c/d and ILI benchmarks for South Africa are shown in the following sections. For the last three indicators, the national average and the national weighted average are shown. In all previous benchmark studies, the weighted average was used. The weighted average is dominated by the metropolitan and secondary city WSAs, as shown in the calculations below:

$$\%\text{NRW average} = \text{AVERAGE}(\%\text{NRW1}, [\%\text{NRW2}], \ldots) \quad \text{(average of the averages)}$$

$$\%\text{NRW weighted average} = \frac{\text{SUM VOLUME (NRW1, [NRW2], ...)}}{\text{SUM VOLUME (SIV1, [SIV2], …)}} \times 100$$

5.2 SENSITIVITY ANALYSIS

To assess the impact of the estimated water balances on the national KPIs, the water balance information was divided into various groups, as summarised in **Table 7**. The percentage NRW is lower in the metros than in the reporting Provinces, although the l/c/d are much higher in the metros. The percentage NRW is much higher than the national average in the Provinces that report poorly, with estimated water balance. However, the l/c/d is much lower than the national average in these Provinces. Therefore, the estimated water balances increase the national percentage NRW by approximately 5.5% and reduces the l/c/d by approximately 23 l/c/d. The estimated water balances increases the national figures, and it is highly unlikely that the NRW in reporting municipalities would be lower than in non-reporting municipalities.

Table 7: Impact of estimated water balances

Group	SIV (m^3/annum)	% of national	NRW (m^3/annum)	%NRW	l/c/d	Population
Metropolitan municipalities	2 338 765 117	53%	981 791 047	42.0%	250	25 670 841
Reporting Provinces (WC, GT, KZN)	2 882 351 541	66%	1 281 133 336	44.4%	238	33 183 957
Reporting Provinces (WC, GT, KZN) including metros in other Provinces	3 129 671 940	71%	1 391 882 940	44.5%	237	36 209 531
Poor reporting Provinces (LP, FS, EC, NC, NW, MP)	1 506 957 018	34%	797 419 617	52.9%	195	21 140 809
National	4 389 308 559	100%	2 078 552 953	47.4%	218	54 331 818

5.3 SYSTEM INPUT VOLUME

The SIV distribution per municipal category is shown in **Figure 47** and per WSA in **Figure 48**. The metropolitan municipalities are by far the biggest water users in South Africa, followed by Category B1, B2 and B3 municipalities, respectively. The results are comparable to previous assessments. The rural B4 and C2 municipalities' estimated water use is higher than previous assessments. Category A, B1 and B2 municipalities represent 74% of the total water use while the Gauteng, Western Cape, and KwaZulu Natal Provinces make up 66% of the total estimated use.

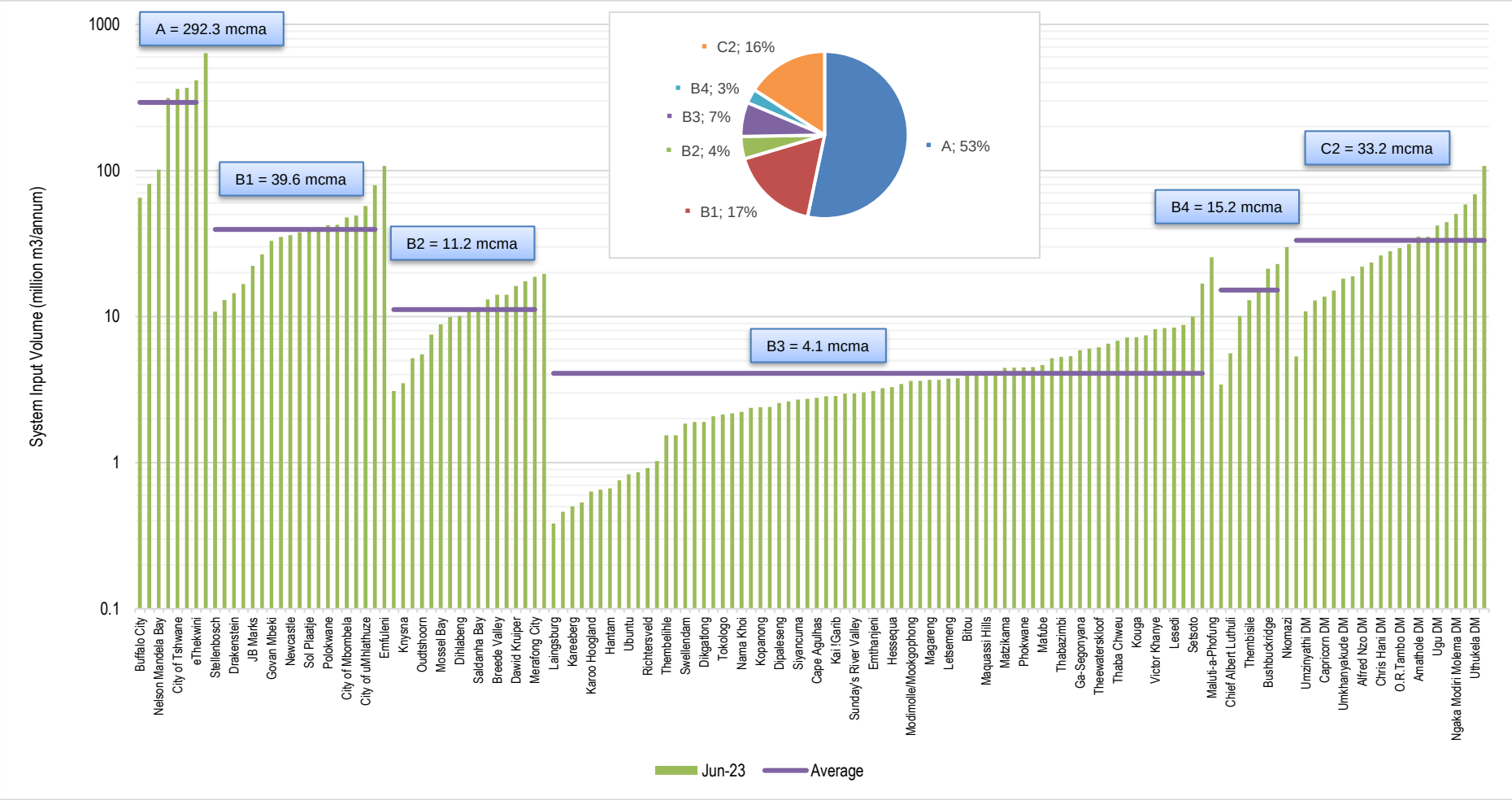


Figure 47: SIV distribution per municipal category

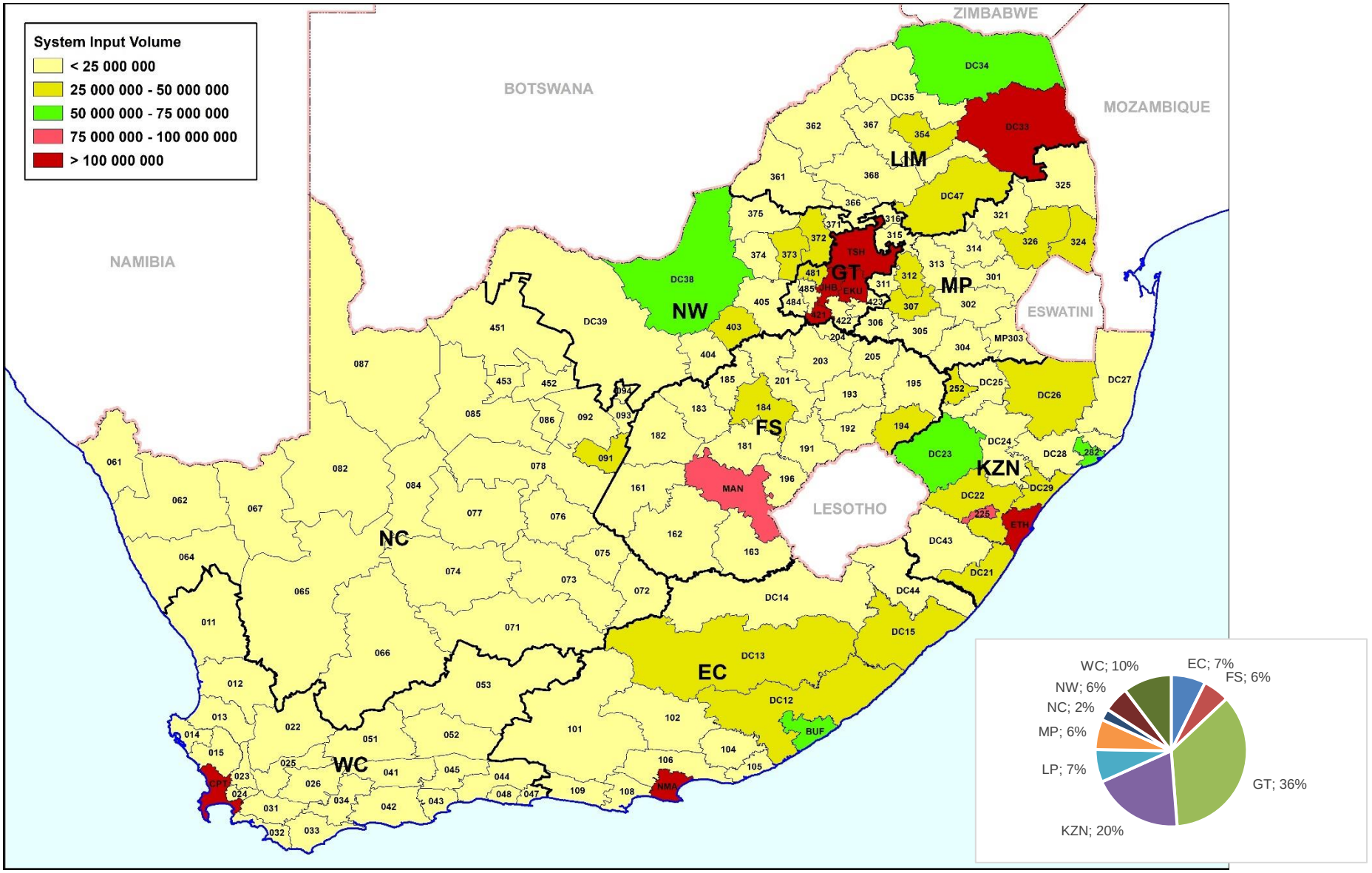


Figure 48: SIV distribution per WSA

5.4 VOLUME NON-REVENUE WATER

The volume NRW for the municipal categories is shown in **Figure 49** and per WSA in **Figure 50**. The volume NRW in the Category A, B1 and B2 municipalities accounts for almost two thirds of all NRW in South Africa and should be a focus area of the national WC/WDM programme. The Gauteng and KwaZulu Natal Provinces account for half of the national volume NRW.

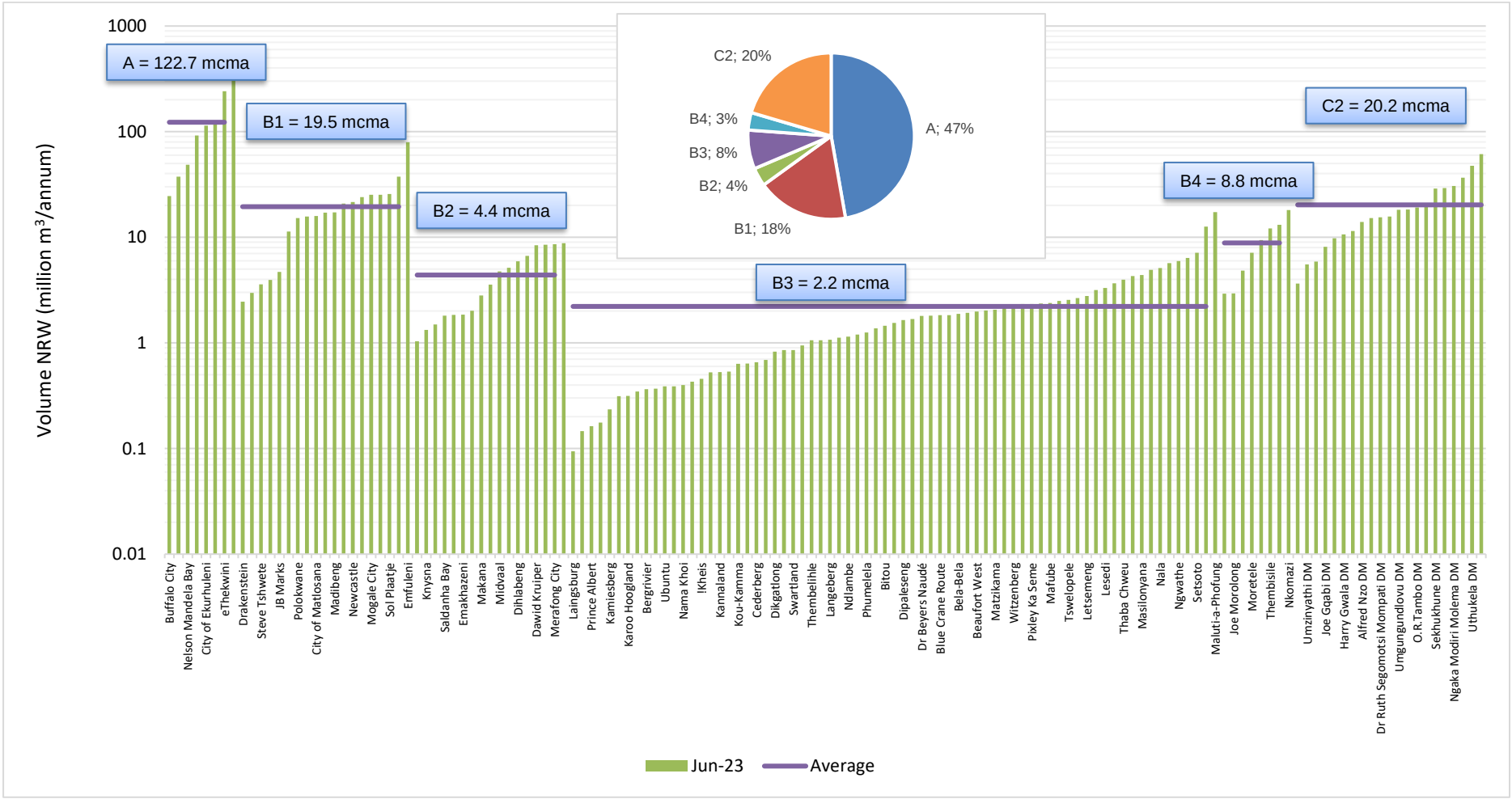


Figure 49: Volume NRW distribution per municipal category

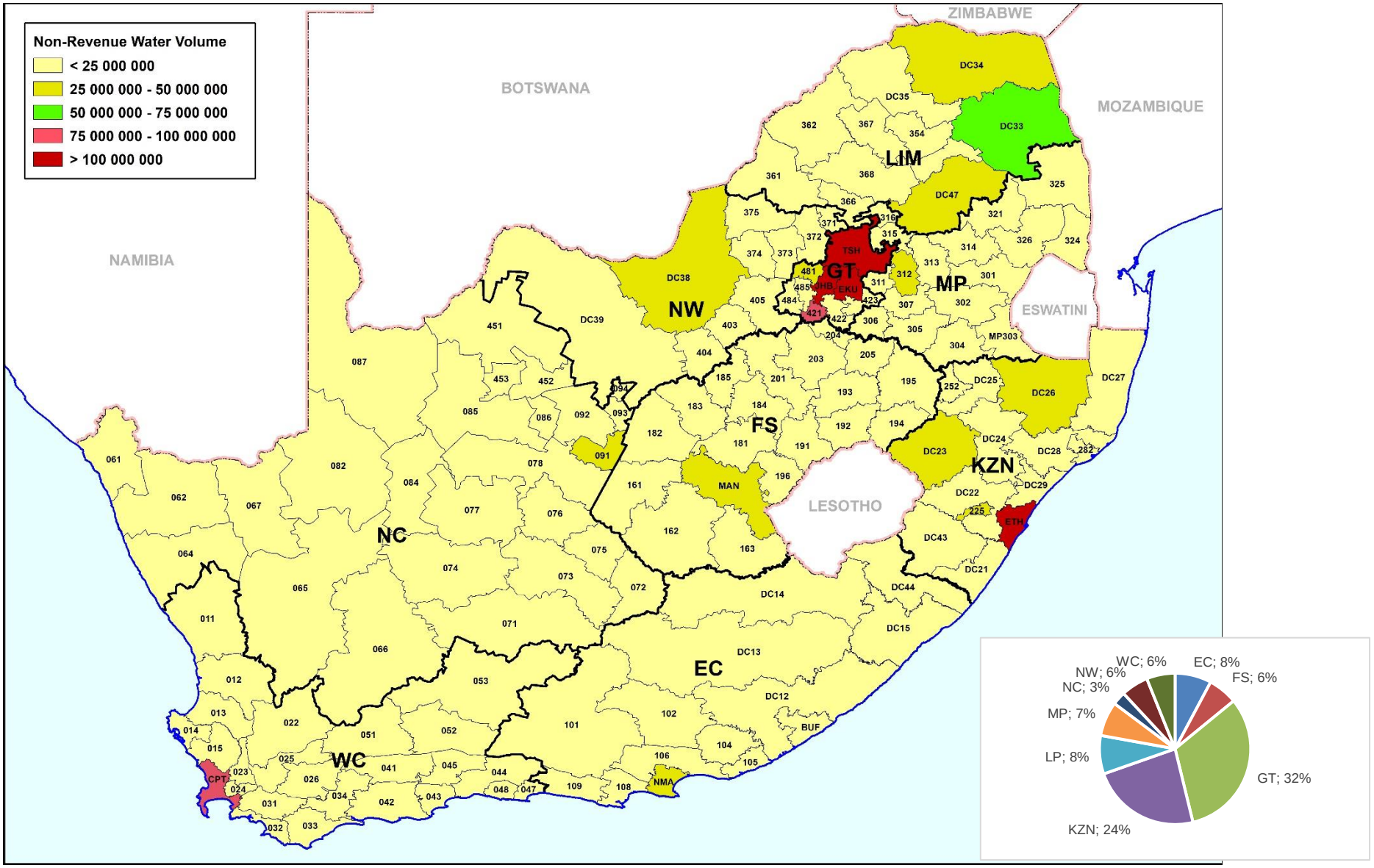


Figure 50: Volume NRW distribution per WSA

5.5 PERCENTAGE NON-REVENUE WATER

The percentage NRW distribution per municipal category and per WSA is shown **Figure 51** and **Figure 52**. In all municipal categories, the performance varies from very poor to very good. Category A and B2 municipalities are performing better, and it is assumed that they have sufficient budget and resources to implement effective WC/WDM programmes. Category B1, B3 and rural municipalities face significant budget, cost recovery, and resource challenges, and have higher NRW. The national average of 49.1% is higher than the weighted average of 45.1% because it is not influenced by the size of the metropolitan municipalities which have lower NRW.

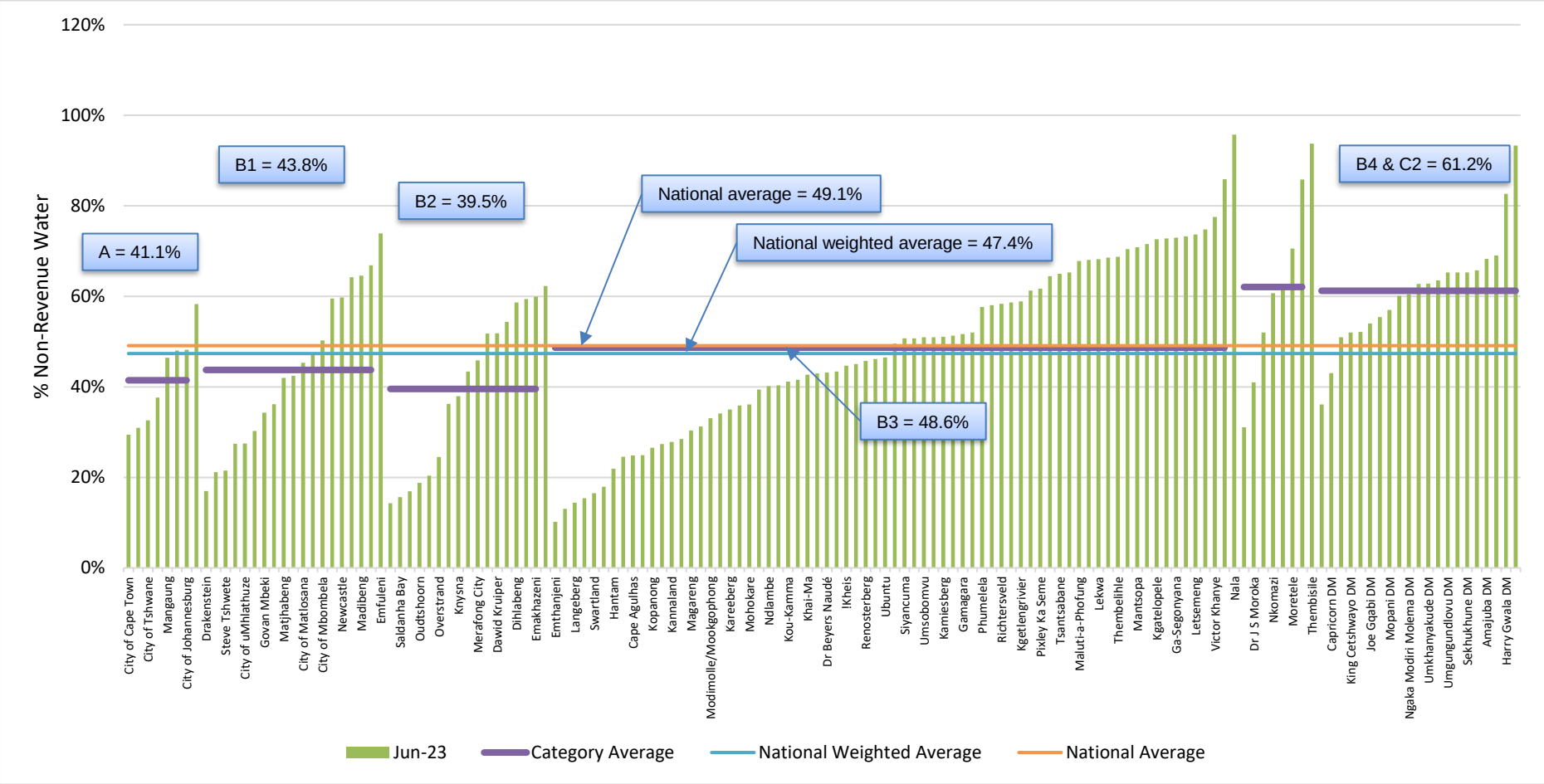
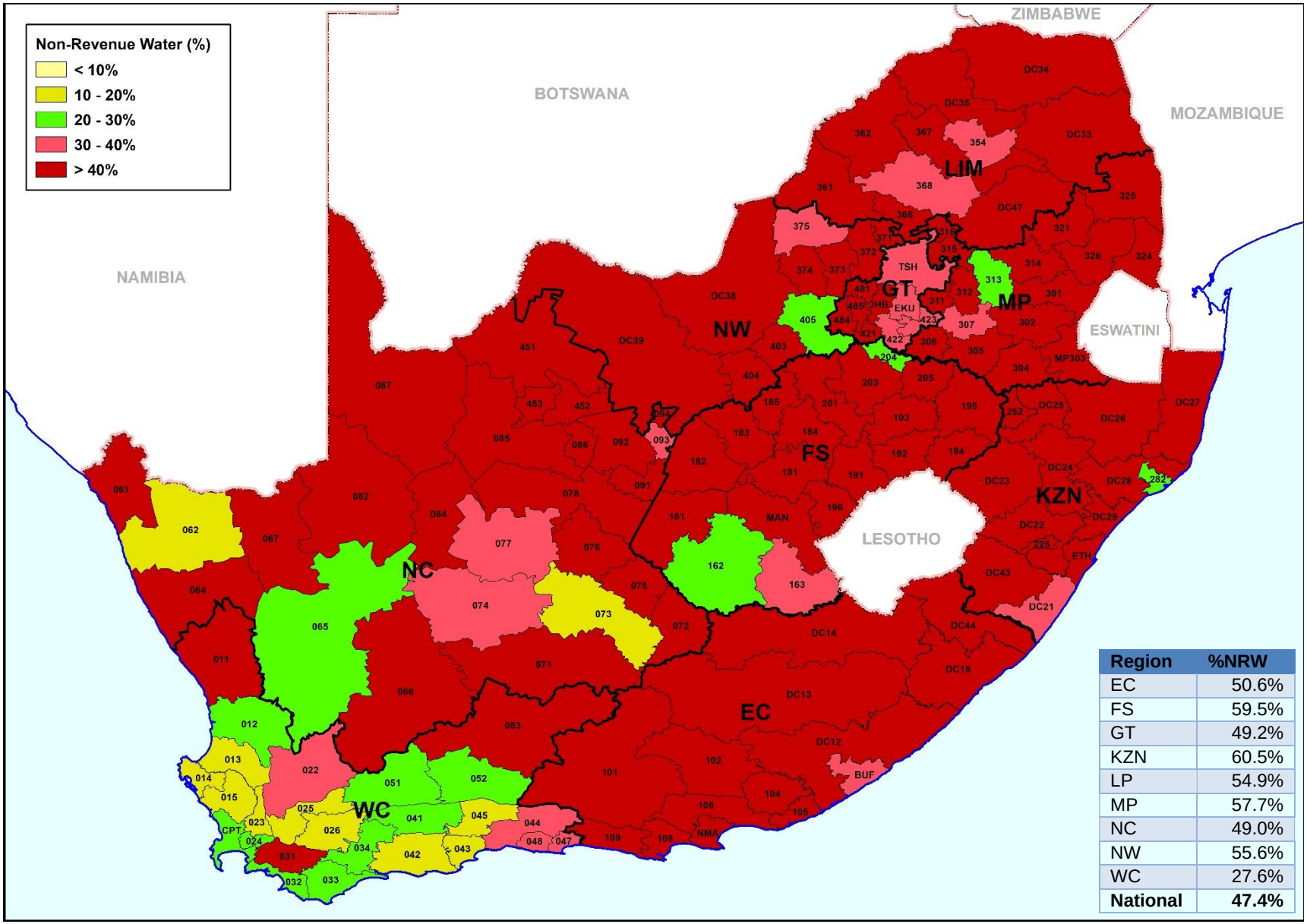


Figure 51: Percentage NRW distribution per municipal category



Region	%NRW
EC	50.6%
FS	59.5%
GT	49.2%
KZN	60.5%
LP	54.9%
MP	57.7%
NC	49.0%
NW	55.6%
WC	27.6%
National	**47.4%**

Figure 52: Percentage NRW distribution per WSA

5.6 LITRES PER CAPITA PER DAY

The water use efficiency, using l/c/d, are shown **Figure 53** and **Figure 54**. The metropolitan municipalities have the highest per capita consumption and the highest number of wet industries. Category B1 and B2 municipalities have slightly lower consumption figures, which are above the national average of 189 l/c/d. The national weighted average of 218 l/c/d is dominated by the Category A and B1 municipalities. The l/c/d in some municipalities is extremely high and needs further investigation to ensure the population served figures are accurate.

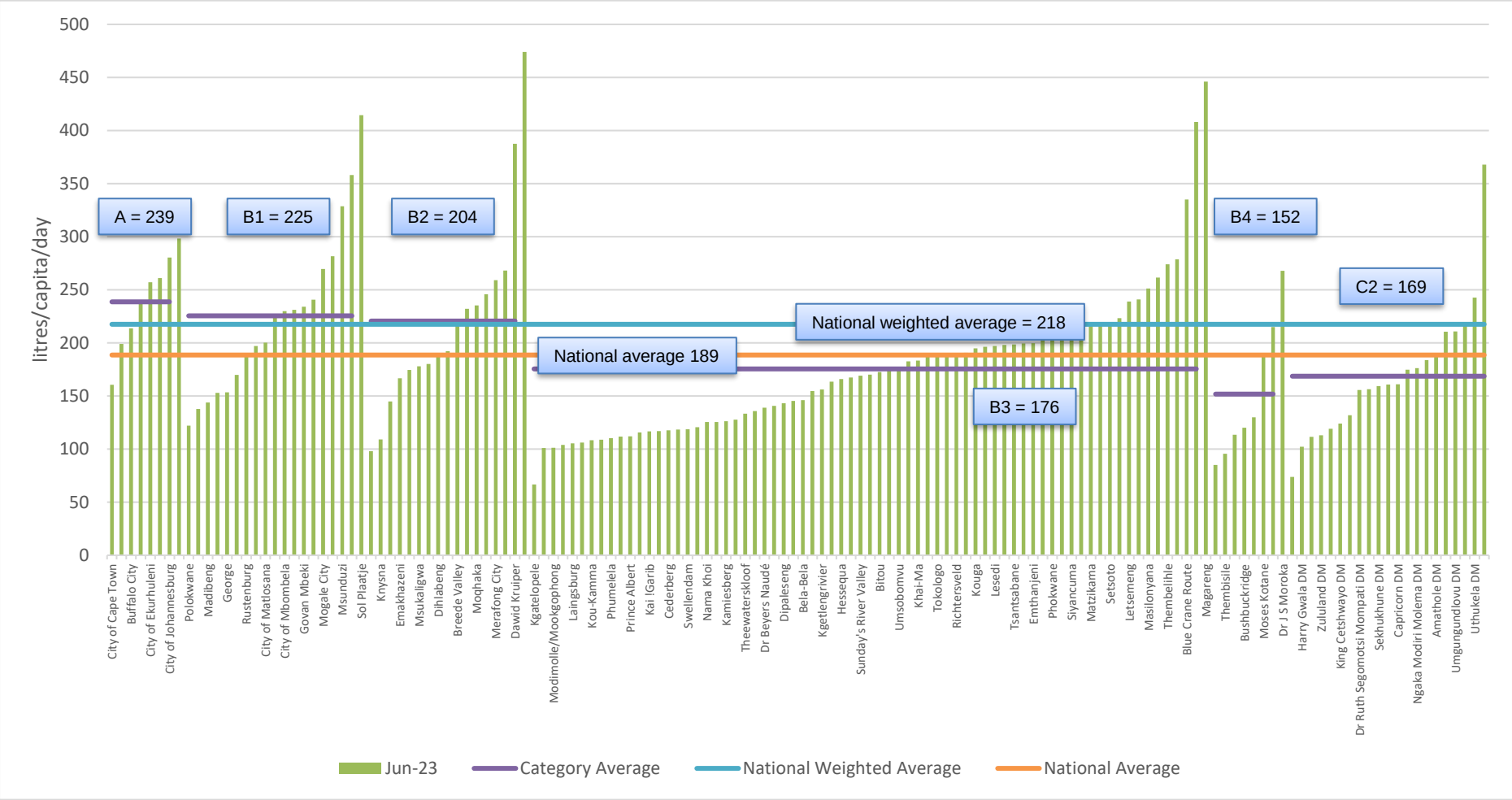
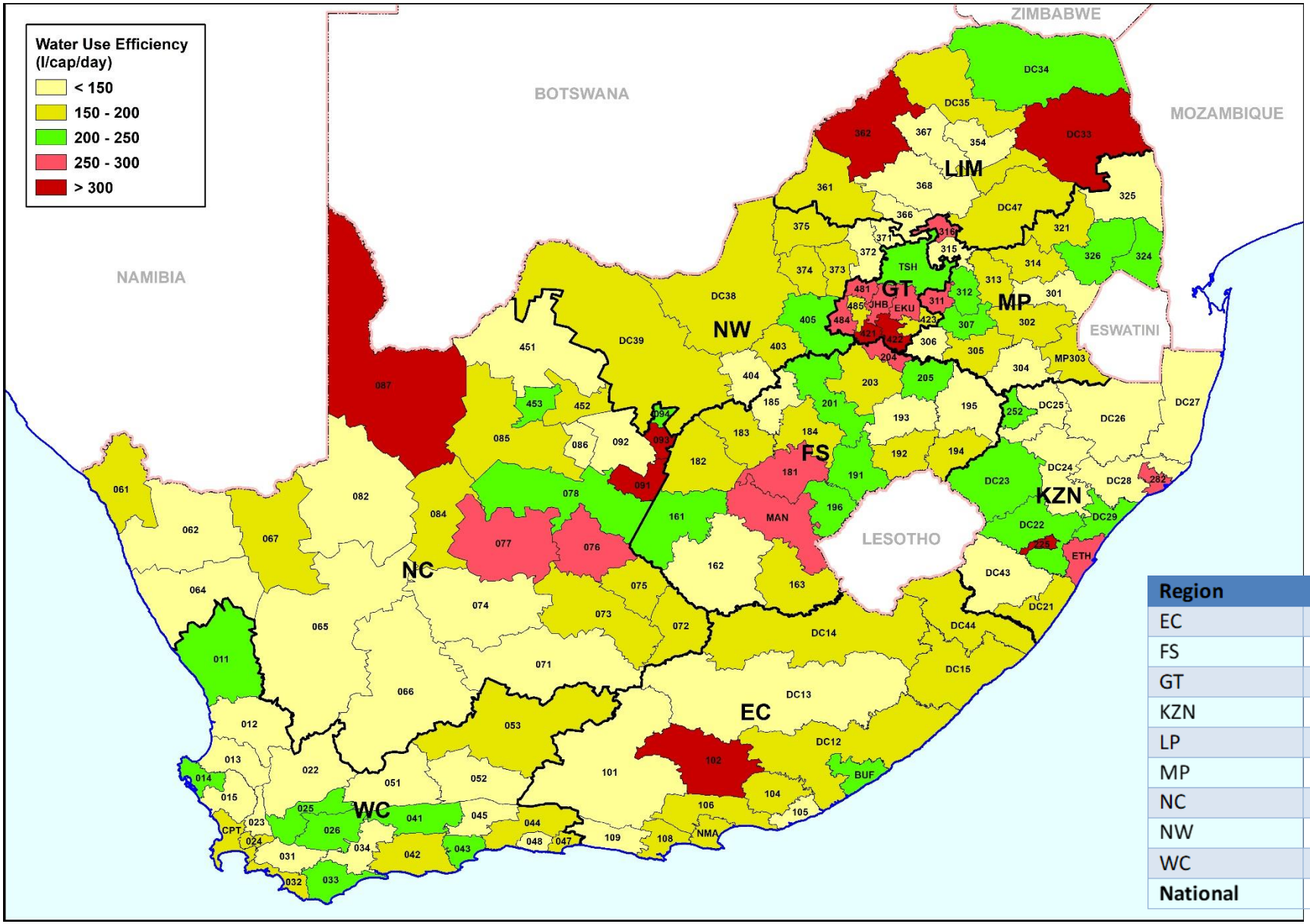


Figure 53: Litres per capita per day distribution per municipal category



Region	l/c/d
EC	180
FS	196
GT	279
KZN	187
LP	197
MP	179
NC	193
NW	167
WC	164
National	**218**

Figure 54: Litres per capita per day per WSA

5.7 INFRASTRUCTURE LEAKAGE INDEX

The ILI for the municipal categories is shown in **Figure 55** and for WSAs and **Figure 56**. Physical water losses are the highest in Category A and B1 municipalities and should be addressed through active leak detection and repair programmes. The high ILIs in the Category B1 municipalities need further investigation and might be because of average pressure, length of mains, or reporting unbilled consumption as water loss errors.

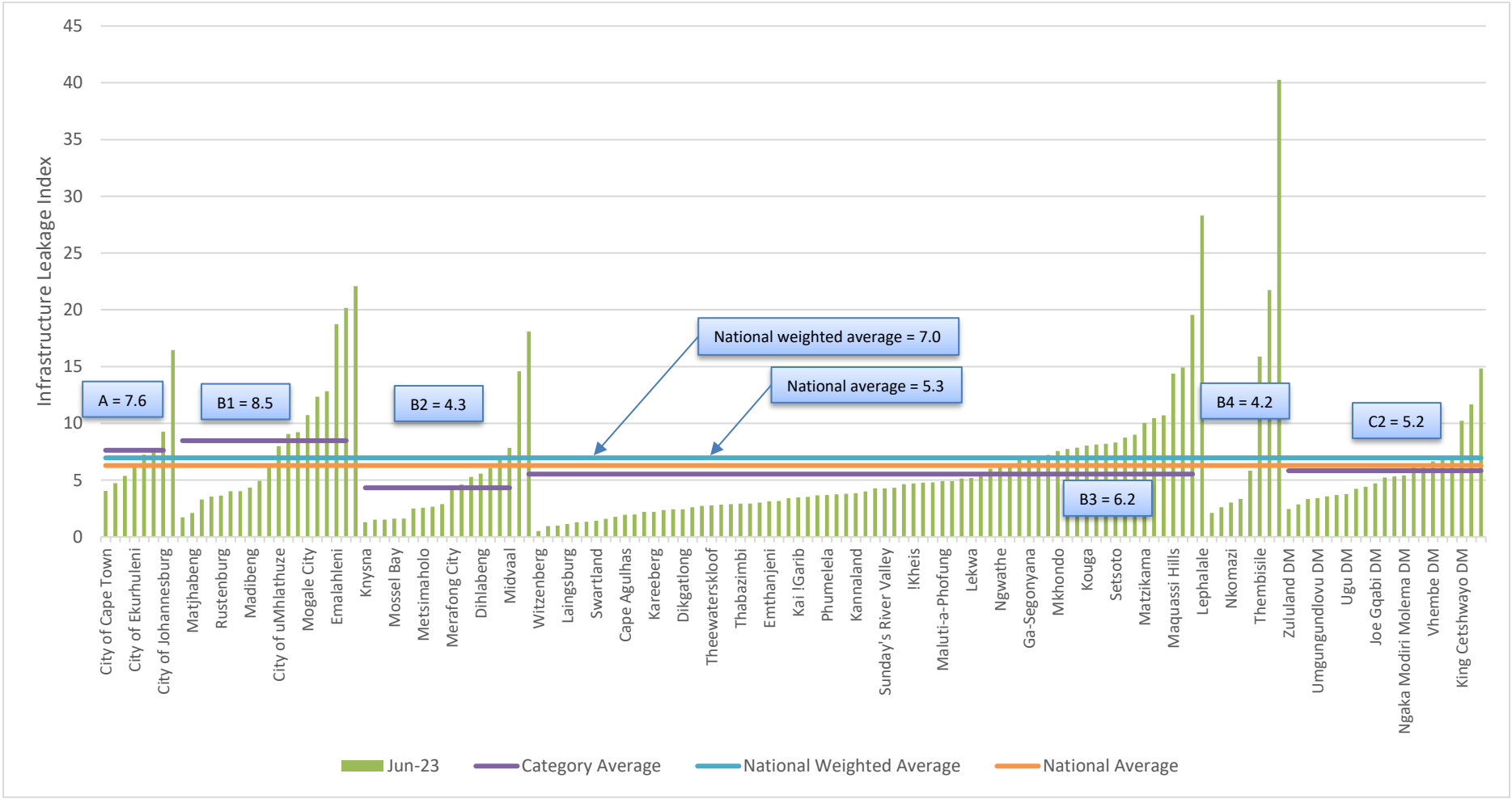


Figure 55: ILI distribution per municipal category

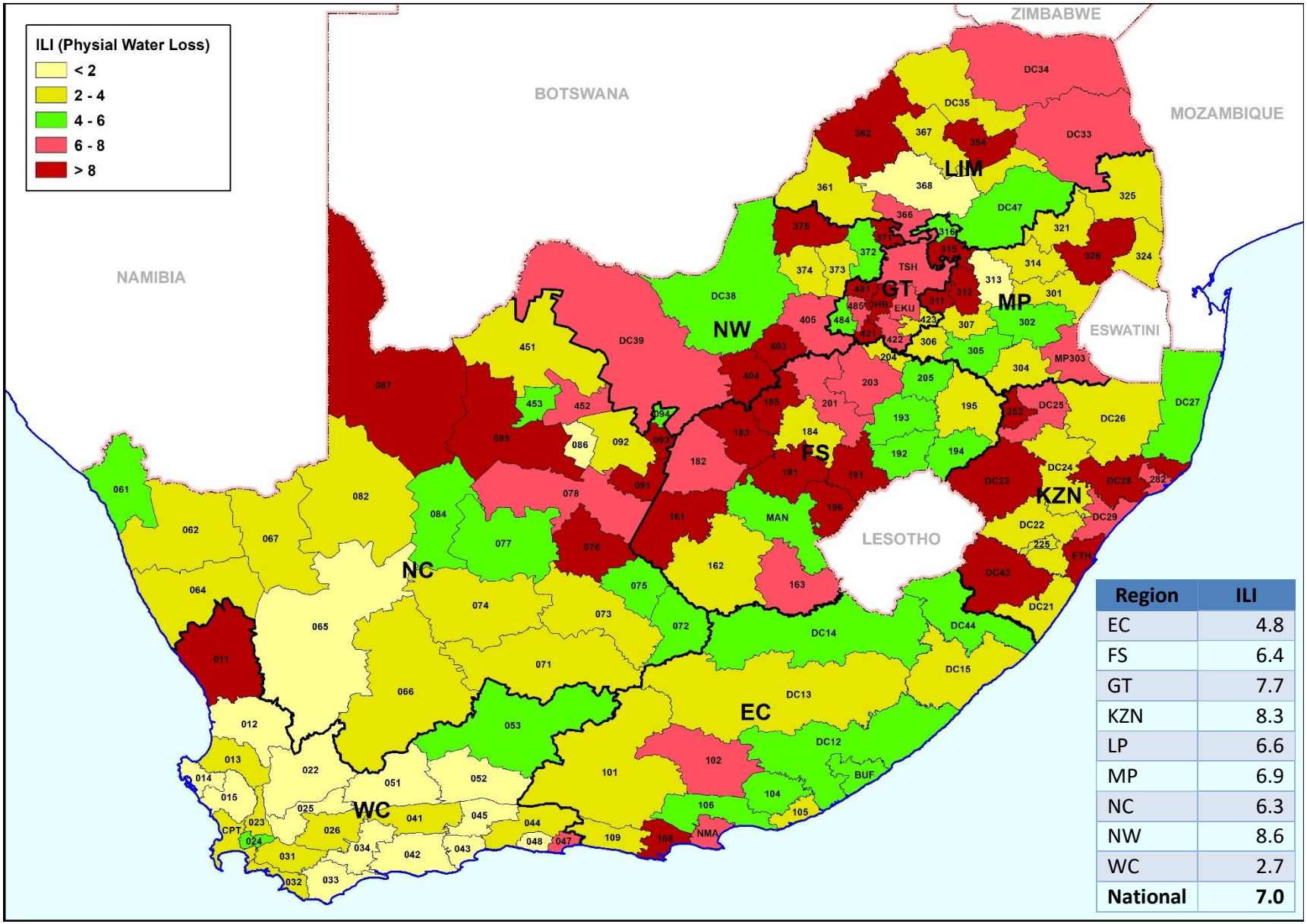


Figure 56: ILI per WSA

5.8 BENCHMARK SUMMARY

The weighted benchmarks for the Provinces are summarised in **Table 8**. The Western Cape is the best preforming Province in South Africa with lowest %NRW, l/c/d and ILI. Gauteng Province is the worst performing Province with the highest l/c/d, ILI and volume NRW. However, Gauteng Province has the second lowest percentage NRW. Limpopo Province has the highest percentage NRW in South Africa. It is concerning that seven Provinces' percentage NRW is above the national average.

Table 8: Province benchmark summary

Province	SIV	RW	NRW	%NRW	l/c/d	ILI
EC	322 340 566	160 335 729	162 004 837	50.5%	180	4.7
FS	247 977 565	117 228 256	130 749 310	60.6%	196	6.6
GT	1 569 696 786	902 178 874	667 517 912	46.4%	279	7.5
KZN	858 026 407	371 100 538	486 925 869	59.2%	187	7.4
LP	305 413 154	134 471 525	170 941 629	51.6%	197	7.5
MP	283 727 455	130 423 536	153 303 919	58.4%	179	7.1
NC	107 474 516	48 072 109	59 402 407	48.5%	193	6.1
NW	240 023 761	119 006 246	121 017 515	52.1%	167	11.8
WC	454 628 348	327 938 793	126 689 555	26.9%	164	2.8
National	**4 389 308 559**	**2 310 755 606**	**2 078 552 953**	**47.4%**	**218**	**7.0**

The average benchmarks for the Categories are summarised in **Table 9** with a breakdown of Category A (metropolitan municipalities) provided in **Table 10**. City of Cape Town is the best performing metro with the lowest %NRW, l/c/d and ILI. eThekwini is the worst performing metro with the highest %NRW, l/c/d and ILI. City of Johannesburg has the highest SIV and volume NRW.

Table 9: Category benchmark summary

Category	SIV	Revenue water	NRW	%NRW	l/c/d	ILI
A	2 338 765 117	1 356 974 071	981 791 047	41.4%	239	7.6
B1	751 719 678	382 045 505	369 674 174	43.8%	225	8.5
B2	189 763 240	115 253 845	74 509 395	39.5%	221	4.3
B3	290 197 411	132 970 429	157 226 983	48.6%	176	5.5
B4	121 652 361	51 095 113	70 557 248	62.1%	152	11.9
C2	697 210 751	272 416 644	424 794 107	61.2%	169	5.8
Total	**4 389 308 559**	**2 310 755 606**	**2 078 552 953**	**47.4%**	**218**	**7.0**

Table 10: Category A (metro) benchmark summary

Metro	SIV	Revenue water	NRW	%NRW	l/c/d	ILI
Buffalo City	65 166 097	40 626 442	24 539 655	37.7%	214	4.7
City of Cape Town	312 826 977	220 753 930	92 073 047	29.4%	161	4.0
City of Ekurhuleni	368 351 408	254 395 814	113 955 594	30.9%	257	6.4
City of Johannesburg	634 461 668	328 709 771	305 751 897	48.2%	280	9.3
City of Tshwane	361 666 588	243 780 416	117 886 172	32.6%	239	7.2
eThekwini	414 138 078	172 763 345	241 374 733	58.3%	298	16.4
Mangaung	80 813 586	43 279 273	37 534 313	46.4%	261	5.4
Nelson Mandela Bay	101 340 716	52 665 080	48 675 636	48.0%	199	7.4
Category A	**2 338 765 117**	**1 356 974 071**	**981 791 047**	**41.4%**	**239**	**7.6**

6 FINANCIAL ANALYSIS

In *The State of Non-Revenue Water in South Africa* (WRC, 2012) the value of NRW is estimated at R 7.2 billion per annum using production tariffs of between R 3.00/kl for Category B4 and R 5.00/kl for Category A municipalities. The DWS First Order Assessment of the status of water loss, water use efficiency and NRW in municipalities (2014) used R 6.00/kl to calculate the potential savings. The R 6.00/kl was based on the Water Services Tariffs Report for 2012/13 (DWA, 2013). The results from these studies gave a high-level understanding of the potential financial benefit of implementing WC/WDM in the municipal environment.

The Medium Term Revenue and Expenditure Framework (MTREF) submitted by municipalities on an annual basis provides valuable information on the revenue and expenditure for the current year, past three years, and projected three years. This financial analysis is an attempt at aligning the actual water revenue and expenditure with the IWA water balance to assess water cost and potential revenue. Focus was placed on Table A2 Budgeted Financial Performance (revenue and expenditure by functional classification) and Table SA1 Supporting detail to 'Budgeted Financial Performance'. Examples are shown in **Table 11** and **Table 12**.

Table 11: MTREF Table A2 Budgeted Financial Performance

Functional Classification Description	2016/17	2017/18	2018/19	Current Year 2019/20			2020/21 Medium Term Revenue & Expenditure Framework		
R thousand	Audited Outcome	Audited Outcome	Audited Outcome	Original Budget	Adjusted Budget	Full Year Forecast	Budget Year 2020/21	Budget Year +1 2021/22	Budget Year +2 2022/23
Revenue - Functional									
Trading services	**195 102**	**217 956**	**247 828**	**288 792**	**295 383**	**295 383**	**359 027**	**377 858**	**397 677**
Energy sources	125 614	126 679	151 759	176 205	183 874	183 874	224 902	236 709	249 136
Water management	29 451	58 974	62 164	73 663	71 411	71 411	80 282	84 497	88 933
Waste water management	25 024	14 810	15 674	18 644	18 576	18 576	32 197	33 887	35 666
Waste management	15 012	17 493	18 232	20 279	21 523	21 523	21 646	22 765	23 941
Expenditure - Functional									
Trading services	**245 051**	**369 576**	**196 708**	**373 086**	**332 303**	**332 303**	**435 000**	**461 230**	**489 382**
Energy sources	166 734	238 243	181 881	242 379	221 869	221 869	306 793	323 900	341 352
Water management	39 197	55 886	14 687	72 200	60 726	60 726	66 247	69 724	73 385
Waste water management	12 871	47 670	140	26 693	22 258	22 258	26 132	27 504	28 948
Waste management	26 248	27 776	–	31 814	27 449	27 449	35 828	40 102	45 697
Surplus/(Deficit) for the year	**-49 949**	**-151 620**	**51 120**	**-84 294**	**-36 920**	**-36 920**	**-75 973**	**-83 372**	**-91 705**

Table 12: MTREF Supporting Table SA1 Supporting detail to 'Budgeted Financial Performance'

Description	2016/17	2017/18	2018/19	Current Year 2019/20				2020/21 Medium Term Revenue & Expenditure Framework		
R thousand	Audited Outcome	Audited Outcome	Audited Outcome	Original Budget	Adjusted Budget	Full Year Forecast	Pre-audit outcome	Budget Year 2020/21	Budget Year +1 2021/22	Budget Year +2 2022/23
REVENUE ITEMS:										
Service charges - water revenue										
Total Service charges - water revenue	**29 379**	**59 056**	**63 242**	**95 648**	**100 256**	**100 256**		**81 141**	85 401	89 884
less Revenue Foregone ***(in excess of 6 kilolitres per indigent household per month)***										

Description	2016/17	2017/18	2018/19	Current Year 2019/20				2020/21 Medium Term Revenue & Expenditure Framework		
R thousand	Audited Outcome	Audited Outcome	Audited Outcome	Original Budget	Adjusted Budget	Full Year Forecast	Pre-audit outcome	Budget Year 2020/21	Budget Year +1 2021/22	Budget Year +2 2022/23
less Cost of Free Basis Services (6 kilolitres per indigent household per month)	–	–	1 078	28 845	28 845	28 845		1 172	1 234	1 299
Net Service charges - water revenue	**29 379**	**59 056**	**62 164**	**66 804**	**71 411**	**71 411**	**–**	**79 969**	**84 167**	**88 586**

The Water Management Functional Expenditure divided by the SIV provides an indication of the cost of water supply, as shown in **Figure 57**. Based on the functional expenditure and SIV of 127 WSAs, the average cost of supplying water is R 13.70/kl. This ranges from R 17.32/kl for metropolitan municipalities to R 12.06/kl for Category B3 municipalities. The cost of supplying rural municipalities (Categories B4 and C2) appears to be the highest, ranging from R 14.26/kl to R 17.64/kl. This is a meaningful change from previous assessments that suggested that the cost of supplying water in rural schemes is less than in large municipalities. The higher cost is justified, considering that these schemes often consist of many small systems with boreholes, which are expensive to operate.

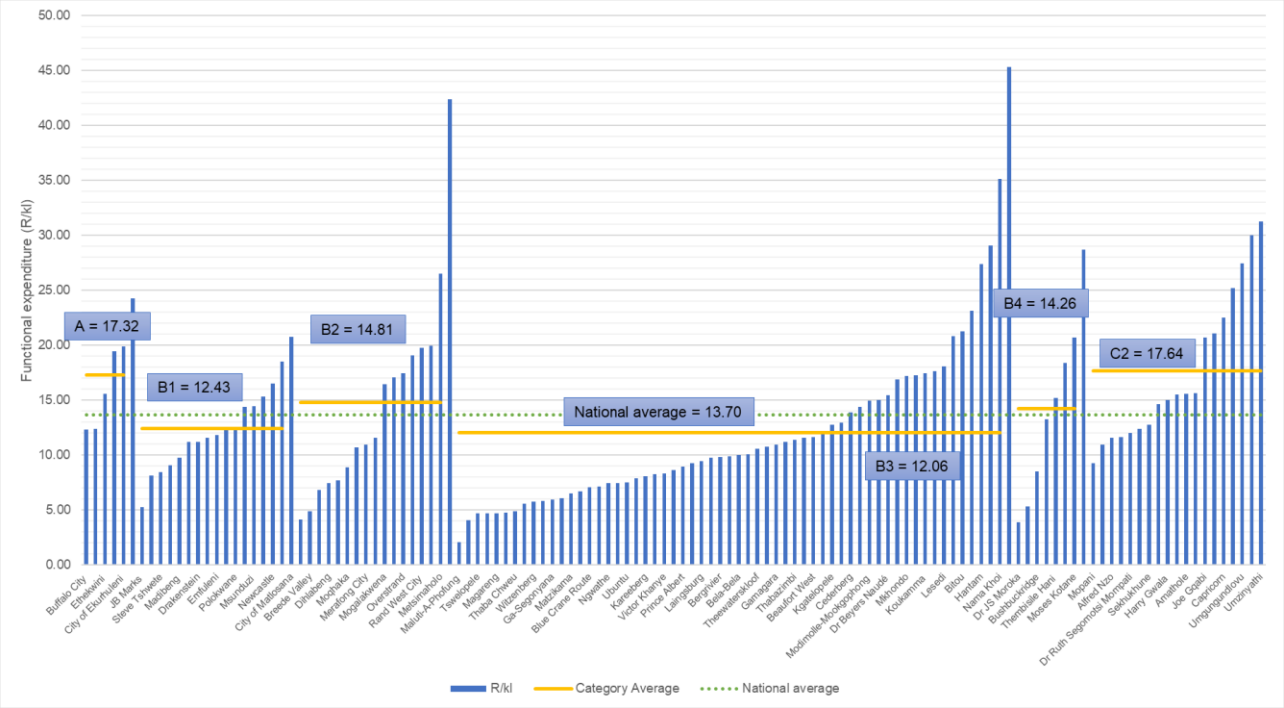


Figure 57: Cost of water supply (functional expenditure per kilolitre)

The functional revenue per kilolitre is shown in **Figure 58** and is based on the water revenue generated by the municipality plus national government subsidies and grants. The national average is R 34.55/kl and increases to R 47.45 for Category C2 municipalities. The rate for rural municipalities is very high because of large grants versus small volume billed consumption.

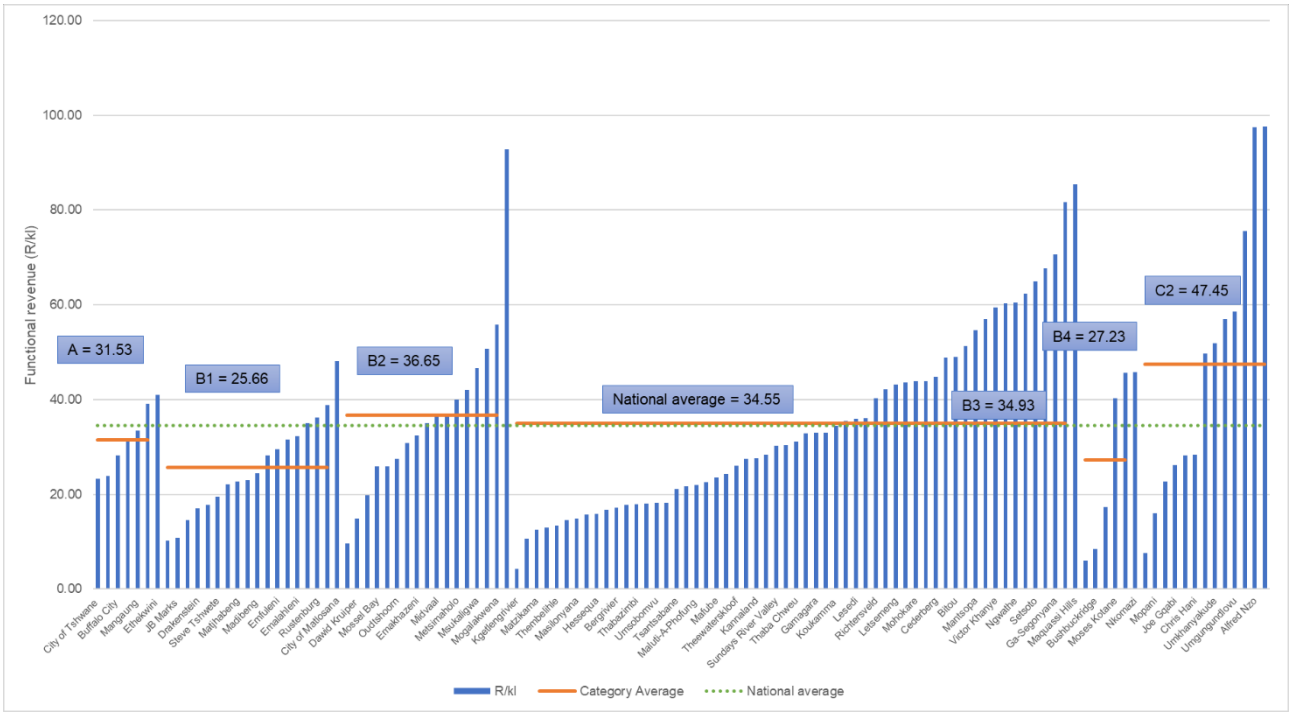


Figure 58: Functional revenue per kilolitre

The Service Charges - Water Revenue divided by the revenue water provides an accurate indication of the revenue generated from water services by the municipality, as shown in **Figure 59**. The national average charged for water services is R 18.95/kl for every kilolitre supplied at R 13.07/kl. The national average charged for water services is R 18.95/kl excludes government subsidies and grants.

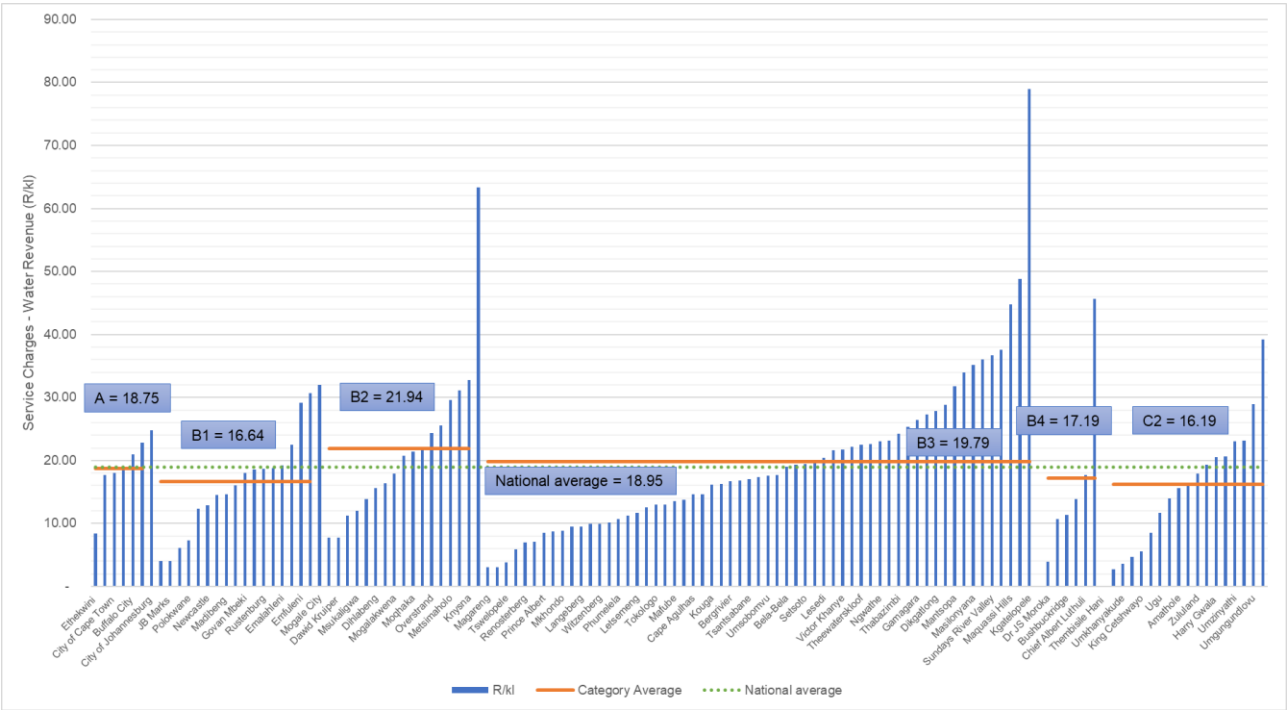


Figure 59: Service charge per kilolitre

The functional revenue per kl and the service charges – water revenue per kl is shown in **Figure 60**. The results indicate that some municipalities are highly subsidised and highly dependent on equitable share to remain sustainable.

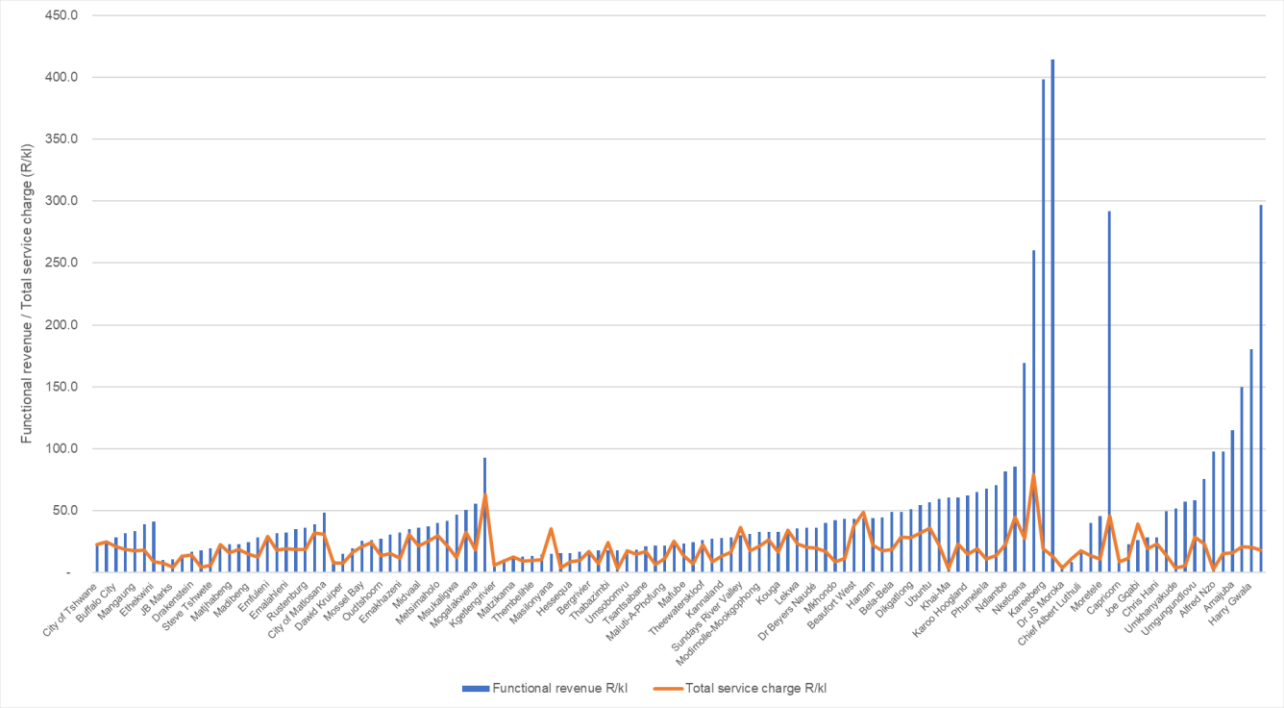


Figure 60: Functional revenue versus service charges - water revenue (per kilolitre)

Using the average tariffs from **Figure 57** and **Figure 59**, it is possible to calculate the financial balance for South Africa as shown in **Table 13.** The national average tariff was used for the Provinces.

Table 13: Monetary value of water SIV, Revenue water and NRW

Province	SIV (m^3/annum)	SIV @ R13.07 (R'000/annum)	RW (m^3/annum)	RW @ R18.95 (R'000/annum)	NRW (m^3/annum)	NRW @ R13.07 (R'000/annum)	Surplus/ deficit (R'000/annum)
EC	322 340 566	R4 415 349	160 335 729	R3 038 447	162 004 837	R2 219 106	-R1 376 902
FS	247 977 565	R3 396 741	117 228 256	R2 221 537	130 749 310	R1 790 975	-R1 175 204
GT	1 569 696 786	R21 501 355	902 178 874	R17 096 767	667 517 912	R9 143 511	-R4 404 587
KZN	858 026 407	R11 753 053	371 100 538	R7 032 552	486 925 869	R6 669 801	-R4 720 502
LP	305 413 154	R4 183 481	134 471 525	R2 548 307	170 941 629	R2 341 520	-R1 635 174
MP	283 727 455	R3 886 435	130 423 536	R2 471 595	153 303 919	R2 099 923	-R1 414 840
NC	107 474 516	R1 472 162	48 072 109	R910 992	59 402 407	R813 681	-R561 170
NW	240 023 761	R3 287 792	119 006 246	R2 255 231	121 017 515	R1 657 671	-R1 032 560
WC	454 628 348	R6 227 397	327 938 793	R6 214 614	126 689 555	R1 735 365	-R12 783
Total	**4 389 308 559**	**R60 123 764**	**2 310 755 606**	**R43 790 042**	**2 078 552 953**	**R28 471 552**	**-R16 333 723**
A	2 338 765 117	R40 502 671	1 356 974 071	R25 441 080	981 791 047	R17 002 631	-R15 061 592
B1	751 719 678	R9 343 301	382 045 505	R6 356 835	369 674 174	R4 594 767	-R2 986 466
B2	189 763 240	R2 809 651	115 253 845	R2 529 069	74 509 395	R1 103 193	-R280 582
B3	290 197 411	R3 499 375	132 970 429	R2 631 880	157 226 983	R1 895 938	-R867 495
B4	121 652 361	R1 734 638	51 095 113	R878 175	70 557 248	R1 006 074	-R856 463
C2	697 210 751	R12 297 376	272 416 644	R4 409 610	424 794 107	R7 492 502	-R7 887 766
Total	**4 389 308 559**	**R70 187 012**	**2 310 755 606**	**R42 246 648**	**2 078 552 953**	**R33 095 104**	**-R27 940 364**

The results show that all Provinces and categories operate at a deficit if government grants are excluded from the revenue tariff, which enforces the policy that water tariffs should be cost effective and in accordance with the Revision of the Norms and Standards for Setting Water Services Tariffs (Government Notice 1153,

Government Gazette 39411 of 13 November 2015) in terms of Section 10 of the Water Services Act (No. 108 of 1997).

Using the average and category tariffs, the estimated cost to supply water in South Africa is between R 60 and R 60 billion per annum and revenue of between R 42 and R 44 billion is generated from water sales. The value of NRW is between R 28 and R 33 billion at R 13.07/kl, which is higher than previous estimates. The increase is due to above inflation water tariff increases from water boards and the under estimation of water supply costs to rural municipalities.

Using the average tariffs, the potential impact of increasing revenue water and reducing the SIV is shown in **Table 14**. Approximately R 1 billion per annum could be saved if the SIV is reduced by 2%, and municipalities would generate nearly R 1 billion per annum for every 2% increase in revenue. The nett benefit could be R 10 billion per annum if revenue is increased by 10% and the SIV is reduced by 10%. Reducing the SIV by 10% and increasing the revenue by 10% would reduce the national NRW figure to 35.7% and the per capita consumption to 195 l/c/d as shown in **Table 15**.

Table 14: Potential impact of reducing NRW

		Percentage increase in billed consumption @ R 18.95								
		0%	**2%**	**4%**	**6%**	**8%**	**10%**	**12%**	**14%**	**16%**
Percentage reduction in system input volume @ R13.70	**0%**	R 0	R 881	R 1 762	R 2 644	R 3 525	R 4 406	R 5 287	R 6 169	R 7 050
	2%	R 1 160	R 2 041	R 2 922	R 3 804	R 4 685	R 5 566	R 6 447	R 7 329	R 8 210
	4%	R 2 320	R 3 201	R 4 082	R 4 963	R 5 845	R 6 726	R 7 607	R 8 488	R 9 370
	6%	R 3 480	R 4 361	R 5 242	R 6 123	R 7 005	R 7 886	R 8 767	R 9 648	R 10 529
	8%	R 4 639	R 5 521	R 6 402	R 7 283	R 8 164	R 9 046	R 9 927	R 10 808	R 11 689
	10%	R 5 799	R 6 681	R 7 562	R 8 443	R 9 324	R 10 206	R 11 087	R 11 968	R 12 849
	12%	R 6 959	R 7 840	R 8 722	R 9 603	R 10 484	R 11 365	R 12 247	R 13 128	R 14 009
	14%	R 8 119	R 9 000	R 9 882	R 10 763	R 11 644	R 12 525	R 13 406	R 14 288	R 15 169
	16%	R 9 279	R 10 160	R 11 041	R 11 923	R 12 804	R 13 685	R 14 566	R 15 448	R 16 329

Table 15: Target water balance KPIs

% Reduction	**SIV (m3/annum)**	**% Increase**	**Billed consumption (m^3/annum)**	**NRW (m^3/annum)**	**%NRW**	**l/c/d**
0%	4 389 308 559	0%	2 310 755 606	2 078 552 953	47.4%	217
2%	4 301 522 388	2%	2 356 970 718	1 944 551 670	45.2%	213
4%	4 213 736 217	4%	2 403 185 830	1 810 550 386	43.0%	208
6%	4 125 950 045	6%	2 449 400 943	1 676 549 103	40.6%	204
8%	4 038 163 874	8%	2 495 616 055	1 542 547 820	38.2%	200
10%	3 950 377 703	10%	2 541 831 167	1 408 546 536	35.7%	195
12%	3 862 591 532	12%	2 588 046 279	1 274 545 253	33.0%	191
14%	3 774 805 361	14%	2 634 261 391	1 140 543 970	30.2%	186
16%	3 687 019 190	16%	2 680 476 503	1 006 542 686	27.3%	182

7 CONCLUSIONS

The following conclusions are drawn from the assessment:

- A total of 88 datasets (61%) were received from WSAs, which is the highest number to date. Less than 50% of WSAs were able to submit water balance data in previous surveys. The confidence level of the data submitted varies between high (55%), medium (18%) and low (27%).
- **Category A** - Metropolitan municipalities continue to report consistently and most can provide a water balance monthly. This is encouraging, considering that metropolitan municipalities represent 53.3% of the total water use and 47.3% of the population.
- **Categories B1 and B2** - Most secondary city and large municipalities can provide a water balance regularly, although there is considerable room for improvement in some Provinces. The secondary city and large municipalities represent 21.4% of the total water use and 20.8% of the population. These municipalities are of economic significance and should have the necessary budgets and resources to implement WC/WDM.
- **Categories C2, B3 and B4 –** 53% of the small and rural municipalities can provide an accurate water balance regularly. Reasons for this include lack of budget, difficultly measuring the supply due to the large number of boreholes, and large indigent consumer bases. These municipalities represent approximately 25.3% of the total water use and 31.9% of the population.
- Water balance information is continuously updated and improved, which means that the data shown in this report differs from the data presented previous benchmarking studies.
- The current focus is to encourage the submission of the most basic water balance regularly, and not focussing on accuracy. Although the DWS highlights and fixes typical errors and anomalies, analysing, interpreting, and improving the water balance can become better over time as the DWS and WSA becomes more acquainted with the methodology and results. The results from this study should be seen as indicative of NRW and water losses in South Africa and improving the level of confidence will require significant time and resources.
- Water losses and NRW have increased in most municipalities since the onset of the Covid-19 pandemic in early 2020. The increase in NRW and water losses are attributed to reduced payment levels, increase supply to curb the spread of the virus, operations and maintenance budget cuts, and lack of capacity in municipalities to undertake repairs due to ill health and deaths.
- The 2022/23 national water balance indicates an SIV of 4 389.3 million m^3/annum, NRW of 2 078.6 million m^3/annum (47.4%) and water losses of 1 789.9 million m^3/annum (40.8%). NRW and water losses have increased by a notable 5.8% and 4.3%, respectively, from 2016. However, the greatest increase was in the past three years and attributed to the COVID-19 pandemic. The fluctuation between 2016 and 2019 was generally less than 1%.
- There has been a noticeable increase in billed unmetered consumption because of incorporating FBW supply in the estimated water balances, especially for rural municipalities. Unbilled unmetered consumption remains lower than expected, considering the high number of unbilled properties in South Africa. Municipalities must correct their water balance calculations and show any water use after an accepted connection as authorised consumption and not as water loss.
- The national NRW and water loss trends show a steady increase in NRW over the past 10 years, and SIV projections with WC/WDM is gradually being exceeded. The figures are highly influenced by the Category A, B1 and B2 municipalities, some of whom have made significant strides in improving NRW management, reducing water losses, and managing the demand in line with reconciliation strategy targets.
- National trends suggest that the per capita consumption of 218 l/c/d has remained constant over the past 8 years, which is commendable. However, WC/WDM efforts must be elevated, considering the level of service and inefficiencies, and that South Africa is one of the 30 driest countries in the world. Nonetheless, the per capita consumption is significantly lower than the

previous national average of 237 l/c/d presented in June 2016 because of the prevailing droughts in parts of South Africa. The subsequent water restrictions and WC/WDM interventions had a significant impact on the SIV, especially in the Western Cape.

- The ILI of 7.0 deteriorated dramatically from 2016 to 2023, showing signs of improvement in 2017 and 2018. The COVID-19 pandemic has adversely affected municipal water losses, and this trend is expected to improve once municipalities have returned to normal, eliminated the leak repair back-logs, and improved revenue collection.
- The results indicate increased NRW, water losses and ILI, but a significant decrease in the national per capita consumption. Given the increases on three key NRW metrics, WC/WDM must be implemented as a matter of urgency in all Provinces, especially considering that several Provinces have NRW and water losses above 50%. There is significant scope for improvement in reporting levels, data accuracy, and reduction of SIV, NRW, water losses and improved efficiency across South Africa. Only continuous monitoring and analyses will provide a credible benchmark against which the progress made with the implementation of WC/WDM can be measured.
- All municipalities would benefit from targeted demand management programmes, including community education and awareness, leak repair, infrastructure refurbishment, pressure management, and installation of bulk meters, amongst other measures.
- Based on the functional expenditure and SIV of 127 WSAs, the average cost of supplying water is R 13.07/kl. This ranges from R 17.32/kl for metropolitan municipalities to R 12.06 for Category B3 municipalities. The cost of supplying rural municipalities (Categories B4 and C2) is the highest, ranging from R 14.26/kl to R 17.64/kl. This is a meaningful change from previous assessments that suggested that the cost of supplying water in rural schemes is less than in large municipalities. The higher cost is justified, considering that these schemes often consist of many small systems with boreholes, which are expensive to operate.
- Using the national average and category average tariffs, the estimated cost to supply water in South Africa is between R 60 and R 70 billion per annum and revenue of between R 42 and R 44 billion is generated from water sales. The value of NRW is between R 28 and R 33 billion at R 13.07/kl which is higher than previous estimates. The increase is due to above inflation water tariff increases from water boards, and the under estimation of water supply costs to rural municipalities.
- The results show that approximately R 1 billion per annum could be saved if the SIV is reduced by 2%, and municipalities would generate nearly R 1 billion per annum for every 2% increase in revenue. The nett benefit could be R 10 billion per annum if revenue is increased by 10% and the SIV is reduced by 10%. Reducing the SIV by 10% and increasing the revenue by 10% would reduce the national NRW figure to 35.7%, and the per capita consumption to 195 l/c/d.
- The estimated water balances increase the national percentage NRW by approximately 5.5% and reduces the l/c/d by approximately 23 l/c/d. The estimated water balances increases the national figures, and it is highly unlikely that the NRW in reporting municipalities would be lower than in non-reporting municipalities.

6 RECOMMENDATIONS

The following recommendations are made to build on the progress made with reporting and the implementation of WC/WDM in the municipal environment:

6.1 DEPARTMENT OF WATER AND SANITATION

- All Provincial Offices should establish reporting templates, schedule meetings with municipalities to confirm targets, analyse the water balance information, and provide feedback. The reporting structures in well performing Provinces are now well established and managed by the Provinces, and most municipalities are reporting quarterly. The initiative was supported by Regulations and sending directives to municipalities who did not respond. A similar approach could be followed for all Provinces to improve communications and water balance reporting.
- The national NRW assessment suggests that 40% of municipalities cannot provide basic information such as monthly consumption figures and only 44% can provide information with a medium to high confidence level. One of the key challenges with gathering the information is the poor communication channels with municipalities, which include resigned staff and a considerable number of private e-mails. Discussions also indicate that in some cases municipalities are unwilling to provide the information as it reflects badly on them, or they feel that the information has already been submitted through the WSDP and various questionnaires. Government should reconsider communication channels with municipalities. Communication should be more formal, avoid duplication, and target senior management in the organisation. In this regard, the circulars from National Treasury provide clear guidelines to municipalities and communications are only with the mayor, municipal manager, and CFO.
- Maintenance of the reconciliation strategies must continue and should be used to monitor the progress made with the implementation of WC/WDM.
- Ongoing monitoring and reporting of municipal NRW and water loss performance by DWS against determined targets and baselines are critical.
- DWS Provincial Offices / CMAs / Water Boards must increase their skills and capacity to provide WC/WDM support to municipalities, for monitoring and reporting.
- Budgets are allocated towards new infrastructure projects through WSIG, RBIG, MIG, and other funding programmes, but the management of these funds is fragmented, with emphasis on new infrastructure and insufficient focus on WC/WDM.
- The No Drop incentive-based regulation programme should be rolled-out as planned, alongside the other Drop programmes, to elevate WC/WDM regulation in the municipal environment. DWS should also strengthen and enforce its regulatory mandate to penalise municipalities that do not comply.
- The recommendations of South Africa's National Development Plan (Vision for 2030) (National Planning Commission, 2013) must be implemented.
- The Regulations Relating to Compulsory National Standards and Measures to Conserve Water (GNR.509 of 8 June 2001) states that a water services institution must fit a suitable water volume measuring device or volume controlling device to every user connection to control demand. Many municipalities do not comply with this regulation, which results in excessive leakages on private properties through leaking taps and toilets as there is no incentive for consumers to fix the leaks. DWS should consider a policy whereby water services institutions are compelled to either measure and control or fix leaks on private properties, as government cannot continue to fund new infrastructure projects to supplement leakage. DWS is already encouraging the fixing of leaks through various programmes.
- The National Water and Sanitation Master Plan (DWS, 2018) states that South Africa is facing a water crisis caused by insufficient water infrastructure maintenance and investment, recurrent

droughts driven by climatic variation, inequities in access to water and sanitation, environmental degradation and resource pollution, and a lack of skilled water engineers. This crisis is already having significant impacts on economic growth and on the well-being of everyone in South Africa. The recommendations of the National Water and Sanitation Master Plan should be implemented as a matter of urgency.

6.2 MUNICIPALITIES

- Too many local municipalities are not aware of the reconciliation strategies or expect DWS to provide the necessary funding to implement these strategies. Municipalities must be reminded of their responsibilities in terms of the Water Services Act (No. 108 of 1997) and actively participate, budget through the Integrated Development Planning process, and implement the results from the reconciliation strategies.
- Municipalities should encourage consumers to appreciate the value of water and enforce the user pays principal, through on-going awareness programmes.
- Municipalities should continue their effort to capitalise on the awareness created and sustain the savings achieved during the drought.
- Municipalities should resolve intermittent supply as it is a prerequisite for an effective WC/WDM programme. Intermittent supply is ineffective (consumers adapt), corrupts meter readings and billing data, expensive to operate, damage pipe seals with subsequent increased leakage and is disruptive.
- Municipalities must actively participate and report at the reconciliation strategies meetings and use the outcomes to prioritise resources and budgets.
- Monitoring and reporting on water balances by municipalities could become more self-regulatory if a policy is implemented that no new infrastructure projects will be funded unless the municipality can provide actual consumption figures and proof that their water losses are under control. The IWA water balance should become the backbone of all water related management and decision support systems, especially grant application and awarding processes.
- Municipalities should increase their efforts to achieve the targets set under the reconciliation strategies to ensure water security, and targets must be reviewed regularly.
- Municipalities should increase their efforts to reduce NRW and the negative impact it has on their ability to generate income and operate a viable water service.
- Municipalities should resolve metering and billing issues to increase payment levels, encourage consumer fixing of leaks, prosecute illegal water connections, and reduce theft of water.
- The recommendations of the Third Edition of the National Water Resource Strategy (DWA, June 2021) must be implemented, including the call for greater emphasis on meeting specific targets to reduce water loss. WC/WDM measures will have multiple benefits in terms of the postponement of infrastructure augmentation, mitigation against climate change, support for economic growth, and ensuring that adequate water is available for equitable allocation.
- Municipal asset management needs to be improved to ensure greater sustainability of water supply services.
- There is close correlation between operations, maintenance, low water losses and NRW. Municipalities should implement proactive operations and maintenance programmes to coincide with WC/WDM programmes.
- Closer involvement and collaboration with National Treasury are critical to ensure issues related to funding of WC/WDM programmes, and metering and billing issues are resolved with municipal finance departments.

6.3 STAKEHOLDERS

- Greater involvement of the private sector through public-private partnership, stewardship, and performance-based contracts should be encouraged to improve service delivery and expedite the implementation of WC/WDM interventions. National Treasury should review the procurement of these contracts to eliminate bottlenecks and attract private investment.
- On-going provision of mentorship to municipalities through the DWS Provincial Offices, Department of Cooperative Governance and Traditional Affairs (CoGTA), the South African Local Government Association (SALGA) and other institutions is critical.
- Closer involvement and collaboration with CoGTA and SALGA are critical to ensure issues related to human resources skills and capacity in municipalities, payment for services, and unauthorised water use are resolved.
- Closer collaboration is required with other national, provincial, and local government departments that are big water users. These include Departments of Education, Correctional Services, Health, Public Works, and Housing, to ensure leakages and wastage are brought under control.
- Every citizen has a right to, amongst other things, sufficient food, and water, placing water at the forefront of human development and therefore emphasizing the importance of its management and beneficial use. This human right comes with a responsibility and every citizen must use water sparingly, pay for water services, fix household leaks, report municipal leaks, and promote water use efficiency at home, work, and public facilities.

APPENDIX A: MUNICIPAL WATER BALANCE SCORECARDS

Municipal IWA Water Balance Information

National and Provincial

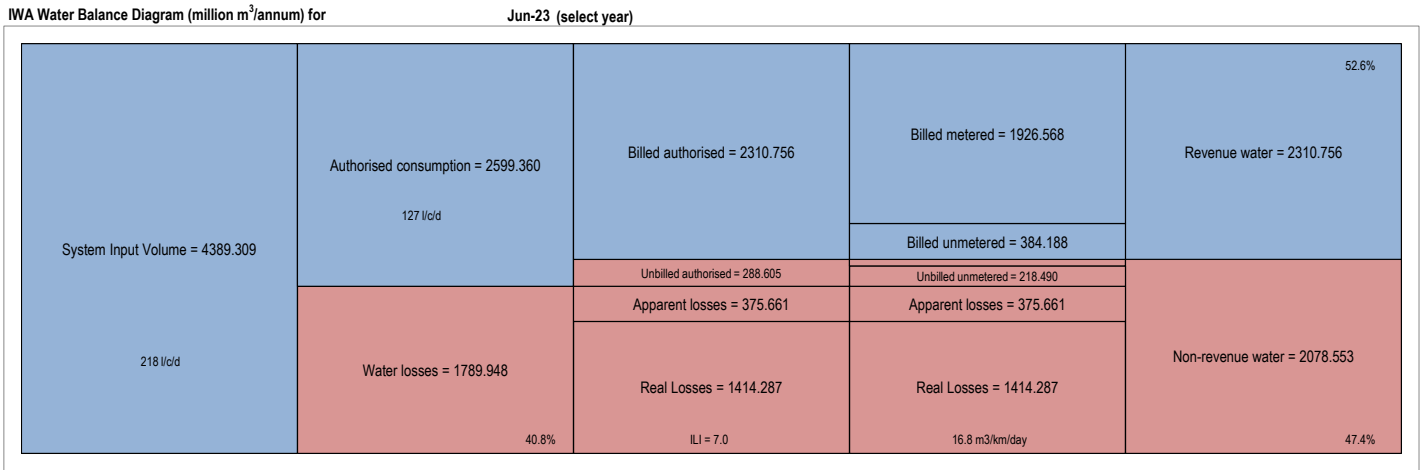
Municipal IWA Water Balance Information

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Province	National
Municipal Code	
District Municipality	
Municipality	
Settlements	

		Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Input Data	**Population served**	**No**	**44 575 371**	**45 401 128**	**46 146 561**	**46 966 860**	**48 093 972**	**49 466 866**	**50 965 477**	**51 765 758**	**52 547 314**	**52 945 160**	**54 331 818**
	Households served	**No**	**13 469 336**	**13 789 169**	**14 199 215**	**14 689 460**	**15 246 361**	**15 808 363**	**16 313 112**	**16 579 251**	**16 838 912**	**16 432 092**	**17 097 678**
	Connections - total	**No**	**9 813 323**	**10 327 076**	**10 288 627**	**10 578 493**	**10 697 074**	**10 618 063**	**10 912 552**	**10 928 477**	**11 095 461**	**10 737 231**	**10 680 482**
	Connections - metered	**No**	**8 321 874**	**8 653 686**	**8 332 235**	**8 468 653**	**8 546 894**	**8 551 830**	**8 746 340**	**8 650 604**	**8 761 732**	**8 660 445**	**8 624 517**
	Domestic (and non-domestic)	No	8 218 316	8 518 035	8 216 467	8 343 797	8 423 818	8 398 363	8 590 833	8 504 504	8 605 453	8 471 564	8 443 043
	Non-domestic	No	103 559	135 651	115 768	124 856	123 075	153 467	155 507	146 101	156 279	188 882	181 475
	Connections - unmetered	**No**	**1 595 007**	**1 809 041**	**2 072 160**	**2 234 696**	**2 273 256**	**2 219 699**	**2 321 719**	**2 423 974**	**2 490 009**	**2 265 667**	**2 237 439**
	Households / connection	**No**	**1.4**	**1.3**	**1.4**	**1.4**	**1.4**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.6**
	Length of mains	**km**	**207 274**	**203 220**	**202 778**	**208 239**	**213 995**	**219 759**	**224 262**	**231 932**	**234 864**	**229 607**	**230 049**
	Connections / km	**No / km**	**47**	**51**	**51**	**51**	**50**	**48**	**49**	**47**	**47**	**47**	**46**
	Average system pressure	**m**	**46**	**48**	**47**	**47**	**47**	**47**	**47**	**47**	**47**	**47**	**46**
	Time system pressurised	**%**	**96%**	**95%**	**96%**	**98%**	**98%**	**98%**	**97%**	**98%**	**97%**	**94%**	**95%**
	Apparent losses	**%**	**20%**	**20%**	**20%**	**21%**	**21%**	**21%**	**21%**	**20%**	**20%**	**20%**	**21%**
	Consumer meter age	%	6%	6%	7%	7%	7%	7%	7%	7%	7%	7%	7%
	Illegal connections	%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	7%
	Data transfer	%	8%	8%	7%	8%	8%	8%	8%	7%	7%	7%	7%
Water Balance Calculations	**System input volume**	**kl/annum**	**3 169 816 802**	**3 124 470 860**	**3 451 329 549**	**4 127 353 742**	**3 930 831 938**	**3 887 970 962**	**4 004 729 253**	**4 131 009 296**	**4 241 587 467**	**4 306 772 698**	**4 389 308 559**
	Own sources	kl/annum	1 660 918 755	1 564 415 668	1 856 180 212	2 491 545 427	2 313 451 653	1 898 447 941	1 879 908 456	1 888 880 756	1 949 885 532	1 935 021 984	1 970 273 563
	Other sources	kl/annum	1 508 898 047	1 560 055 192	1 595 149 338	1 635 808 316	1 617 380 284	1 989 523 021	2 124 820 797	2 242 128 540	2 291 701 935	2 371 750 713	2 419 034 996
	Authorised Consumption	**kl/annum**	**2 242 368 848**	**2 149 911 042**	**2 337 573 662**	**2 623 089 808**	**2 550 090 883**	**2 530 146 324**	**2 504 810 825**	**2 527 209 915**	**2 542 550 781**	**2 553 611 482**	**2 599 360 426**
	Billed authorised	**kl/annum**	**2 013 246 051**	**1 976 632 166**	**2 146 063 832**	**2 412 932 659**	**2 336 732 323**	**2 289 053 531**	**2 281 840 882**	**2 301 030 912**	**2 315 559 265**	**2 292 166 484**	**2 310 755 606**
	Billed metered	kl/annum	1 936 272 676	1 898 784 025	2 002 842 519	2 003 965 735	1 944 121 752	1 892 732 094	1 897 011 467	1 899 331 600	1 920 947 577	1 904 281 320	1 926 567 807
	Domestic (and non-domestic)	kl/annum	1 627 954 645	1 611 848 612	1 664 226 041	1 674 253 377	1 701 922 156	1 572 764 402	1 581 343 193	1 542 123 587	1 553 163 643	1 473 772 950	1 477 981 595
	Non-domestic	kl/annum	250 014 290	227 706 448	274 219 355	260 511 281	181 153 936	269 836 093	267 438 992	299 052 711	305 109 695	362 705 653	373 271 555
	Export volume	kl/annum	58 303 740	59 228 965	64 397 123	69 201 077	61 045 659	50 131 599	48 229 282	58 155 303	62 674 239	67 802 716	75 314 658
	Billed unmetered	kl/annum	76 973 375	77 848 141	143 221 313	408 966 924	392 610 570	396 321 437	384 829 416	401 699 311	394 611 688	387 885 164	384 187 799
	Unbilled authorised	**kl/annum**	**229 122 797**	**173 278 875**	**191 509 830**	**210 157 149**	**213 358 561**	**241 092 793**	**222 969 943**	**226 179 004**	**226 991 516**	**261 444 999**	**288 604 819**
	Unbilled metered	kl/annum	107 443 043	37 470 416	39 997 375	57 640 949	40 289 219	48 954 363	33 851 408	35 046 914	32 074 173	55 920 232	70 115 107
	Unbilled unmetered	kl/annum	121 679 754	135 808 459	151 512 455	152 516 200	173 069 342	192 138 430	189 118 535	191 132 090	194 917 343	205 524 766	218 489 713
	Water Losses	**kl/annum**	**927 447 953**	**974 559 818**	**1 113 755 887**	**1 504 263 934**	**1 380 741 054**	**1 357 824 637**	**1 499 918 427**	**1 603 799 380**	**1 699 036 686**	**1 753 161 215**	**1 789 948 133**
	Commercial / Apparent losses	**kl/annum**	**183 840 317**	**194 539 686**	**225 754 866**	**312 669 413**	**287 562 644**	**280 251 194**	**315 925 147**	**326 839 023**	**343 247 974**	**350 743 232**	**375 660 852**
	Physical / Real losses	**kl/annum**	**743 607 636**	**780 020 132**	**888 001 022**	**1 191 594 521**	**1 093 178 410**	**1 077 573 444**	**1 183 993 280**	**1 276 960 357**	**1 355 788 712**	**1 402 417 983**	**1 414 287 281**
	UARL	**kl/annum**	**185 867 458**	**197 682 068**	**194 489 975**	**205 989 381**	**208 008 068**	**210 336 922**	**214 526 231**	**215 660 997**	**217 632 637**	**203 706 348**	**203 210 832**
	Potential real loss saving	**kl/annum**	**557 740 178**	**582 338 065**	**693 511 046**	**985 605 140**	**885 170 342**	**867 236 522**	**969 467 048**	**1 061 299 361**	**1 138 156 075**	**1 198 711 635**	**1 211 076 450**
	Revenue water	**kl/annum**	**2 013 246 051**	**1 976 632 166**	**2 146 063 832**	**2 412 932 659**	**2 336 732 323**	**2 289 053 531**	**2 281 840 882**	**2 301 030 912**	**2 315 559 265**	**2 292 166 484**	**2 310 755 606**
	Non-Revenue water	**kl/annum**	**1 156 570 751**	**1 147 838 693**	**1 305 265 717**	**1 714 421 083**	**1 594 099 615**	**1 598 917 431**	**1 722 888 370**	**1 829 978 384**	**1 926 028 201**	**2 014 606 214**	**2 078 552 953**
	Projected SIV without WDM	kl/annum	2 502 934 521	3 319 650 476	3 905 892 241	4 000 393 424	4 096 158 347	4 202 415 007	4 310 214 114	4 419 501 242	4 520 870 504	4 622 108 854	4 721 340 439
	Projected SIV with WDM	kl/annum	2 371 163 857	3 110 611 879	3 619 652 004	3 650 003 533	3 683 870 575	3 767 054 261	3 851 537 468	3 947 421 618	4 043 126 515	4 136 258 643	4 216 963 316
	Source of information												
	Comments												

IWA Water Balance Diagram (million m^3/annum) for **Jun-23 (select year)**



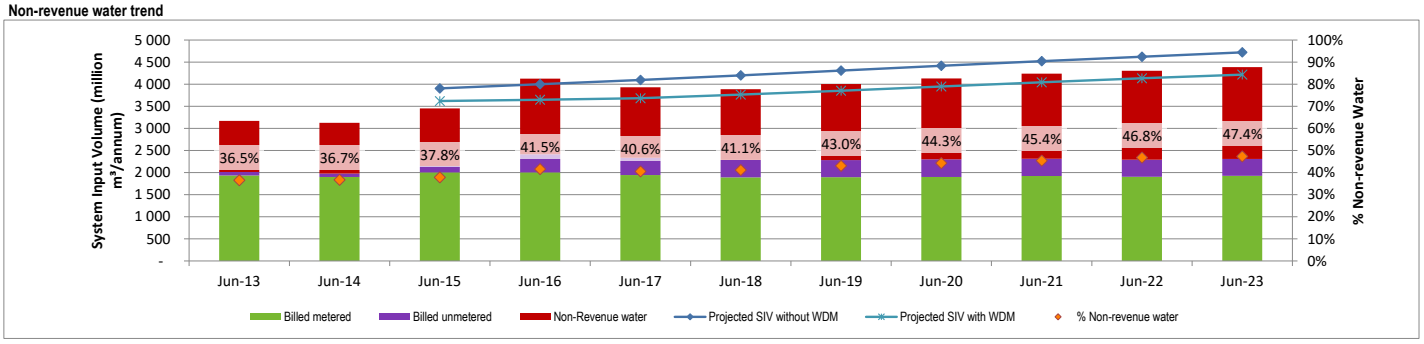
Note : All underlined values have been calculated using trends and / or averages based on previous years.

Municipal IWA Water Balance Information

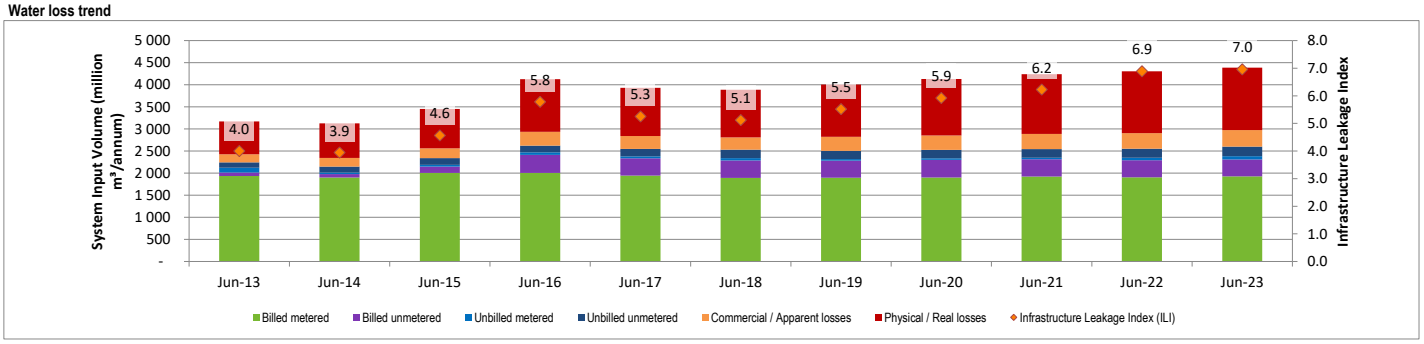
water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

	Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Key performance indicators	Indicator as % of system input volume											
	% Revenue water	63.5%	63.3%	62.2%	58.5%	59.4%	58.9%	57.0%	55.7%	54.6%	53.2%	52.6%
	% Non-revenue water	36.5%	36.7%	37.8%	41.5%	40.6%	41.1%	43.0%	44.3%	45.4%	46.8%	47.4%
	% Water Losses	29.3%	31.2%	32.3%	36.4%	35.1%	34.9%	37.5%	38.8%	40.1%	40.7%	40.8%
	System input volume unit consumption											
	Litres / capita / day	191	185	201	237	220	213	213	216	218	219	218
	m³ / household / month	19	19	20	23	21	20	20	20	21	21	21
	m³ / connection / month	26	25	27	32	30	30	30	31	31	33	34
	Authorised Unit Consumption											
	Litres / capita / day	134	126	135	149	142	137	132	131	129	129	127
	m³ / household / month	14	13	13	14	14	13	13	12	12	13	12
	m³ / connection / month	19	17	18	20	19	19	19	19	19	19	20
	Domestic (& ND) m³ / connection / month	16	15	16	18	18	17	17	17	16	16	17
	Non-domestic m³ / connection / month	201	140	197	174	123	147	143	171	163	160	171
	Water loss indicators											
	Litres / capita / day	57	59	66	88	79	75	81	85	89	91	90
	m³ / household / month	6	6	7	9	8	7	8	8	8	9	9
	m³ / connection / month	8	8	9	12	11	11	11	12	13	14	14
	UARL : Losses (litres / connection / day)	52	52	52	53	53	54	54	54	54	52	52
	CARL : Losses (litres / connection / day)	208	207	236	309	280	278	297	320	335	358	363
	Infrastructure Leakage Index (ILI)	4.0	3.9	4.6	5.8	5.3	5.1	5.5	5.9	6.2	6.9	7.0
	CARL : Losses (m³ / km mains / day)	10	11	12	16	14	13	14	15	16	17	17
	% Population growth	1.81%	1.85%	1.64%	1.81%	2.09%	2.63%	2.94%	2.30%	1.54%	1.13%	1.68%
	% Water demand growth	-1.22%	-1.43%	10.46%	31.63%	-2.41%	-2.94%	0.94%	3.08%	2.91%	2.11%	1.73%
	% Water demand growth without WDM	2.85%	32.63%	17.66%	1.45%	2.41%	2.49%	2.58%	2.55%	2.41%	2.27%	2.19%
	% Water demand growth with WDM	0.17%	31.19%	16.36%	5.72%	0.88%	1.59%	2.25%	2.37%	2.46%	2.36%	2.13%
	5 Year Annualised Population Growth	2.75%	2.63%	2.14%	1.66%	1.90%	2.10%	2.34%	2.32%	2.27%	1.11%	1.15%
	5 Year Annualised Water Growth	4.11%	3.77%	3.64%	3.58%	3.57%	3.25%	3.42%	3.15%	2.77%	8.21%	4.18%

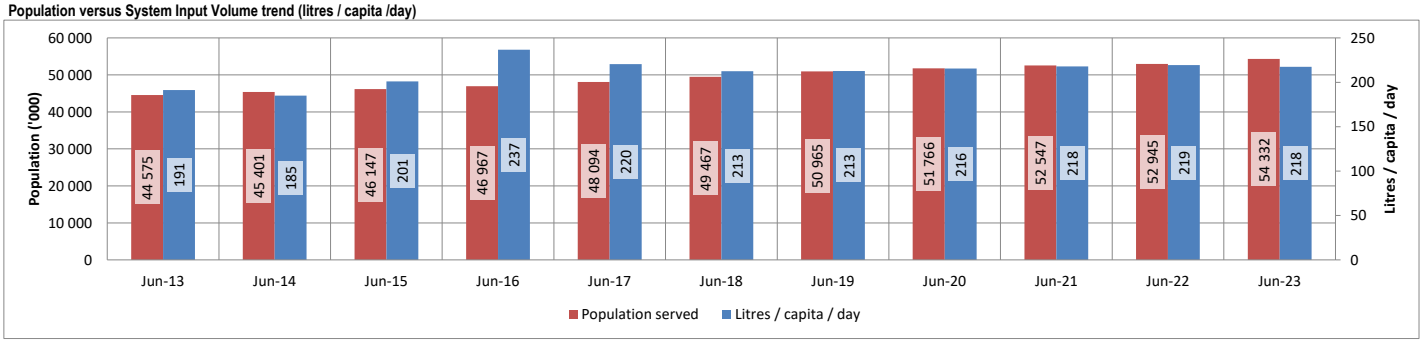
Non-revenue water trend



Water loss trend



Population versus System Input Volume trend (litres / capita /day)



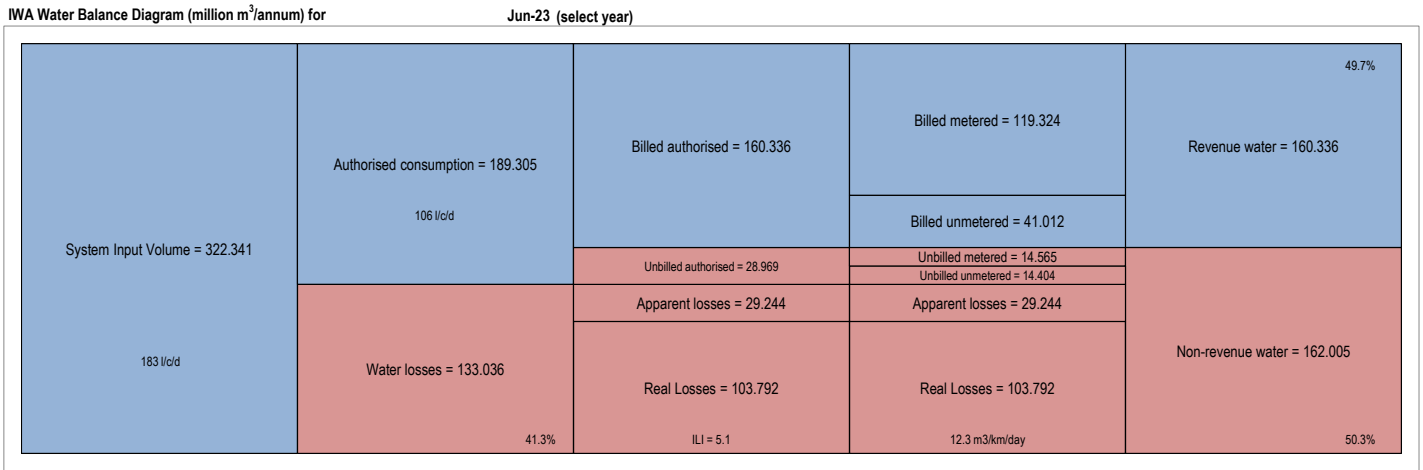
Municipal IWA Water Balance Information

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Province	Eastern Cape
Municipal Code	
District Municipality	Cacadu, Amathole, Chris Hani, Joe Gqabi, OR Thambo
Municipality	
Settlements	

		Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Input Data	**Population served**	**No**	**4 258 296**	**4 269 938**	**4 294 770**	**4 477 918**	**4 697 378**	**4 443 888**	**4 472 177**	**4 491 422**	**4 500 104**	**4 742 235**	**4 773 325**
	Households served	**No**	**1 171 071**	**1 183 477**	**1 195 885**	**1 208 325**	**1 275 960**	**1 198 390**	**1 206 299**	**1 211 946**	**1 214 430**	**1 252 386**	**1 262 172**
	Connections - total	**No**	**1 062 441**	**1 076 636**	**1 082 167**	**1 086 215**	**1 138 664**	**1 094 483**	**1 029 952**	**1 034 813**	**1 029 749**	**1 032 402**	**1 010 755**
	Connections - metered	**No**	**711 838**	**715 992**	**719 873**	**724 758**	**716 098**	**707 244**	**729 551**	**732 267**	**731 746**	**735 154**	**683 098**
	Domestic (and non-domestic)	No	695 797	699 119	702 902	707 555	698 529	689 638	712 550	715 858	712 447	715 963	664 129
	Non-domestic	No	16 041	16 873	16 972	17 203	17 569	17 606	17 002	16 410	19 299	19 191	18 969
	Connections - unmetered	**No**	**350 603**	**360 644**	**362 293**	**361 457**	**422 566**	**387 239**	**300 400**	**302 546**	**298 003**	**297 248**	**327 657**
	Households / connection	**No**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
	Length of mains	**km**	**19 958**	**19 889**	**20 069**	**20 226**	**21 186**	**20 853**	**21 192**	**22 608**	**22 743**	**23 029**	**23 090**
	Connections / km	**No / km**	**53**	**54**	**54**	**54**	**54**	**52**	**49**	**46**	**45**	**45**	**44**
	Average system pressure	**m**	**51**	**52**	**48**	**49**	**49**	**49**	**49**	**46**	**46**	**46**	**46**
	Time system pressurised	**%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	Apparent losses	**%**	**21%**	**20%**	**18%**	**19%**	**20%**	**20%**	**21%**	**21%**	**22%**	**22%**	**22%**
	Consumer meter age	%	6%	6%	6%	6%	6%	6%	7%	7%	7%	7%	7%
	Illegal connections	%	6%	6%	5%	5%	6%	6%	6%	7%	7%	7%	7%
	Data transfer	%	8%	8%	7%	7%	8%	8%	8%	8%	8%	8%	8%
Water Balance Calculations	**System input volume**	**kl/annum**	**197 544 976**	**202 304 984**	**205 196 065**	**350 617 773**	**349 628 741**	**335 357 994**	**339 579 811**	**333 625 862**	**332 784 991**	**313 262 793**	**322 340 566**
	Own sources	kl/annum	169 707 363	173 610 253	175 950 449	325 857 436	320 115 946	305 845 200	311 155 805	305 201 856	300 413 306	280 835 045	289 302 168
	Other sources	kl/annum	27 837 613	28 694 731	29 245 617	24 760 337	29 512 795	29 512 795	28 424 006	28 424 006	32 371 686	32 427 749	33 038 399
	Authorised Consumption	**kl/annum**	**117 868 585**	**121 649 841**	**124 491 044**	**191 258 526**	**201 466 635**	**194 902 885**	**192 783 884**	**182 531 441**	**184 306 286**	**187 771 224**	**189 304 930**
	Billed authorised	**kl/annum**	**108 743 588**	**118 077 811**	**120 631 463**	**182 003 794**	**190 744 453**	**183 645 754**	**183 345 532**	**172 150 461**	**171 952 257**	**164 489 616**	**160 335 729**
	Billed metered	kl/annum	100 674 548	105 596 589	113 561 731	107 935 122	118 172 317	110 742 591	111 437 769	116 879 034	119 866 668	120 711 310	119 323 695
	Domestic (and non-domestic)	kl/annum	67 859 923	71 369 536	89 203 311	75 683 679	79 306 646	77 371 379	80 604 844	85 788 542	87 449 173	89 925 418	89 181 319
	Non-domestic	kl/annum	30 259 759	30 675 082	20 767 671	26 650 274	33 127 783	27 700 607	26 106 888	26 999 955	27 628 373	26 822 388	26 309 265
	Export volume	kl/annum	2 554 866	3 551 971	3 590 749	5 601 169	5 737 888	5 670 606	4 726 037	4 090 537	4 789 123	3 963 504	3 833 111
	Billed unmetered	kl/annum	8 069 040	12 481 222	7 069 732	74 068 672	72 572 136	72 903 163	71 907 763	55 271 427	52 085 589	43 778 306	41 012 034
	Unbilled authorised	**kl/annum**	**9 124 997**	**3 572 031**	**3 859 582**	**9 254 732**	**10 722 182**	**11 257 132**	**9 438 352**	**10 380 980**	**12 354 029**	**23 281 609**	**28 969 201**
	Unbilled metered	kl/annum	6 981 212	1 256 801	1 510 869	517 897	8 325 777	8 866 379	1 251 497	1 058 497	1 333 734	11 749 828	14 565 093
	Unbilled unmetered	kl/annum	2 143 785	2 315 230	2 348 713	8 736 835	2 396 405	2 390 753	8 186 855	9 322 483	11 020 295	11 531 781	14 404 108
	Water Losses	**kl/annum**	**79 676 391**	**80 655 143**	**80 705 021**	**159 359 247**	**148 162 106**	**140 455 109**	**146 795 927**	**151 094 421**	**148 478 705**	**125 491 569**	**133 035 636**
	Commercial / Apparent losses	**kl/annum**	**16 479 734**	**16 131 029**	**14 795 921**	**29 841 916**	**29 782 347**	**28 233 149**	**31 342 678**	**32 449 326**	**33 003 369**	**27 899 465**	**29 244 084**
	Physical / Real losses	**kl/annum**	**63 196 657**	**64 524 114**	**65 909 100**	**129 517 331**	**118 379 759**	**112 221 960**	**115 453 249**	**118 645 095**	**115 475 336**	**97 592 104**	**103 791 553**
	UARL	**kl/annum**	**22 722 433**	**23 290 910**	**21 571 334**	**21 913 590**	**22 966 314**	**22 231 707**	**21 422 864**	**20 818 177**	**20 624 657**	**20 746 155**	**20 475 003**
	Potential real loss saving	**kl/annum**	**40 474 224**	**41 233 205**	**44 337 767**	**107 603 741**	**95 413 445**	**89 990 252**	**94 030 385**	**97 826 918**	**94 850 679**	**76 845 949**	**83 316 549**
	Revenue water	**kl/annum**	**108 743 588**	**118 077 811**	**120 631 463**	**182 003 794**	**190 744 453**	**183 645 754**	**183 345 532**	**172 150 461**	**171 952 257**	**164 489 616**	**160 335 729**
	Non-Revenue water	**kl/annum**	**88 801 388**	**84 227 174**	**84 564 602**	**168 613 979**	**158 884 288**	**151 712 240**	**156 234 278**	**161 475 400**	**160 832 734**	**148 773 178**	**162 004 837**
	Projected SIV without WDM	kl/annum		395 635 843	405 444 632	414 316 466	423 205 158	432 427 304	441 666 849	451 262 928	460 135 098	469 308 799	478 482 500
	Projected SIV with WDM	kl/annum		360 497 817	365 836 425	370 110 338	374 334 223	378 738 727	383 093 736	389 937 880	398 810 050	407 983 751	417 157 452
Source of information													
Comments													

IWA Water Balance Diagram (million m^3/annum) for **Jun-23 (select year)**



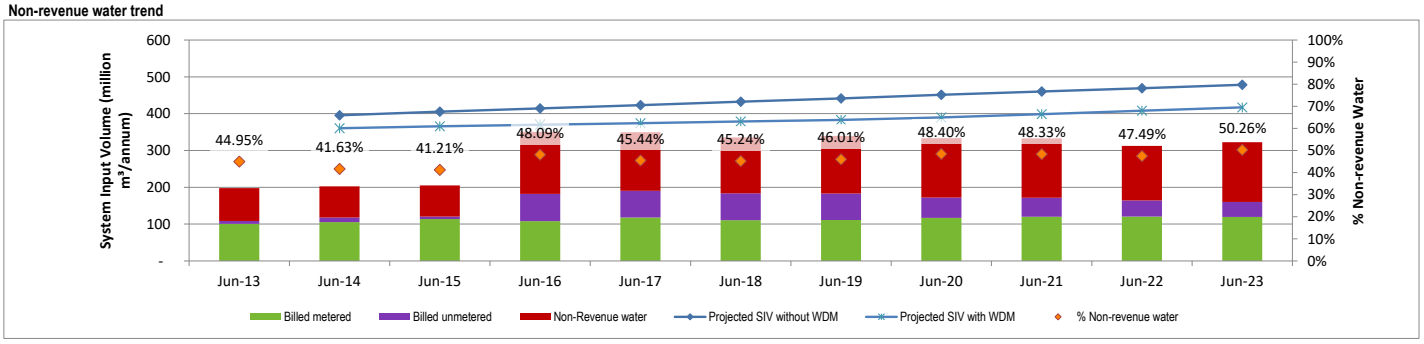
Note : All underlined values have been calculated using trends and / or averages based on previous years.

Municipal IWA Water Balance Information

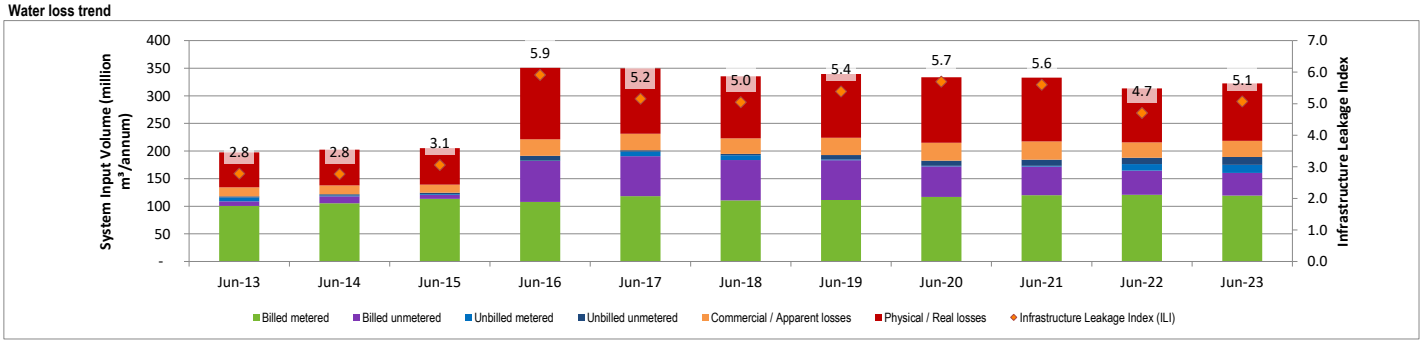
water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

	Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Key performance indicators	Indicator as % of system input volume											
	% Revenue water	55.0%	58.4%	58.8%	51.9%	54.6%	54.8%	54.0%	51.6%	51.7%	52.5%	49.7%
	% Non-revenue water	45.0%	41.6%	41.2%	48.1%	45.4%	45.2%	46.0%	48.4%	48.3%	47.5%	50.3%
	% Water Losses	40.3%	39.9%	39.3%	45.5%	42.4%	41.9%	43.2%	45.3%	44.6%	40.1%	41.3%
	System input volume unit consumption											
	Litres / capita / day	125	128	129	211	201	203	205	201	200	179	183
	m³ / household / month	14	14	14	24	22	23	23	23	23	21	21
	m³ / connection / month	15	15	16	26	25	25	27	27	27	25	26
	Authorised Unit Consumption											
	Litres / capita / day	74	76	77	114	114	117	115	109	109	106	106
	m³ / household / month	8	8	8	13	13	13	13	12	12	12	12
	m³ / connection / month	9	9	9	14	14	14	15	14	15	15	15
	Domestic (& ND) m³ / connection / month	7	7	8	12	12	13	13	12	13	13	13
	Non-domestic m³ / connection / month	157	151	102	129	157	131	128	137	119	116	116
	Water loss indicators											
	Litres / capita / day	51	52	51	98	86	87	90	92	90	73	76
	m³ / household / month	6	6	6	11	10	10	10	10	10	8	9
	m³ / connection / month	6	6	6	12	11	11	12	12	12	10	11
	UARL : Losses (litres / connection / day)	59	59	55	55	55	56	57	55	55	55	55
	CARL : Losses (litres / connection / day)	163	164	167	327	285	281	307	314	307	259	281
	Infrastructure Leakage Index (ILI)	2.8	2.8	3.1	5.9	5.2	5.0	5.4	5.7	5.6	4.7	5.1
	CARL : Losses (m³ / km mains / day)	9	9	9	18	15	15	15	14	14	12	12
	% Population growth	0.28%	0.27%	0.58%	3.02%	4.58%	-0.82%	0.11%	0.07%	0.03%	1.00%	1.58%
	% Water demand growth	-9.96%	2.41%	1.43%	96.68%	30.53%	13.45%	26.05%	13.44%	22.24%	9.97%	72.89%
	% Water demand growth without WDM			2.48%	1.08%	2.17%	0.21%	0.21%	0.21%	0.17%	0.20%	0.19%
	% Water demand growth with WDM			1.48%	90.90%	1.15%	14.46%	13.36%	13.27%	0.23%	0.23%	0.22%
	5 Year Annualised Population Growth	2.00%	1.46%	1.06%	1.07%	2.04%	-0.82%	0.11%	0.07%	0.03%	1.00%	1.58%
	5 Year Annualised Water Growth	-6.28%	-7.10%	-6.71%	9.83%	9.77%	13.45%	26.05%	13.44%	22.24%	9.97%	72.89%

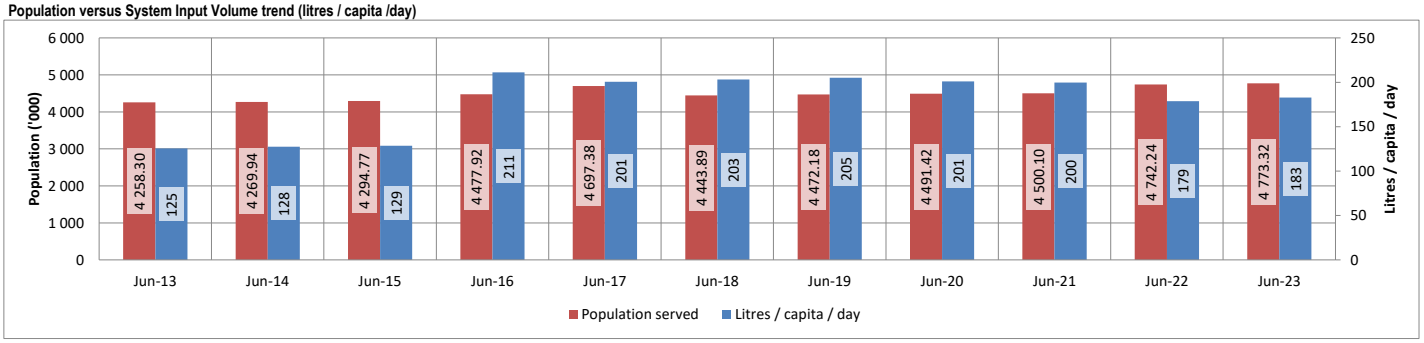
Non-revenue water trend



Water loss trend



Population versus System Input Volume trend (litres / capita /day)



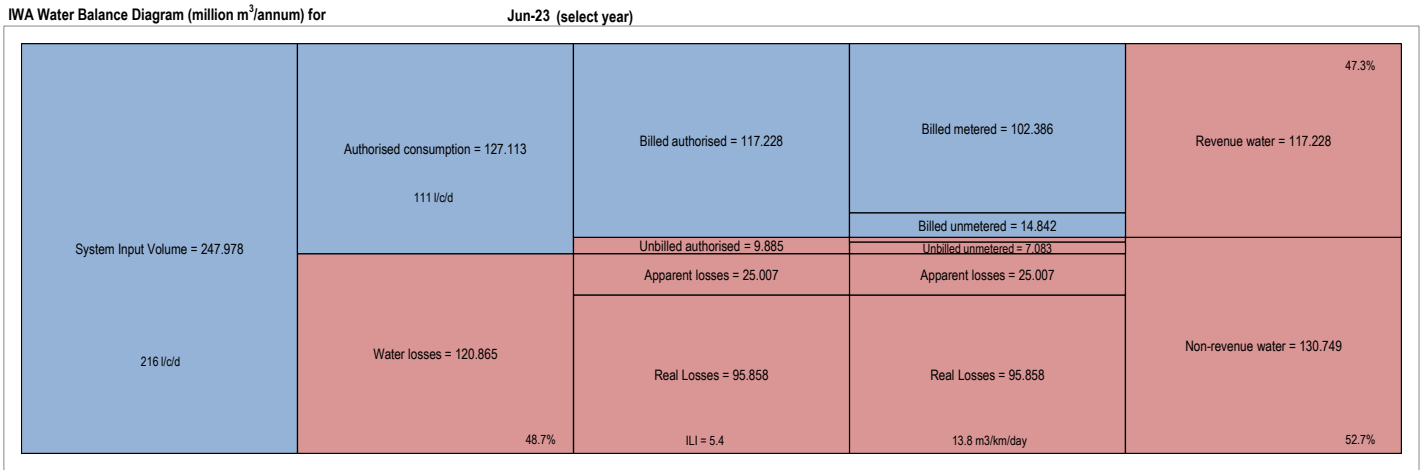
Municipal IWA Water Balance Information

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Province	Free State
Municipal Code	FS196
District Municipality	Dr Ruth Segomotsi Mompati, Lejweleputswa, Thabo Mofutsanyana, Fezile Dabi
Municipality	
Settlements	

		Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Inpu	**Population served**	**No**	**2 632 809**	**2 641 291**	**2 652 166**	**2 723 028**	**2 768 365**	**2 881 990**	**2 977 420**	**2 968 504**	**2 985 349**	**3 000 518**	**3 145 674**
	Households served	**No**	**834 565**	**859 760**	**884 958**	**910 172**	**944 089**	**992 731**	**1 025 562**	**1 022 515**	**1 028 244**	**1 032 762**	**1 039 863**
	Connections - total	**No**	**772 438**	**803 922**	**816 858**	**847 013**	**869 274**	**921 515**	**948 298**	**944 686**	**949 568**	**942 903**	**949 802**
	Connections - metered	**No**	**687 608**	**714 370**	**727 384**	**754 845**	**769 643**	**816 878**	**796 467**	**792 689**	**797 284**	**791 516**	**798 043**
	Domestic (and non-domestic)	No	687 608	714 370	727 384	754 845	769 643	816 878	792 701	788 923	793 518	786 597	793 136
	Non-domestic	No	0	0	0	0	0	0	3 766	3 766	3 766	4 919	4 907
	Connections - unmetered	**No**	**84 830**	**89 552**	**89 474**	**92 168**	**99 631**	**104 637**	**151 831**	**151 997**	**152 285**	**151 387**	**151 759**
	Households / connection	**No**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**
	Length of mains	**km**	**15 709**	**16 099**	**16 489**	**16 907**	**17 552**	**18 392**	**19 067**	**18 933**	**19 105**	**18 871**	**18 967**
	Connections / km	**No/km**	**49**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**
	Average system pressure	**m**	**44**	**48**	**47**	**44**	**44**	**44**	**44**	**44**	**44**	**47**	**47**
	Time system pressurised	**%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**94%**	**94%**
	Apparent losses	**%**	**20%**	**20%**	**21%**	**21%**	**20%**	**20%**	**20%**	**20%**	**20%**	**19%**	**21%**
	Consumer meter age	%	6%	6%	8%	7%	6%	6%	6%	6%	6%	6%	7%
	Illegal connections	%	6%	6%	7%	7%	6%	6%	6%	6%	6%	6%	6%
	Data transfer	%	8%	8%	5%	7%	8%	8%	8%	8%	8%	8%	8%
	System input volume	**kl/annum**	**188 395 654**	**132 417 094**	**121 219 008**	**233 020 335**	**230 378 911**	**234 199 766**	**241 103 855**	**240 913 681**	**244 232 783**	**247 056 885**	**247 977 565**
	Own sources	kl/annum	105 141 630	44 702 328	33 620 940	148 568 720	150 205 846	152 000 269	154 780 611	154 691 081	157 799 998	159 219 771	160 165 059
	Other sources	kl/annum	83 254 024	87 714 766	87 598 068	84 451 615	80 173 065	82 199 498	86 323 244	86 222 601	86 432 785	87 837 114	87 812 506
	Authorised Consumption		**133 820 096**	**86 311 306**	**87 714 221**	**127 819 995**	**126 565 870**	**122 468 055**	**123 923 799**	**121 362 087**	**120 301 057**	**119 985 966**	**127 113 035**
	Billed authorised	**kl/annum**	**95 192 468**	**68 656 961**	**70 622 588**	**113 091 619**	**115 648 989**	**116 642 149**	**118 217 877**	**113 448 524**	**114 620 933**	**114 281 016**	**117 228 256**
	Billed metered	kl/annum	95 084 468	68 656 961	66 837 908	89 529 051	91 829 161	93 438 223	94 225 429	91 717 162	93 288 739	93 946 878	102 385 811
	Domestic (and non-domestic)	kl/annum	95 084 468	68 656 961	66 837 908	89 529 051	91 829 161	93 438 223	94 225 429	91 717 162	93 288 739	93 802 164	96 073 062
	Non-domestic	kl/annum	0	0	0	0	0	0	0	0	0	144 714	6 312 683
	Export volume	kl/annum	0	0	0	0	0	0	0	0	0	0	66
	Billed unmetered	kl/annum	108 000	0	3 784 680	23 562 568	23 819 828	23 203 926	23 992 448	21 731 362	21 332 194	20 334 138	14 842 445
	Unbilled authorised	**kl/annum**	**38 627 628**	**17 654 345**	**17 091 633**	**14 728 376**	**10 916 882**	**5 825 907**	**5 705 922**	**7 913 562**	**5 680 124**	**5 704 950**	**9 884 780**
	Unbilled metered	kl/annum	33 954 652	12 871 191	12 301 877	8 819 068	686 683	850 536	797 469	2 976 071	733 817	754 007	2 801 828
	Unbilled unmetered	kl/annum	4 672 976	4 783 154	4 789 757	5 909 308	10 230 198	4 975 371	4 908 453	4 937 491	4 946 307	4 950 943	7 082 951
	Water Losses	**kl/annum**	**54 575 558**	**46 105 789**	**33 504 787**	**105 200 340**	**103 813 041**	**111 731 711**	**117 180 056**	**119 551 595**	**123 931 726**	**127 070 919**	**120 864 530**
	Commercial / Apparent losses	**kl/annum**	**10 915 112**	**9 221 158**	**6 967 844**	**21 704 809**	**20 762 608**	**22 122 879**	**23 201 651**	**23 591 515**	**24 455 861**	**24 499 273**	**25 006 871**
	Physical / Real losses	**kl/annum**	**43 660 446**	**36 884 631**	**26 536 943**	**83 495 530**	**83 050 433**	**89 608 832**	**93 978 405**	**95 960 080**	**99 475 866**	**102 571 646**	**95 857 659**
	UARL	**kl/annum**	**14 465 340**	**16 344 693**	**16 417 822**	**15 590 564**	**16 242 461**	**17 156 456**	**17 695 749**	**17 610 536**	**17 723 036**	**17 585 114**	**17 688 655**
	Potential real loss saving	**kl/annum**	**29 195 107**	**20 539 938**	**10 119 121**	**67 904 967**	**66 807 972**	**72 452 376**	**76 282 656**	**78 349 544**	**81 752 830**	**84 986 532**	**78 169 004**
	Revenue water	**kl/annum**	**95 192 468**	**68 656 961**	**70 622 588**	**113 091 619**	**115 648 989**	**116 642 149**	**118 217 877**	**113 448 524**	**114 620 933**	**114 281 016**	**117 228 256**
	Non-Revenue water	**kl/annum**	**93 203 186**	**63 760 133**	**50 596 420**	**119 928 716**	**114 729 923**	**117 557 618**	**122 885 978**	**127 465 157**	**129 611 850**	**132 775 869**	**130 749 310**
	Projected SIV without WDM	kl/annum	257 740 318	264 718 701	271 962 658	277 720 537	283 644 188	289 736 573	296 000 851	302 440 381	308 914 157	315 567 973	322 169 723
	Projected SIV with WDM	kl/annum	244 320 880	248 575 952	253 199 870	255 063 460	258 090 125	263 171 284	268 452 953	274 203 686	280 282 159	284 228 177	289 611 079
Water Balance Calculations													
Source of information													
omments													

IWA Water Balance Diagram (million m^3/annum) for **Jun-23 (select year)**



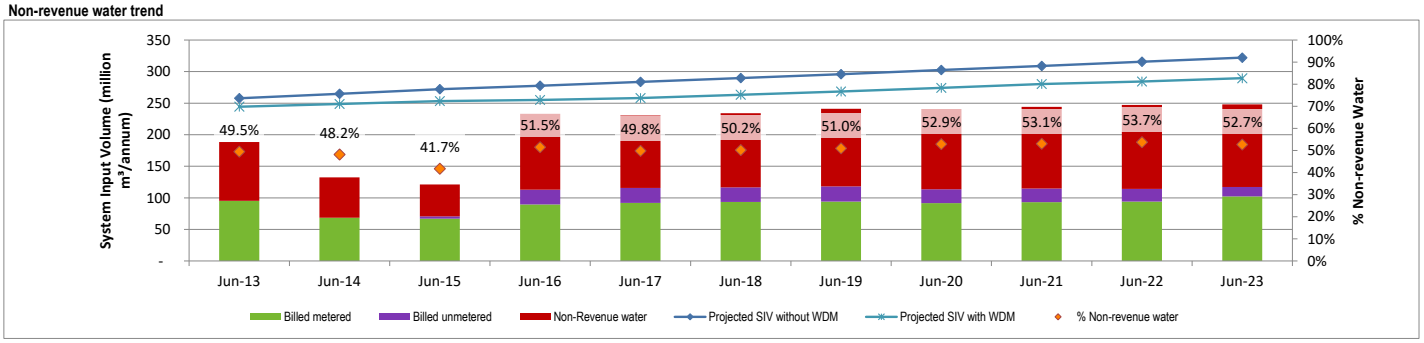
Note : All underlined values have been calculated using trends and / or averages based on previous years.

Municipal IWA Water Balance Information

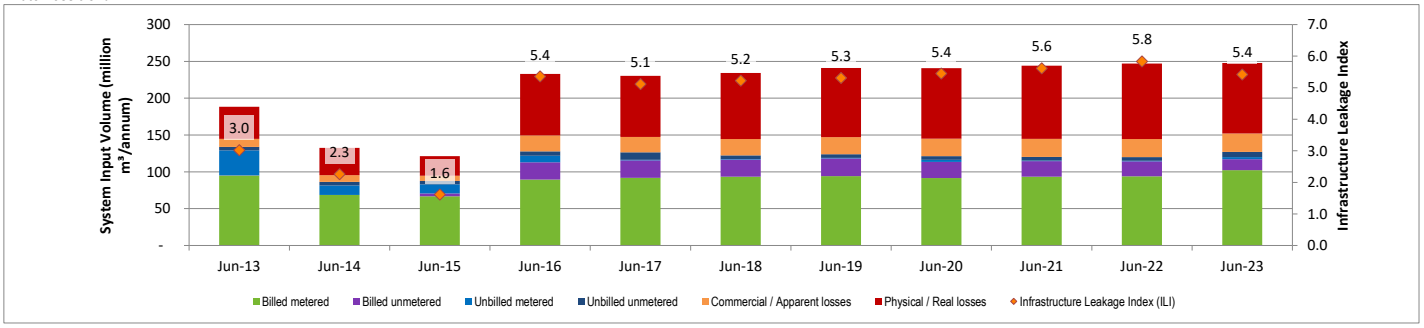
water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Key	Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
	Indicator as % of system input volume											
	% Revenue water	50.5%	51.8%	58.3%	48.5%	50.2%	49.8%	49.0%	47.1%	46.9%	46.3%	47.3%
	% Non-revenue water	49.5%	48.2%	41.7%	51.5%	49.8%	50.2%	51.0%	52.9%	53.1%	53.7%	52.7%
	% Water Losses	29.0%	34.8%	27.6%	45.1%	45.1%	47.7%	48.6%	49.6%	50.7%	51.4%	48.7%
	System input volume unit consumption											
	Litres / capita / day	196	137	125	234	228	223	222	222	224	226	216
	m³ / household / month	19	13	11	21	20	20	20	20	20	20	20
	m³ / connection / month	20	14	12	23	22	21	21	21	21	22	22
	Authorised Unit Consumption											
	Litres / capita / day	139	90	91	129	125	116	114	112	110	110	111
	m³ / household / month	13	8	8	12	11	10	10	10	10	10	10
	m³ / connection / month	14	9	9	13	12	11	11	11	11	11	11
	Domestic (& ND) m³ / connection / month	14	9	9	13	12	11	11	11	11	11	11
	Non-domestic m³ / connection / month							0	0	0	2	107
	Water loss indicators											
	Litres / capita / day	57	48	35	106	103	106	108	110	114	116	105
	m³ / household / month	5	4	3	10	9	9	10	10	10	10	10
	m³ / connection / month	6	5	3	10	10	10	10	11	11	11	11
	UARL : Losses (litres / connection / day)	51	56	55	50	51	51	51	51	51	51	51
	CARL : Losses (litres / connection / day)	155	126	89	270	262	266	272	278	287	298	277
	Infrastructure Leakage Index (ILI)	3.0	2.3	1.6	5.4	5.1	5.2	5.3	5.4	5.6	5.8	5.4
	CARL : Losses (m³ / km mains / day)	7.6	6.3	4.4	13.5	13.0	13.3	13.5	13.9	14.3	14.9	13.8
	% Population growth	0.34%	0.32%	0.41%	1.32%	2.17%	2.88%	3.71%	1.49%	0.13%	0.54%	2.65%
	% Water demand growth	11.21%	-29.71%	-8.46%	174.38%	37.86%	0.25%	2.30%	1.42%	0.65%	1.27%	0.76%
	% Water demand growth without WDM	2.71%	2.71%	2.74%	1.05%	2.13%	2.14%	2.15%	2.17%	2.16%	2.15%	2.12%
	% Water demand growth with WDM	1.30%	1.74%	1.86%	0.37%	0.96%	1.58%	1.99%	2.07%	2.18%	1.81%	1.65%
	5 Year Annualised Population Growth	0.73%	0.34%	0.93%	0.74%	1.08%	1.76%	2.07%	1.57%	1.11%	0.48%	1.06%
	5 Year Annualised Water Growth	1.65%	-8.46%	-11.31%	6.58%	6.34%	12.08%	23.21%	4.19%	4.09%	18.96%	0.54%

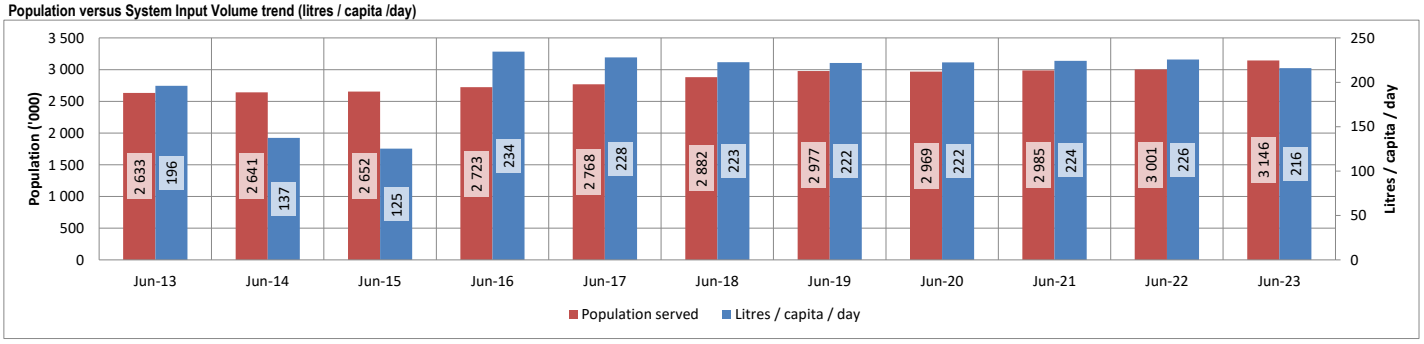
Non-revenue water trend



Water loss trend



Population versus System Input Volume trend (litres / capita /day)



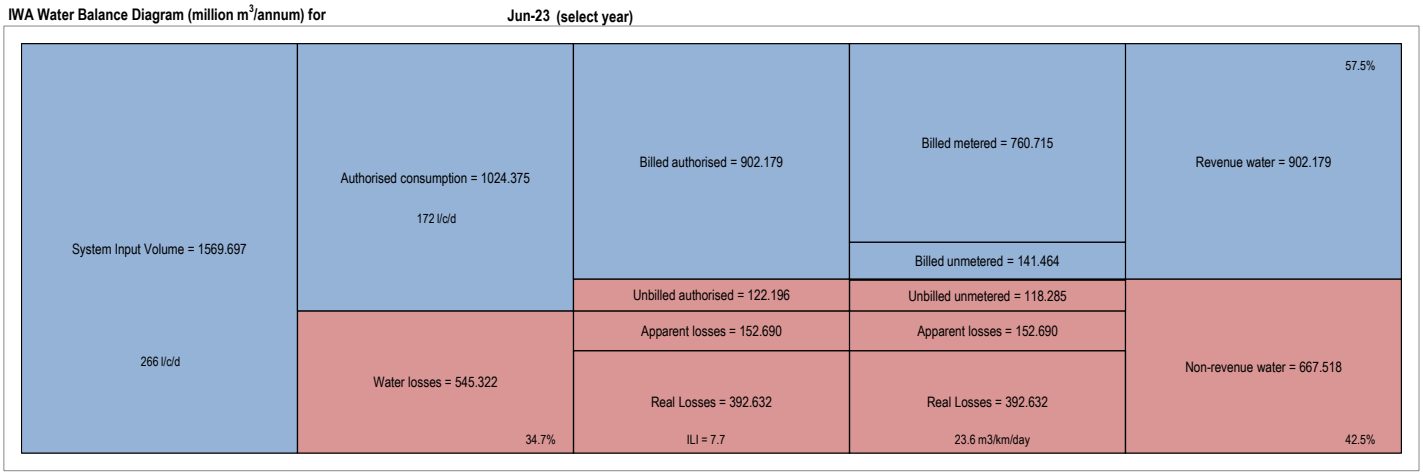
Municipal IWA Water Balance Information

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Province	Gauteng
Municipal Code	
District Municipality	City of Johannesburg, City of Tshwane, Ekurhuleni, Sedibeng, West Rand
Municipality	
Settlements	

		Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Input Data	**Population served**	**No**	**12 224 995**	**12 521 317**	**12 839 931**	**12 978 281**	**13 428 134**	**14 404 910**	**15 094 546**	**15 467 592**	**15 816 699**	**15 032 564**	**15 906 536**
	Households served	**No**	**4 155 668**	**4 369 184**	**4 582 703**	**4 796 234**	**5 030 659**	**5 391 485**	**5 649 500**	**5 789 004**	**5 919 358**	**5 153 217**	**5 660 258**
	Connections - total	**No**	**2 198 503**	**2 291 376**	**2 155 300**	**2 218 891**	**2 269 982**	**2 308 073**	**2 430 501**	**2 215 367**	**2 299 250**	**2 258 862**	**2 292 566**
	Connections - metered	**No**	**1 900 053**	**2 002 976**	**1 578 805**	**1 611 267**	**1 668 208**	**1 773 070**	**1 834 407**	**1 713 340**	**1 734 914**	**2 027 121**	**2 061 420**
	Domestic (and non-domestic)	No	1 854 949	1 930 548	1 495 506	1 520 984	1 575 994	1 675 862	1 738 992	1 635 330	1 649 845	1 967 738	2 009 126
	Non-domestic	No	45 105	72 428	83 299	90 284	92 214	97 207	95 414	78 010	85 069	59 383	52 294
	Connections - unmetered	**No**	**298 450**	**288 399**	**576 495**	**607 624**	**601 774**	**535 003**	**596 095**	**502 028**	**564 336**	**231 741**	**231 146**
	Households / connection	**No**	**1.9**	**1.9**	**2.1**	**2.2**	**2.2**	**2.3**	**2.3**	**2.6**	**2.6**	**2.3**	**2.5**
	Length of mains	**km**	**45 622**	**41 985**	**39 322**	**42 028**	**42 122**	**42 920**	**43 675**	**40 700**	**40 780**	**44 154**	**45 628**
	Connections / km	**No/km**	**48**	**55**	**55**	**53**	**54**	**54**	**56**	**54**	**56**	**51**	**50**
	Average system pressure	**m**	**53**	**53**	**54**	**53**	**50**	**53**	**53**	**53**	**53**	**53**	**53**
	Time system pressurised	**%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	Apparent losses	**%**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Consumer meter age	%	10%	10%	10%	9%	9%	10%	11%	7%	7%	7%	10%
	Illegal connections	%	6%	8%	8%	8%	8%	8%	7%	7%	6%	6%	10%
	Data transfer	%	10%	10%	10%	10%	10%	10%	9%	8%	7%	7%	8%
Water Balance Calculations	**System input volume**	**kl/annum**	**1 393 851 728**	**1 423 863 630**	**1 462 868 565**	**1 474 082 056**	**1 393 721 925**	**1 413 889 515**	**1 488 931 412**	**1 493 422 521**	**1 525 333 405**	**1 536 435 972**	**1 569 696 786**
	Own sources	kl/annum	96 450 328	81 535 287	87 189 781	75 229 015	69 556 288	53 997 409	70 421 775	67 061 039	62 558 426	66 337 603	66 287 218
	Other sources	kl/annum	1 297 401 400	1 342 328 343	1 375 678 784	1 398 853 041	1 324 165 637	1 359 892 106	1 418 509 637	1 426 361 482	1 462 774 979	1 470 098 369	1 503 409 568
	Authorised Consumption	**kl/annum**	**1 030 390 954**	**1 008 457 032**	**1 044 884 360**	**1 069 034 271**	**998 897 284**	**1 020 321 910**	**1 003 737 357**	**1 024 933 756**	**998 837 314**	**1 012 016 781**	**1 024 375 221**
	Billed authorised	**kl/annum**	**915 036 358**	**904 731 503**	**931 737 473**	**944 261 160**	**883 911 256**	**905 968 137**	**897 772 260**	**915 653 704**	**884 539 985**	**887 774 438**	**902 178 874**
	Billed metered	kl/annum	865 981 562	852 648 284	823 308 870	824 797 220	763 238 671	778 719 656	770 626 853	770 682 302	745 695 803	746 639 590	760 715 016
	Domestic (and non-domestic)	kl/annum	707 742 600	650 003 602	574 247 145	584 952 964	612 247 055	628 088 517	626 700 750	612 388 931	596 850 052	586 308 442	593 227 379
	Non-domestic	kl/annum	136 032 174	180 132 012	226 737 102	212 324 885	125 656 991	128 188 026	122 043 097	132 715 898	126 115 453	136 295 323	143 112 251
	Export volume	kl/annum	22 206 787	22 512 670	22 324 624	27 519 371	25 334 626	22 443 114	21 883 006	25 577 473	22 730 298	24 035 825	24 375 386
	Billed unmetered	kl/annum	49 054 796	52 083 219	108 428 603	119 463 940	120 672 585	127 248 481	127 145 407	144 971 402	138 844 182	141 134 848	141 463 858
	Unbilled authorised	**kl/annum**	**115 354 597**	**103 725 529**	**113 146 887**	**124 773 111**	**114 986 028**	**114 353 773**	**105 965 097**	**109 280 052**	**114 297 329**	**124 242 343**	**122 196 347**
	Unbilled metered	kl/annum	16 216 652	637 738	2 466 277	11 375 535	3 294 966	3 349 375	3 409 962	2 167 277	2 176 295	3 033 006	3 911 625
	Unbilled unmetered	kl/annum	99 137 945	103 087 791	110 680 610	113 397 576	111 691 062	111 004 398	102 555 135	107 112 775	112 121 034	121 209 337	118 284 723
	Water Losses	**kl/annum**	**363 460 774**	**415 406 597**	**417 984 205**	**405 047 785**	**394 824 641**	**393 567 606**	**485 194 055**	**468 488 765**	**526 496 091**	**524 419 191**	**545 321 564**
	Commercial / Apparent losses	**kl/annum**	**93 772 880**	**112 990 594**	**113 691 704**	**109 144 176**	**106 389 448**	**108 624 659**	**128 884 423**	**103 067 528**	**108 458 195**	**108 030 353**	**152 690 038**
	Physical / Real losses	**kl/annum**	**269 687 894**	**302 416 003**	**304 292 501**	**295 903 609**	**288 435 193**	**284 942 947**	**356 309 632**	**365 421 236**	**418 037 896**	**416 388 837**	**392 631 526**
	UARL	**kl/annum**	**49 831 752**	**49 765 815**	**48 157 415**	**48 973 980**	**46 978 709**	**50 664 794**	**52 822 587**	**48 076 048**	**49 391 666**	**49 937 370**	**50 921 681**
	Potential real loss saving	**kl/annum**	**219 856 142**	**252 650 188**	**256 135 086**	**246 929 628**	**241 456 484**	**234 278 152**	**303 487 045**	**317 345 189**	**368 646 230**	**366 451 467**	**341 709 845**
	Revenue water	**kl/annum**	**915 036 358**	**904 731 503**	**931 737 473**	**944 261 160**	**883 911 256**	**905 968 137**	**897 772 260**	**915 653 704**	**884 539 985**	**887 774 438**	**902 178 874**
	Non-Revenue water	**kl/annum**	**478 815 371**	**519 132 126**	**531 131 091**	**529 820 896**	**509 810 669**	**507 921 378**	**591 159 152**	**577 768 817**	**640 793 420**	**648 661 534**	**667 517 912**
	Projected SIV without WDM	kl/annum	1 381 188 945	1 407 385 317	1 434 071 521	1 461 309 400	1 488 547 279	1 526 646 550	1 564 724 133	1 602 802 476	1 640 880 058	1 678 957 640	1 710 592 242
	Projected SIV with WDM	kl/annum	1 328 391 341	1 323 164 904	1 318 268 239	1 316 470 037	1 314 671 835	1 356 877 237	1 399 129 164	1 441 381 319	1 483 633 246	1 525 885 173	1 543 760 518
Source of information (Evidence to BWSAudit)													
Comments													

IWA Water Balance Diagram (million m^3/annum) for **Jun-23 (select year)**



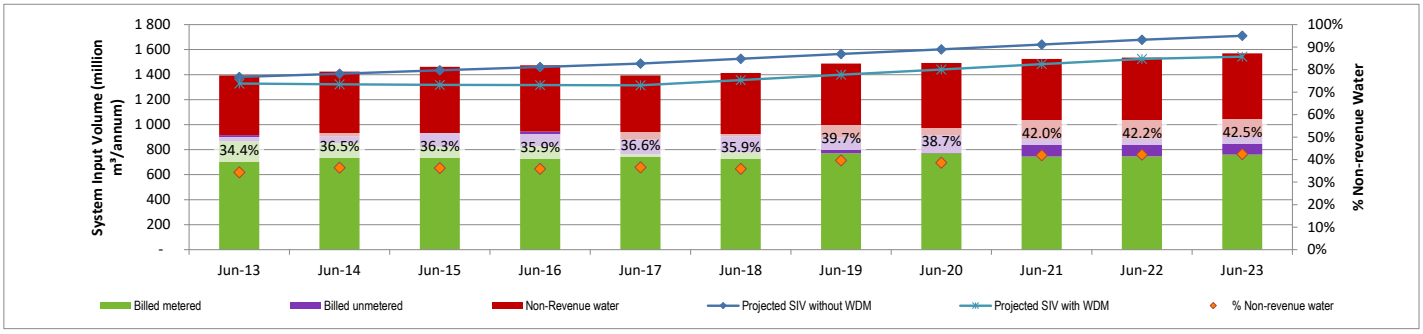
Note : All underlined values have been calculated using trends and / or averages based on previous years.

Municipal IWA Water Balance Information

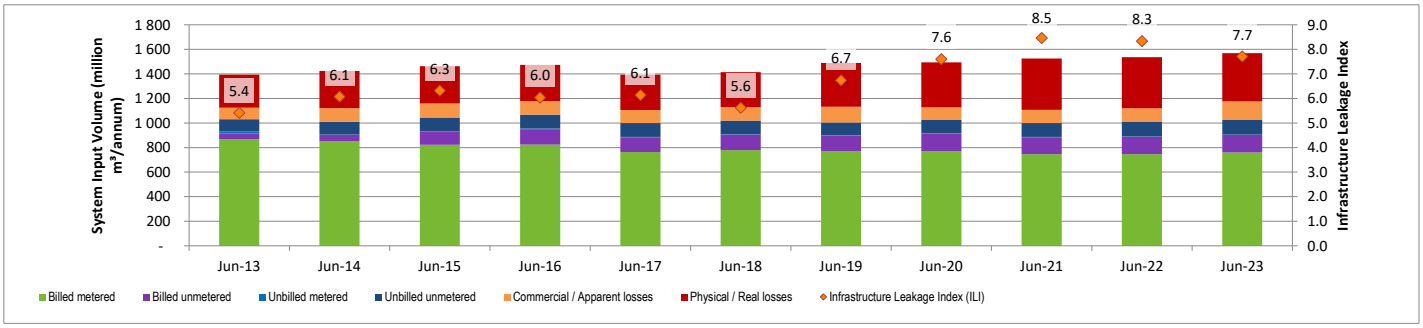
water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Key Performance Indicators	Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
	Indicator as % of system input volume											
	% Revenue water	65.6%	63.5%	63.7%	64.1%	63.4%	64.1%	60.3%	61.3%	58.0%	57.8%	57.5%
	% Non-revenue water	34.4%	36.5%	36.3%	35.9%	36.6%	35.9%	39.7%	38.7%	42.0%	42.2%	42.5%
	% Water Losses	26.1%	29.2%	28.6%	27.5%	28.3%	27.8%	32.6%	31.4%	34.5%	34.1%	34.7%
	System input volume unit consumption											
	Litres / capita / day	307	307	307	305	279	265	266	260	260	276	266
	m³ / household / month	28	27	26	25	23	22	22	21	21	24	23
	m³ / connection / month	52	51	56	54	50	50	50	55	54	56	56
	Authorised Unit Consumption											
	Litres / capita / day	226	216	218	220	199	190	178	177	169	180	172
	m³ / household / month	20	19	19	18	16	15	14	14	14	16	15
	m³ / connection / month	38	36	40	39	36	36	34	38	35	36	36
	Domestic (& ND) m³ / connection / month	34	30	32	32	32	33	31	34	32	32	32
	Non-domestic m³ / connection / month	251	207	227	196	114	110	107	142	124	191	228
	Water loss indicators											
	Litres / capita / day	81	91	89	86	81	75	88	83	91	96	94
	m³ / household / month	7	8	8	7	7	6	7	7	7	8	8
	m³ / connection / month	14	15	16	15	14	14	17	18	19	19	20
	UARL : Losses (litres / connection / day)	62	60	61	60	57	60	60	59	59	61	61
	CARL : Losses (litres / connection / day)	336	362	387	365	348	338	402	452	498	505	469
	Infrastructure Leakage Index (ILI)	5.4	6.1	6.3	6.0	6.1	5.6	6.7	7.6	8.5	8.3	7.7
	CARL : Losses (m³ / km mains / day)	16	20	21	19	19	18	22	25	28	26	24
	% Population growth	2.46%	2.42%	2.54%	1.08%	2.26%	5.35%	6.02%	3.62%	2.36%	-1.42%	0.28%
	% Water demand growth	3.18%	2.15%	2.74%	0.28%	-2.39%	-2.06%	3.36%	2.77%	1.22%	1.43%	1.44%
	% Water demand growth without WDM	1.89%	1.90%	1.90%	0.94%	1.88%	2.21%	2.53%	2.46%	2.40%	2.35%	2.10%
	% Water demand growth with WDM	-2.00%	-0.39%	-0.37%	-0.07%	-0.14%	1.52%	3.16%	3.07%	2.98%	2.89%	2.01%
	5 Year Annualised Population Growth	3.44%	3.67%	2.62%	1.70%	2.39%	2.84%	3.29%	#N/A	#N/A	0.38%	0.81%
	5 Year Annualised Water Growth	2.76%	2.52%	3.43%	1.76%	0.63%	-0.14%	0.26%	0.76%	1.80%	7.74%	0.94%

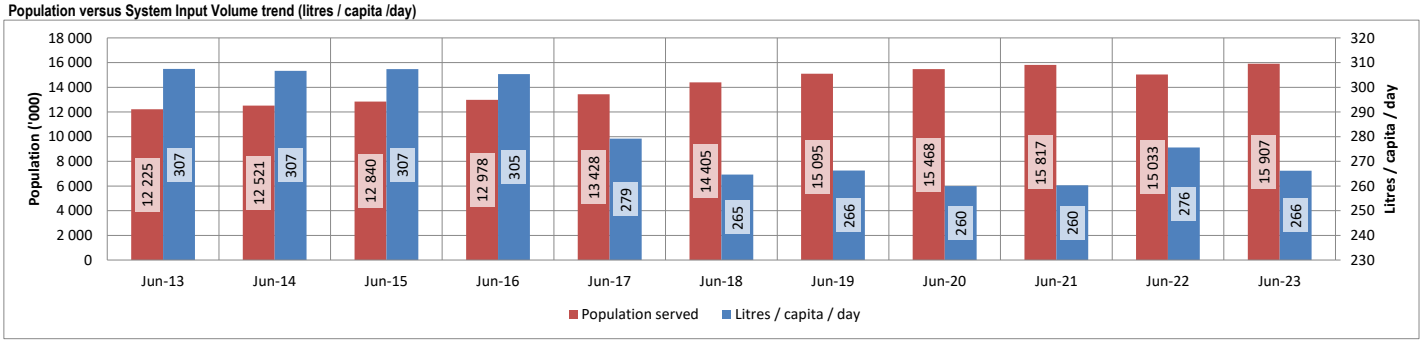
Non-revenue water trend



Water loss trend



Population versus System Input Volume trend (litres / capita /day)



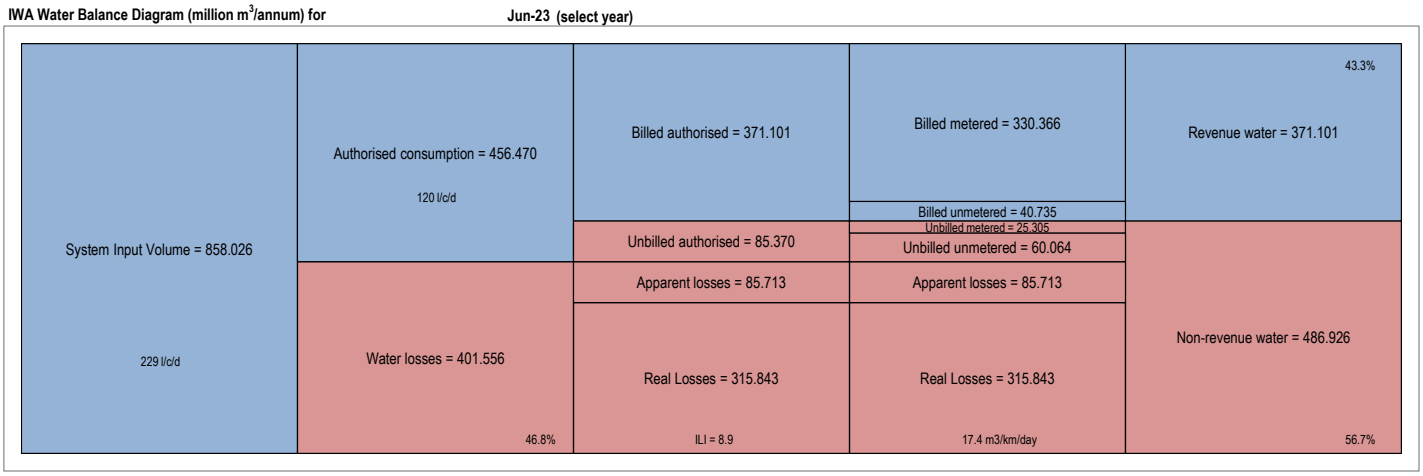
Municipal IWA Water Balance Information

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Province	KwaZulu Natal
Municipal Code	
District Municipality	Ugu, Umgungundlovu, Uthukela, Umzinyathi, Amajuba, Zululand, Umkhanyakude, uThungulu, iLembe, Sinsonke
Municipality	
Settlements	

		Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Inp	**Population served**	**No**	**8 336 694**	**8 558 628**	**8 592 055**	**8 769 928**	**9 086 759**	**9 257 789**	**9 439 503**	**9 598 023**	**9 748 879**	**10 070 185**	**10 073 560**
	Households served	**No**	**2 373 601**	**2 281 732**	**2 279 882**	**2 357 879**	**2 467 639**	**2 589 827**	**2 639 984**	**2 684 074**	**2 725 741**	**2 862 463**	**2 878 821**
	Connections - total	**No**	**1 475 755**	**1 746 626**	**1 729 423**	**1 875 056**	**1 790 380**	**1 577 029**	**1 636 929**	**1 758 930**	**1 765 748**	**1 746 734**	**1 767 950**
	Connections - metered	**No**	**1 253 638**	**1 347 119**	**1 349 492**	**1 406 359**	**1 335 301**	**1 119 045**	**1 103 933**	**1 056 178**	**1 063 917**	**1 106 702**	**1 122 877**
	Domestic (and non-domestic)	No	1 253 249	1 346 730	1 348 310	1 405 064	1 332 888	1 093 596	1 078 519	1 022 571	1 031 039	1 074 633	1 091 673
	Non-domestic	No	389	389	1 182	1 295	2 413	25 449	25 414	33 607	32 878	32 069	31 204
	Connections - unmetered	**No**	**222 506**	**399 896**	**381 113**	**469 992**	**457 492**	**483 433**	**558 409**	**736 360**	**734 709**	**672 101**	**676 277**
	Households / connection	**No**	**1.6**	**1.3**	**1.3**	**1.3**	**1.4**	**1.6**	**1.6**	**1.5**	**1.5**	**1.6**	**1.6**
	Length of mains	**km**	**39 726**	**36 044**	**36 058**	**37 183**	**38 952**	**41 050**	**41 280**	**47 746**	**48 648**	**49 845**	**49 859**
	Connections / km	**No / km**	**37**	**48**	**48**	**50**	**46**	**38**	**40**	**37**	**36**	**35**	**35**
	Average system pressure	**m**	**54**	**52**	**55**	**53**	**51**	**51**	**52**	**51**	**51**	**51**	**51**
	Time system pressurised	**%**	**95%**	**95%**	**92%**	**94%**	**91%**	**88%**	**88%**	**85%**	**85%**	**83%**	**83%**
	Apparent losses	**%**	**21%**	**21%**	**22%**	**20%**	**21%**	**20%**	**23%**	**22%**	**21%**	**21%**	**21%**
	Consumer meter age	%	7%	6%	7%	7%	7%	7%	7%	7%	7%	8%	7%
	Illegal connections	%	7%	8%	7%	6%	7%	7%	10%	9%	8%	8%	9%
	Data transfer	%	8%	7%	7%	7%	6%	6%	6%	6%	6%	6%	6%
Wat	**System input volume**	**kl/annum**	**612 136 153**	**609 672 086**	**659 618 524**	**721 602 192**	**651 476 849**	**688 668 060**	**714 142 993**	**784 434 814**	**815 290 606**	**837 940 748**	**858 026 407**
	Own sources	kl/annum	589 225 413	586 447 744	638 582 991	706 232 086	583 163 046	299 095 952	245 969 974	249 036 083	243 014 312	249 508 172	252 809 304
	Other sources	kl/annum	22 910 740	23 224 342	21 035 533	15 370 106	68 313 803	389 572 108	468 173 019	535 398 730	572 276 293	588 432 576	605 217 103
	Authorised Consumption	**kl/annum**	**357 676 447**	**374 335 283**	**391 152 543**	**404 635 110**	**434 165 051**	**460 018 596**	**462 103 735**	**435 896 805**	**468 072 563**	**444 549 764**	**456 470 309**
	Billed authorised	**kl/annum**	**333 648 783**	**353 221 230**	**361 062 862**	**376 988 435**	**393 058 703**	**389 440 467**	**396 616 408**	**376 822 396**	**411 353 226**	**373 556 640**	**371 100 538**
	Billed metered	kl/annum	326 183 751	349 260 206	352 728 954	320 094 240	355 484 861	354 545 894	367 683 541	339 305 068	368 476 396	333 992 201	330 365 509
	Domestic (and non-domestic)	kl/annum	320 429 301	343 537 921	337 654 671	315 767 784	349 526 939	262 881 189	270 327 929	227 948 201	242 495 519	216 871 121	216 603 004
	Non-domestic	kl/annum	5 246 911	5 209 498	14 561 044	4 326 456	5 511 522	91 664 705	97 355 612	109 131 897	119 104 925	109 664 165	99 459 230
	Export volume	kl/annum	507 539	512 787	513 240	0	446 400	0	0	2 224 971	6 875 951	7 456 914	14 303 275
	Billed unmetered	kl/annum	7 465 032	3 961 024	8 333 908	56 894 195	37 573 841	34 894 573	28 932 867	37 517 328	42 876 830	39 564 439	40 735 028
	Unbilled authorised	**kl/annum**	**24 027 664**	**21 114 053**	**30 089 681**	**27 646 675**	**41 106 349**	**70 578 129**	**65 487 327**	**59 074 409**	**56 719 338**	**70 993 124**	**85 369 771**
	Unbilled metered	kl/annum	11 349 521	5 195 532	6 121 374	15 093 246	5 844 110	12 156 310	7 958 164	8 047 774	9 231 038	20 515 218	25 305 329
	Unbilled unmetered	kl/annum	12 678 143	15 918 521	23 968 306	12 553 429	35 262 239	58 421 819	57 529 163	51 026 635	47 488 299	50 477 907	60 064 442
	Water Losses	**kl/annum**	**254 459 706**	**235 336 803**	**268 465 981**	**316 967 082**	**217 311 797**	**228 649 464**	**252 039 259**	**348 538 009**	**347 218 042**	**393 390 984**	**401 556 098**
	Commercial / Apparent losses	**kl/annum**	**53 627 383**	**48 514 682**	**58 646 394**	**64 061 311**	**44 923 653**	**45 008 558**	**58 434 102**	**75 193 756**	**73 458 937**	**82 518 442**	**85 713 105**
	Physical / Real losses	**kl/annum**	**200 832 323**	**186 822 121**	**209 819 588**	**252 905 771**	**172 388 144**	**183 640 906**	**193 605 157**	**273 344 253**	**273 759 105**	**310 872 542**	**315 842 993**
	UARL	**kl/annum**	**35 329 276**	**36 933 971**	**37 689 125**	**39 648 334**	**36 568 273**	**32 911 076**	**33 896 587**	**35 799 660**	**35 964 821**	**35 193 569**	**35 314 660**
	Potential real loss saving	**kl/annum**	**165 503 047**	**149 888 150**	**172 130 462**	**213 257 437**	**135 819 871**	**150 729 829**	**159 708 570**	**237 544 593**	**237 794 285**	**275 678 973**	**280 528 333**
	Revenue water	**kl/annum**	**333 648 783**	**353 221 230**	**361 062 862**	**376 988 435**	**393 058 703**	**389 440 467**	**396 616 408**	**376 822 396**	**411 353 226**	**373 556 640**	**371 100 538**
	Non-Revenue water	**kl/annum**	**278 487 370**	**256 450 856**	**298 555 662**	**344 613 757**	**258 418 146**	**299 227 593**	**317 526 585**	**407 612 418**	**403 937 380**	**464 384 109**	**486 925 869**
	Projected SIV without WDM	kl/annum	43 603 915	400 954 522	444 970 884	457 020 979	469 131 482	481 304 355	493 541 629	506 099 522	518 791 284	531 809 410	541 437 756
	Projected SIV with WDM	kl/annum	26 460 547	392 657 904	420 759 436	425 409 087	430 090 864	434 897 949	439 821 566	450 710 967	462 086 587	473 756 930	482 546 696
Source of information													
omments													

IWA Water Balance Diagram (million m^3/annum) for **Jun-23 (select year)**



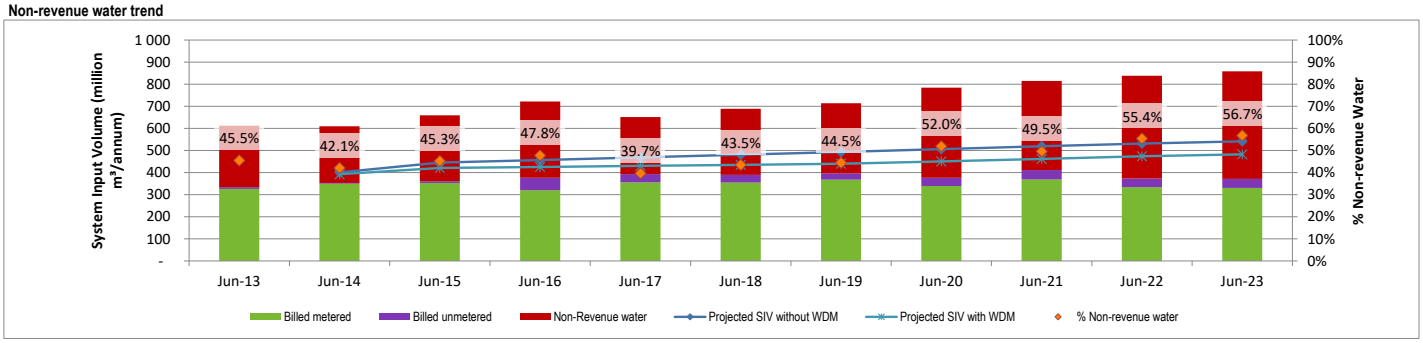
Note : All underlined values have been calculated using trends and / or averages based on previous years.

Municipal IWA Water Balance Information

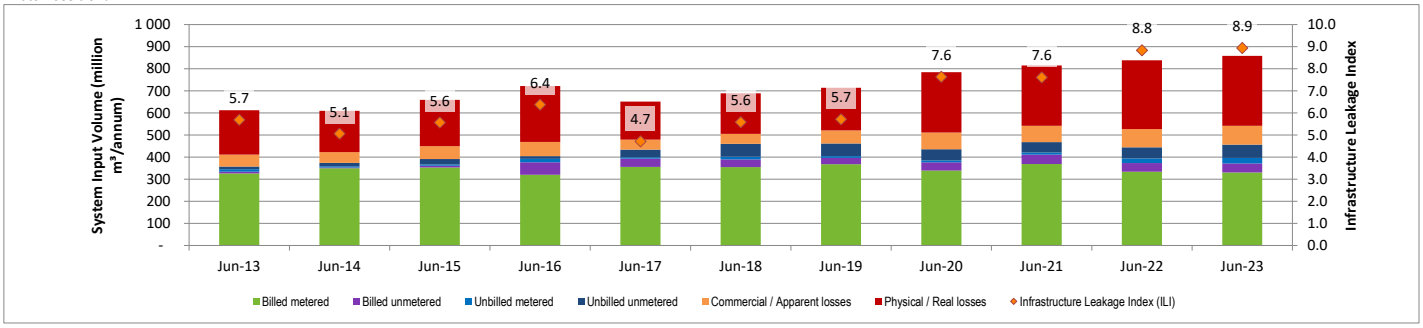
water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

	Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Key	Indicator as % of system input volume											
	% Revenue water	54.5%	57.9%	54.7%	52.2%	60.3%	56.5%	55.5%	48.0%	50.5%	44.6%	43.3%
	% Non-revenue water	45.5%	42.1%	45.3%	47.8%	39.7%	43.5%	44.5%	52.0%	49.5%	55.4%	56.7%
	% Water Losses	41.6%	38.6%	40.7%	43.9%	33.4%	33.2%	35.3%	44.4%	42.6%	46.9%	46.8%
	System input volume unit consumption											
	Litres / capita / day	201	195	210	225	196	204	207	223	227	226	229
	m³ / household / month	21	22	24	26	22	22	23	24	25	24	24
	m³ / connection / month	35	29	32	32	30	36	36	37	38	40	40
	Authorised Unit Consumption											
	Litres / capita / day	117	120	125	126	131	136	134	124	130	119	120
	m³ / household / month	13	14	14	14	15	15	15	13	14	13	13
	m³ / connection / month	20	18	19	18	20	24	24	21	22	21	21
	Domestic (& ND) m³ / connection / month	20	18	18	18	20	19	19	15	16	16	16
	Non-domestic m³ / connection / month	1124	1116	1027	278	190	300	319	271	302	285	266
	Water loss indicators											
	Litres / capita / day	84	75	86	99	66	68	73	99	98	107	109
	m³ / household / month	9	9	10	11	7	7	8	11	11	11	12
	m³ / connection / month	14	11	13	14	10	12	13	17	16	19	19
	UARL : Losses (litres / connection / day)	66	58	60	58	56	57	57	56	56	55	55
	CARL : Losses (litres / connection / day)	373	293	332	370	264	319	324	426	425	488	489
	Infrastructure Leakage Index (ILI)	5.7	5.1	5.6	6.4	4.7	5.6	5.7	7.6	7.6	8.8	8.9
	CARL : Losses (m³ / km mains / day)	14	14	16	19	12	12	13	16	15	17	17
	% Population growth	2.38%	2.66%	0.39%	4.16%	2.84%	2.74%	1.92%	1.82%	1.63%	2.43%	1.65%
	% Water demand growth	33.42%	-0.40%	8.19%	29.25%	-0.62%	-2.31%	4.70%	6.73%	6.85%	3.35%	2.59%
	% Water demand growth without WDM	3.00%	819.54%	10.98%	3.64%	2.68%	2.62%	2.57%	2.54%	2.53%	2.51%	2.16%
	% Water demand growth with WDM	1.26%	1383.94%	7.16%	2.53%	1.10%	1.11%	1.12%	1.80%	2.50%	2.52%	2.19%
	5 Year Annualised Population Growth	2.34%	2.03%	2.34%	1.50%	2.22%	1.58%	2.31%	2.23%	1.23%	1.50%	1.14%
	5 Year Annualised Water Growth	1.65%	0.57%	1.34%	9.48%	7.26%	2.47%	5.05%	8.23%	6.92%	5.39%	6.59%

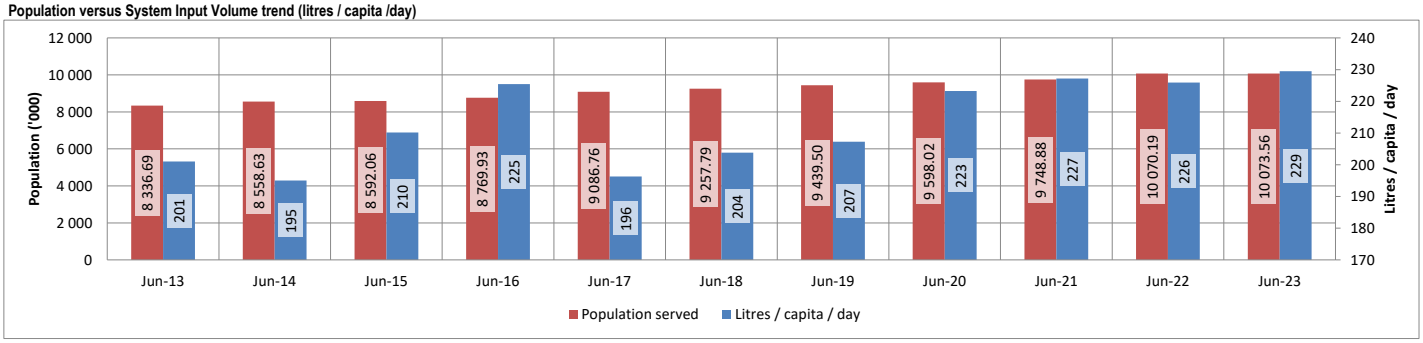
Non-revenue water trend



Water loss trend



Population versus System Input Volume trend (litres / capita /day)



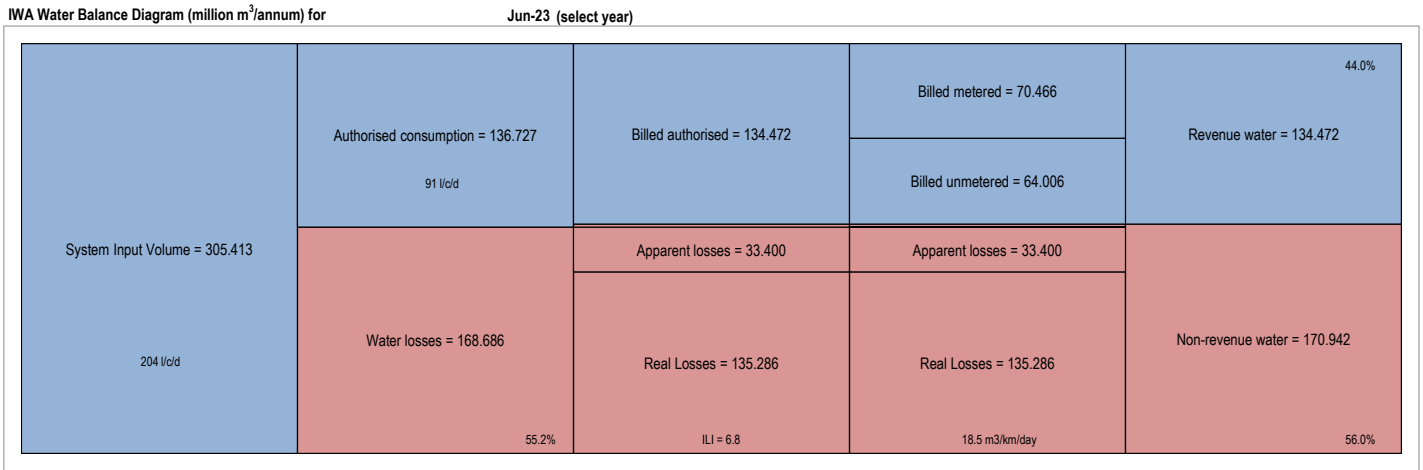
Municipal IWA Water Balance Information

water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Province	Limpopo
Municipal Code	
District Municipality	Mopani, Vhembe, Capricorn, Waterberg, Greater Sekhukhune
Municipality	
Settlements	

		Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Input Data	**Population served**	**No**	**4 000 550**	**4 053 524**	**4 138 240**	**4 225 967**	**3 917 680**	**3 865 105**	**3 871 011**	**3 875 114**	**3 876 427**	**4 086 285**	**4 111 256**
	Households served	**No**	**1 088 478**	**1 116 905**	**1 145 328**	**1 173 775**	**1 113 394**	**1 109 576**	**1 110 824**	**1 111 967**	**1 112 284**	**1 132 156**	**1 146 654**
	Connections - total	**No**	**1 086 736**	**1 115 134**	**1 143 527**	**1 171 946**	**1 114 855**	**1 111 017**	**1 109 268**	**1 110 045**	**1 106 968**	**1 011 567**	**1 010 909**
	Connections - metered	**No**	**787 871**	**808 912**	**829 950**	**851 006**	**811 581**	**807 911**	**808 871**	**804 605**	**804 457**	**667 927**	**658 896**
	Domestic (and non-domestic)	No	787 871	808 912	829 950	851 006	811 581	807 911	808 436	804 605	804 457	666 846	657 390
	Non-domestic	No	0	0	0	0	0	0	435	0	0	1 081	1 506
	Connections - unmetered	**No**	**298 865**	**306 222**	**313 577**	**320 940**	**303 274**	**303 105**	**300 397**	**305 440**	**302 511**	**343 641**	**352 013**
	Households / connection	**No**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.1**	**1.1**
	Length of mains	**km**	**21 684**	**22 252**	**22 819**	**23 211**	**22 172**	**22 097**	**21 652**	**22 201**	**22 139**	**19 975**	**20 061**
	Connections / km	**No/km**	**50**	**50**	**50**	**50**	**50**	**50**	**51**	**50**	**50**	**51**	**50**
	Average system pressure	**m**	**34**	**33**	**38**	**48**	**50**	**50**	**49**	**50**	**50**	**47**	**47**
	Time system pressurised	**%**	**67%**	**67%**	**75%**	**96%**	**99%**	**99%**	**98%**	**100%**	**100%**	**93%**	**100%**
	Apparent losses	**%**	**13%**	**13%**	**15%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**
	Consumer meter age	%	4%	4%	5%	6%	6%	6%	6%	6%	6%	6%	6%
	Illegal connections	%	4%	4%	5%	6%	6%	6%	6%	6%	6%	6%	6%
	Data transfer	%	5%	5%	6%	8%	8%	8%	8%	8%	8%	8%	8%
Water Balance Calculations	**System input volume**	**kl/annum**	**41 753 714**	**34 688 649**	**89 920 374**	**301 440 114**	**300 637 911**	**295 525 544**	**294 983 375**	**298 236 115**	**298 283 154**	**307 467 937**	**305 413 154**
	Own sources	kl/annum	41 753 714	34 688 649	89 920 374	284 087 792	281 723 630	267 078 190	265 893 510	269 146 250	269 193 289	259 867 035	260 890 241
	Other sources	kl/annum	0	0	0	17 352 322	18 914 281	28 447 354	29 089 865	29 089 865	29 089 865	47 600 903	44 522 913
	Authorised Consumption	**kl/annum**	**25 428 084**	**19 337 548**	**44 238 748**	**130 437 260**	**129 811 108**	**129 734 441**	**133 089 124**	**133 089 124**	**133 089 124**	**135 126 770**	**136 727 272**
	Billed authorised	**kl/annum**	**25 428 084**	**19 337 548**	**44 238 748**	**126 781 156**	**126 155 004**	**125 258 605**	**128 581 534**	**128 581 534**	**128 581 534**	**134 230 927**	**134 471 525**
	Billed metered	kl/annum	25 428 084	19 337 548	44 238 748	68 642 958	71 123 225	69 950 548	74 534 532	74 534 532	74 534 532	74 635 533	70 465 664
	Domestic (and non-domestic)	kl/annum	25 428 084	19 337 548	44 238 748	68 642 958	71 123 225	68 657 408	71 721 050	71 721 050	71 721 050	72 197 253	63 424 295
	Non-domestic	kl/annum	0	0	0	0	0	1 293 140	2 813 482	2 813 482	2 813 482	2 438 280	7 041 369
	Export volume	kl/annum	0	0	0	0	0	0	0	0	0	0	0
	Billed unmetered	kl/annum	0	0	0	58 138 198	55 031 779	55 308 057	54 047 002	54 047 002	54 047 002	59 595 394	64 005 861
	Unbilled authorised	**kl/annum**	**0**	**0**	**0**	**3 656 104**	**3 656 104**	**4 475 836**	**4 507 590**	**4 507 590**	**4 507 590**	**895 843**	**2 255 747**
	Unbilled metered	kl/annum	0	0	0	1 898 329	1 898 329	2 205 061	2 122 295	2 122 295	2 122 295	505 053	1 864 957
	Unbilled unmetered	kl/annum	0	0	0	1 757 775	1 757 775	2 270 775	2 385 295	2 385 295	2 385 295	390 790	390 790
	Water Losses	**kl/annum**	**16 325 630**	**15 351 101**	**45 681 626**	**171 002 854**	**170 826 802**	**165 791 103**	**161 894 251**	**165 146 991**	**165 194 030**	**172 341 167**	**168 685 882**
	Commercial / Apparent losses	**kl/annum**	**2 176 751**	**2 046 813**	**6 852 244**	**34 200 571**	**33 766 765**	**32 771 375**	**32 001 097**	**33 029 398**	**33 038 806**	**34 046 955**	**33 399 805**
	Physical / Real losses	**kl/annum**	**14 148 879**	**13 304 287**	**38 829 382**	**136 802 283**	**137 060 038**	**133 019 728**	**129 893 154**	**132 117 593**	**132 155 224**	**138 294 212**	**135 286 078**
	UARL	**kl/annum**	**10 473 024**	**10 484 711**	**13 607 747**	**22 676 841**	**23 246 331**	**23 166 644**	**22 460 526**	**23 499 659**	**23 434 508**	**18 404 579**	**19 892 666**
	Potential real loss saving	**kl/annum**	**3 675 855**	**2 819 577**	**25 221 635**	**114 125 442**	**113 813 706**	**109 853 085**	**107 432 628**	**108 617 933**	**108 720 717**	**119 889 633**	**115 393 412**
	Revenue water	**kl/annum**	**25 428 084**	**19 337 548**	**44 238 748**	**126 781 156**	**126 155 004**	**125 258 605**	**128 581 534**	**128 581 534**	**128 581 534**	**134 230 927**	**134 471 525**
	Non-Revenue water	**kl/annum**	**16 325 630**	**15 351 101**	**45 681 626**	**174 658 958**	**174 482 906**	**170 266 939**	**166 401 841**	**169 654 581**	**169 701 620**	**173 237 010**	**170 941 629**
	Projected SIV without WDM	kl/annum			296 369 036	308 221 565	320 944 585	334 412 002	348 946 441	364 665 181	373 631 600	383 016 762	394 874 131
	Projected SIV with WDM	kl/annum			284 159 677	292 158 700	300 927 704	310 679 792	321 341 256	333 000 070	341 000 055	349 330 011	358 617 464
	Source of information												
	Comments												

IWA Water Balance Diagram (million m^3/annum) for **Jun-23 (select year)**



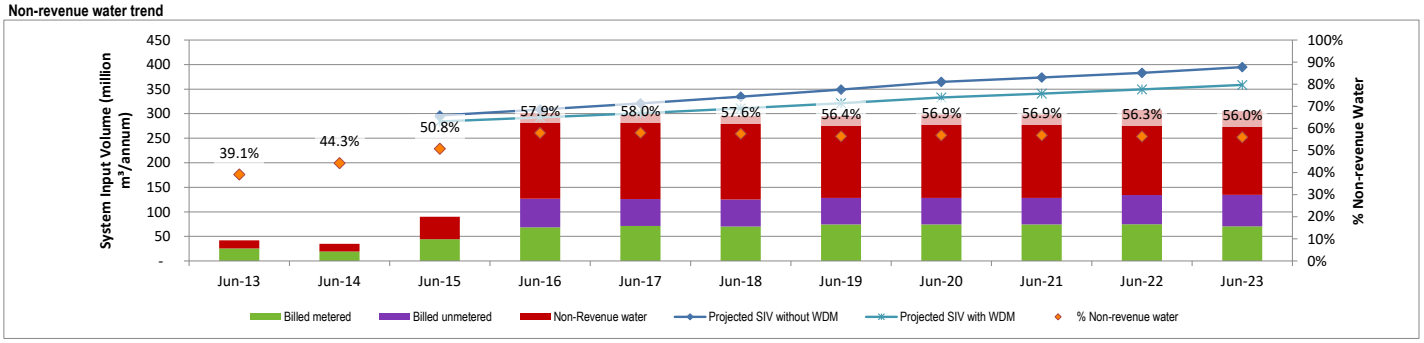
Note : All underlined values have been calculated using trends and / or averages based on previous years.

Municipal IWA Water Balance Information

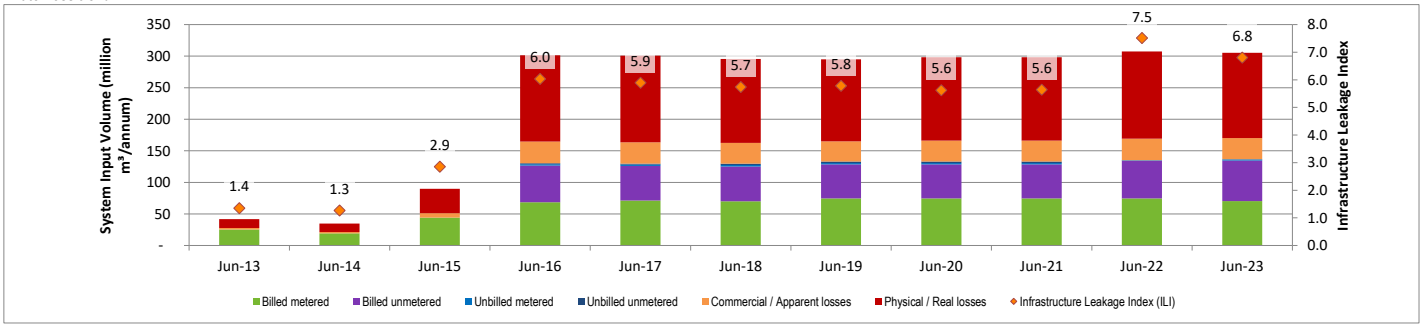
water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

	Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Key Performance Indicators	Indicator as % of system input volume											
	% Revenue water	60.9%	55.7%	49.2%	42.1%	42.0%	42.4%	43.6%	43.1%	43.1%	43.7%	44.0%
	% Non-revenue water	39.1%	44.3%	50.8%	57.9%	58.0%	57.6%	56.4%	56.9%	56.9%	56.3%	56.0%
	% Water Losses	39.1%	44.3%	50.8%	56.7%	56.8%	56.1%	54.9%	55.4%	55.4%	56.1%	55.2%
	System input volume unit consumption											
	Litres / capita / day	29	23	60	195	210	209	209	211	211	206	204
	m³ / household / month	3	3	7	21	23	22	22	22	22	23	22
	m³ / connection / month	3	3	7	21	22	22	22	22	22	25	25
	Authorised Unit Consumption											
	Litres / capita / day	17	13	29	85	91	92	94	94	94	91	91
	m³ / household / month	2	1	3	9	10	10	10	10	10	10	10
	m³ / connection / month	2	1	3	9	10	10	10	10	10	11	11
	Domestic (& ND) m³ / connection / month	2	1	3	9	10	10	10	10	10	11	11
	Non-domestic m³ / connection / month							539			188	390
	Water loss indicators											
	Litres / capita / day	11	10	30	111	119	118	115	117	117	116	112
	m³ / household / month	1	1	3	12	13	12	12	12	12	13	12
	m³ / connection / month	1	1	3	12	13	12	12	12	12	14	14
	UARL : Losses (litres / connection / day)	26	26	33	53	57	57	55	58	58	50	54
	CARL : Losses (litres / connection / day)	36	33	93	320	337	328	321	326	327	375	367
	Infrastructure Leakage Index (ILI)	1.4	1.3	2.9	6.0	5.9	5.7	5.8	5.6	5.6	7.5	6.8
	CARL : Losses (m³ / km mains / day)	2	2	5	16	17	16	16	16	16	19	18
	% Population growth	1.31%	1.32%	2.09%	2.12%	-2.70%	-4.36%	-0.60%	0.13%	0.07%	2.69%	2.98%
	% Water demand growth	-82.36%	-16.92%	159.22%	234.72%	82.85%	-0.99%	-0.94%	0.46%	0.56%	1.54%	1.19%
	% Water demand growth without WDM				1.96%	4.06%	4.16%	4.27%	4.43%	3.48%	2.49%	2.80%
	% Water demand growth with WDM				1.39%	2.91%	3.12%	3.34%	3.53%	3.01%	2.42%	2.55%
	5 Year Annualised Population Growth	2.19%	1.79%	2.09%	1.37%	-0.16%	-0.95%	-1.33%	-1.73%	-0.23%	1.10%	1.19%
	5 Year Annualised Water Growth	-26.02%	-29.59%	-16.80%	4.95%	4.90%	53.49%	26.78%	-0.21%	0.28%	1.18%	1.27%

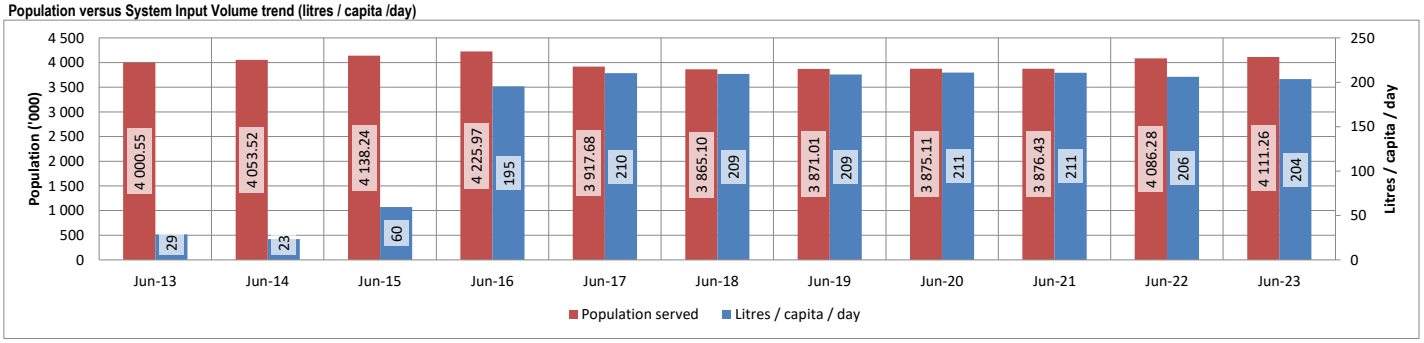
Non-revenue water trend



Water loss trend



Population versus System Input Volume trend (litres / capita /day)



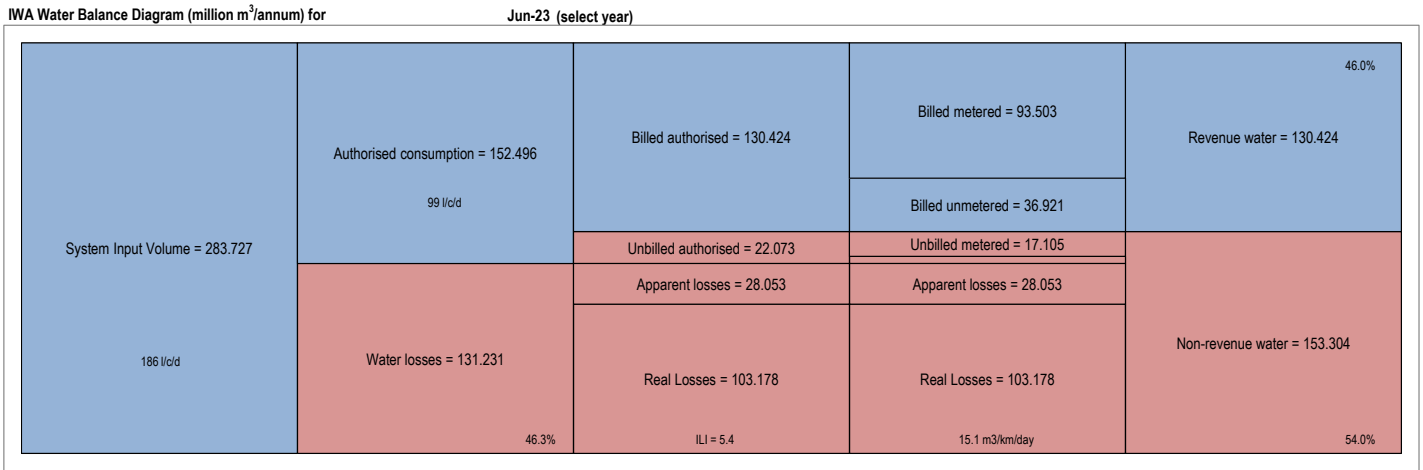
Municipal IWA Water Balance Information

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Province	Mpumalanga
Municipal Code	
District Municipality	Gert Sibande, Nkangala, Ehlanzeni
Municipality	
Settlements	

			Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Input Data	**Population served**	**No**		**3 364 406**	**3 432 794**	**3 515 576**	**3 622 506**	**3 718 598**	**3 791 138**	**3 932 794**	**4 004 891**	**4 081 990**	**4 138 112**	**4 137 618**
	Households served	**No**		**938 434**	**972 865**	**1 007 297**	**1 041 751**	**1 083 337**	**1 125 545**	**1 167 435**	**1 188 589**	**1 211 204**	**1 235 393**	**1 234 001**
	Connections - total	**No**		**938 434**	**972 865**	**1 007 297**	**958 345**	**987 355**	**1 023 588**	**1 065 253**	**1 101 661**	**1 123 986**	**1 039 664**	**1 011 614**
	Connections - metered	**No**		**832 190**	**862 902**	**893 615**	**818 667**	**860 931**	**887 372**	**923 305**	**951 961**	**970 599**	**856 127**	**851 686**
	Domestic (and non-domestic)	No		832 190	862 902	893 615	816 572	857 978	885 632	921 563	949 421	968 077	849 297	845 488
	Non-domestic	No		0	0	0	2 095	2 953	1 740	1 742	2 540	2 522	6 830	6 198
	Connections - unmetered	**No**		**106 244**	**109 963**	**113 682**	**139 679**	**126 424**	**136 216**	**141 948**	**149 700**	**153 387**	**183 538**	**159 928**
	Households / connection	**No**		**1.0**	**1.0**	**1.0**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.2**	**1.2**
	Length of mains	**No**		**18 769**	**19 457**	**20 146**	**19 495**	**20 344**	**21 241**	**22 003**	**22 755**	**23 177**	**19 073**	**18 711**
	Connections / km	**No/km**		**50**	**50**	**50**	**49**	**49**	**48**	**48**	**48**	**48**	**55**	**54**
	Average system pressure	**m**		**41**	**47**	**46**	**49**	**48**	**48**	**48**	**49**	**49**	**50**	**50**
	Time system pressurised	**%**		**100%**	**100%**	**100%**	**97%**	**96%**	**96%**	**96%**	**98%**	**98%**	**91%**	**91%**
	Apparent losses	**%**		**20%**	**20%**	**22%**	**23%**	**22%**	**22%**	**23%**	**23%**	**22%**	**21%**	**21%**
	Consumer meter age	%		6%	6%	7%	7%	7%	7%	7%	7%	7%	8%	8%
	Illegal connections	%		6%	6%	6%	7%	7%	7%	8%	7%	7%	7%	7%
	Data transfer	%		8%	8%	8%	8%	8%	8%	8%	8%	8%	7%	7%
Water Balance Calculations	**System input volume**	**kl/annum**		**96 985 665**	**86 640 265**	**181 912 251**	**258 206 992**	**258 655 725**	**270 640 583**	**265 941 795**	**276 510 957**	**284 877 859**	**289 875 481**	**283 727 455**
	Own sources	kl/annum		41 738 549	30 712 647	124 600 314	188 723 990	183 873 384	184 385 806	185 234 817	193 579 928	201 397 444	215 346 967	212 945 064
	Other sources	kl/annum		55 247 116	55 927 618	57 311 937	69 483 002	74 782 341	86 254 777	80 706 978	82 931 030	83 480 415	74 528 514	70 782 391
	Authorised Consumption			**65 877 978**	**54 457 252**	**107 965 177**	**138 611 286**	**145 345 863**	**154 059 417**	**146 665 278**	**149 841 145**	**148 254 596**	**155 999 607**	**152 496 210**
	Billed authorised	**kl/annum**		**64 613 633**	**54 457 252**	**107 295 334**	**137 912 324**	**140 706 310**	**145 820 338**	**142 607 385**	**142 155 508**	**140 491 650**	**137 168 580**	**130 423 536**
	Billed metered	kl/annum		63 266 858	51 584 410	96 012 383	103 067 961	98 420 413	102 534 594	99 740 661	89 914 693	87 835 603	99 024 273	93 502 609
	Domestic (and non-domestic)	kl/annum		63 266 858	51 506 110	95 963 745	96 282 925	90 358 546	94 200 499	91 073 303	80 000 107	80 351 961	91 897 277	86 346 281
	Non-domestic	kl/annum		0	0	0	4 263 499	5 148 554	5 080 434	5 646 405	6 706 185	3 965 670	3 793 142	3 822 474
	Export volume	kl/annum		0	78 300	48 638	2 521 537	2 913 314	3 253 662	3 020 953	3 208 401	3 517 972	3 333 854	3 333 854
	Billed unmetered	kl/annum		1 346 775	2 872 842	11 282 951	34 844 362	42 285 897	43 285 743	42 866 725	52 240 815	52 656 047	38 144 307	36 920 927
	Unbilled authorised	**kl/annum**		**1 264 345**	**0**	**669 842**	**698 962**	**4 639 553**	**8 239 079**	**4 057 893**	**7 685 637**	**7 762 946**	**18 831 027**	**22 072 674**
	Unbilled metered	kl/annum		1 264 345	0	669 842	698 962	3 864 354	7 514 736	2 919 579	2 901 550	2 919 579	15 085 756	17 104 518
	Unbilled unmetered	kl/annum		0	0	0	0	775 199	724 343	1 138 314	4 784 087	4 843 367	3 745 271	4 968 156
	Water Losses	**kl/annum**		**31 107 687**	**32 183 013**	**73 947 074**	**119 595 706**	**113 309 861**	**116 581 166**	**119 276 517**	**126 669 813**	**136 623 263**	**133 875 874**	**131 231 245**
	Commercial / Apparent losses	**kl/annum**		**6 221 537**	**6 436 603**	**15 939 703**	**27 075 139**	**25 395 798**	**25 916 641**	**27 045 950**	**28 545 863**	**30 593 762**	**28 746 125**	**28 053 282**
	Physical / Real losses	**kl/annum**		**24 886 150**	**25 746 411**	**58 007 371**	**92 520 567**	**87 914 064**	**90 664 525**	**92 230 567**	**98 123 949**	**106 029 501**	**105 129 749**	**103 177 963**
	UARL	**kl/annum**		**16 158 207**	**19 222 515**	**19 713 295**	**19 115 409**	**19 629 047**	**20 395 327**	**21 194 049**	**22 317 611**	**22 981 016**	**19 630 184**	**19 146 429**
	Potential real loss saving	**kl/annum**		**8 727 943**	**6 523 895**	**38 294 077**	**73 405 158**	**68 285 017**	**70 269 198**	**71 036 518**	**75 806 338**	**83 048 485**	**85 499 565**	**84 031 534**
	Revenue water	**kl/annum**		**64 613 633**	**54 457 252**	**107 295 334**	**137 912 324**	**140 706 310**	**145 820 338**	**142 607 385**	**142 155 508**	**140 491 650**	**137 168 580**	**130 423 536**
	Non-Revenue water	**kl/annum**		**32 372 032**	**32 183 013**	**74 616 916**	**120 294 668**	**117 949 414**	**124 820 245**	**123 334 410**	**134 355 450**	**144 386 209**	**152 706 901**	**153 303 919**
	Projected SIV without WDM	kl/annum		165 469 088	168 526 753	171 623 501	174 431 660	177 173 247	179 770 240	182 420 445	185 087 237	187 753 213	190 276 223	193 319 250
	Projected SIV with WDM	kl/annum		159 169 716	160 271 061	161 393 597	162 171 594	162 920 295	165 433 591	167 871 702	170 351 127	172 923 758	175 229 464	178 246 145
Source of information (Evidence to BWSAudit)														
Comments														

IWA Water Balance Diagram (million m^3/annum) for **Jun-23 (select year)**



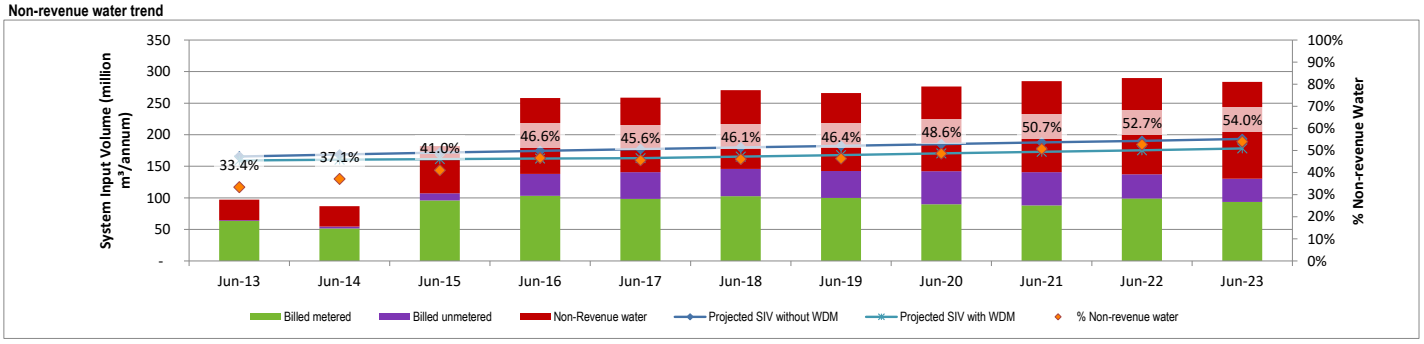
Note : All underlined values have been calculated using trends and / or averages based on previous years.

Municipal IWA Water Balance Information

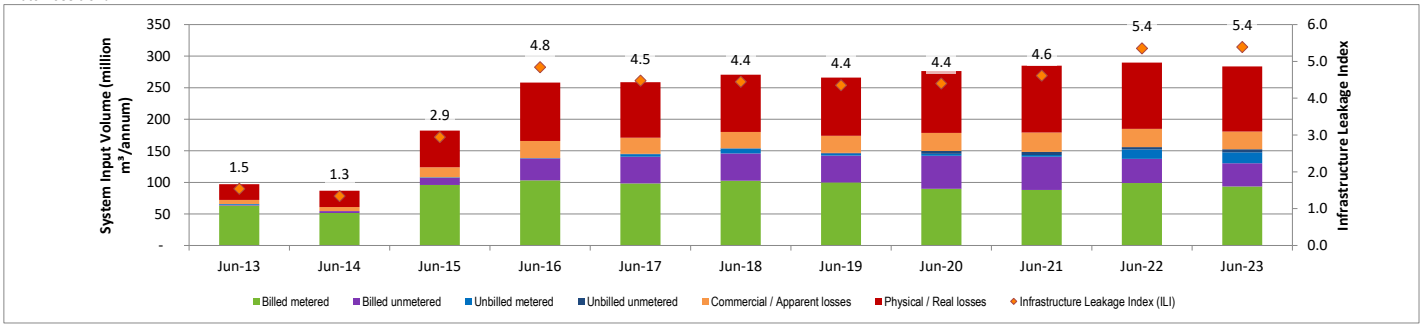
water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

	Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Key performance indicators	Indicator as % of system input volume											
	% Revenue water	66.6%	62.9%	59.0%	53.4%	54.4%	53.9%	53.6%	51.4%	49.3%	47.3%	46.0%
	% Non-revenue water	33.4%	37.1%	41.0%	46.6%	45.6%	46.1%	46.4%	48.6%	50.7%	52.7%	54.0%
	% Water Losses	32.1%	37.1%	40.6%	46.3%	43.8%	43.1%	44.9%	45.8%	48.0%	46.2%	46.3%
	System input volume unit consumption											
	Litres / capita / day	79	69	142	193	188	193	183	187	189	190	186
	m³ / household / month	9	7	15	20	20	20	19	19	19	19	19
	m³ / connection / month	9	7	15	22	22	22	21	21	21	23	23
	Authorised Unit Consumption											
	Litres / capita / day	54	43	84	103	105	109	100	100	97	101	99
	m³ / household / month	6	5	9	11	11	11	10	10	10	10	10
	m³ / connection / month	6	5	9	12	12	12	11	11	11	12	12
	Domestic (& ND) m³ / connection / month	6	5	9	11	12	12	11	11	10	12	12
	Non-domestic m³ / connection / month				170	145	243	270	220	131	46	51
	Water loss indicators											
	Litres / capita / day	25	26	58	90	83	84	83	87	92	89	87
	m³ / household / month	3	3	6	10	9	9	9	9	9	9	9
	m³ / connection / month	3	3	6	10	10	9	9	10	10	11	11
	UARL : Losses (litres / connection / day)	47	54	54	55	54	55	55	56	56	52	52
	CARL : Losses (litres / connection / day)	73	73	158	264	244	243	237	244	258	277	279
	Infrastructure Leakage Index (ILI)	1.5	1.3	2.9	4.8	4.5	4.4	4.4	4.4	4.6	5.4	5.4
	CARL : Losses (m³ / km mains / day)	4	4	8	13	12	12	11	12	13	15	15
	% Population growth	2.06%	2.03%	2.41%	1.50%	2.85%	2.30%	2.84%	2.78%	1.88%	1.65%	0.68%
	% Water demand growth	-32.78%	-10.67%	109.96%	72.74%	19.24%	2.38%	1.40%	1.08%	3.50%	2.39%	-0.20%
	% Water demand growth without WDM	1.86%	1.85%	1.84%	0.81%	1.60%	1.52%	1.47%	1.47%	1.45%	1.39%	1.47%
	% Water demand growth with WDM	0.49%	0.69%	0.70%	0.24%	0.47%	1.00%	1.51%	1.48%	1.49%	1.42%	1.53%
	5 Year Annualised Population Growth	3.90%	3.79%	2.44%	1.90%	2.44%	2.01%	1.96%	1.76%	1.68%	1.39%	0.84%
	5 Year Annualised Water Growth	-0.87%	-14.54%	1.01%	12.34%	12.38%	25.58%	12.21%	7.87%	2.37%	2.89%	0.86%

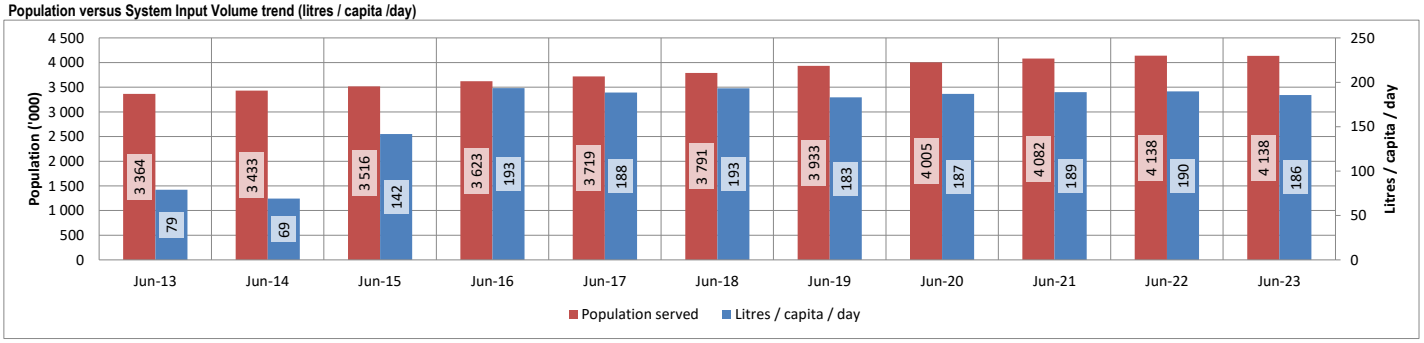
Non-revenue water trend



Water loss trend



Population versus System Input Volume trend (litres / capita /day)



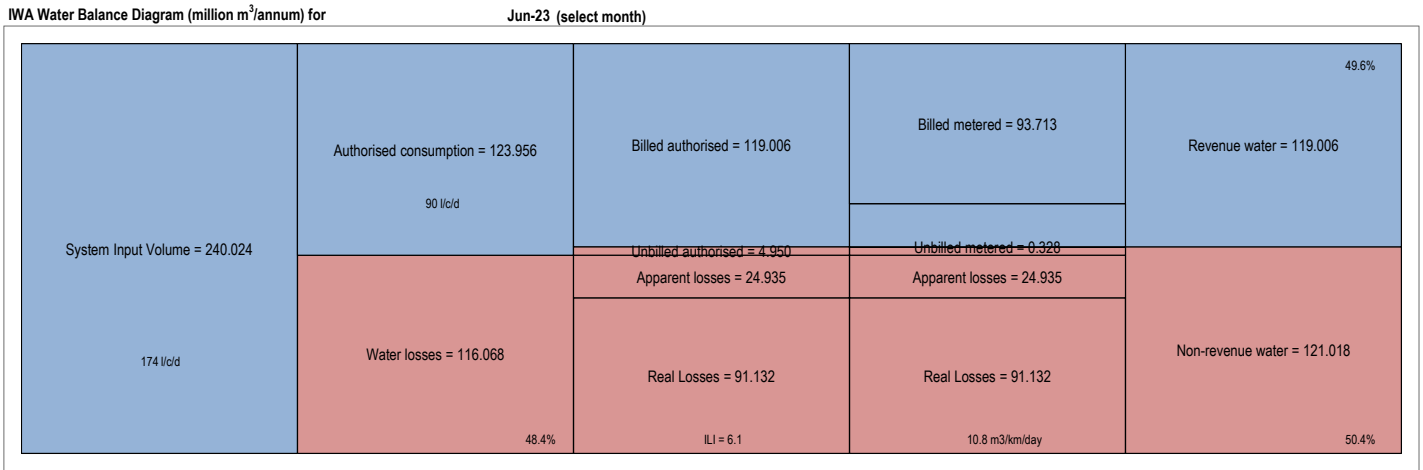
Municipal IWA Water Balance Information

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Province	North West
Municipal Code	
District Municipality	Bojanala Platinum, Ngaka Modiri Molema, Dr Ruth Segomotsi Mompati, Dr Kenneth Kaunda
Municipality	
Settlements	

		Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Input Data	**Population served**	**No**	**2 983 670**	**3 018 656**	**3 067 990**	**3 095 011**	**3 180 449**	**3 302 850**	**3 426 035**	**3 493 207**	**3 563 362**	**3 617 806**	**3 785 624**
	Households served	**No**	**950 178**	**981 195**	**1 012 210**	**1 043 246**	**1 086 489**	**1 148 702**	**1 191 389**	**1 214 630**	**1 238 949**	**1 257 771**	**1 330 969**
	Connections - total	**No**	**950 178**	**981 195**	**1 012 210**	**1 043 246**	**1 086 134**	**1 146 532**	**1 211 232**	**1 240 365**	**1 287 552**	**1 202 338**	**1 150 730**
	Connections - metered	**No**	**792 198**	**820 287**	**848 374**	**876 478**	**911 665**	**959 182**	**1 014 948**	**1 040 357**	**1 079 850**	**950 554**	**914 924**
	Domestic (and non-domestic)	No	792 198	820 287	848 374	876 478	911 665	959 182	1 014 948	1 040 357	1 079 850	945 379	909 749
	Non-domestic	No	0	0	0	0	0	0	0	0	0	5 175	5 175
	Connections - unmetered	**No**	**157 980**	**160 908**	**163 836**	**166 768**	**174 469**	**187 349**	**196 284**	**200 008**	**207 702**	**251 784**	**235 807**
	Households / connection	**No**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.2**
	Length of mains	**No**	**19 004**	**19 624**	**20 244**	**20 865**	**21 723**	**22 931**	**24 225**	**24 807**	**25 751**	**24 047**	**23 015**
	Connections / km	**No / km**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**
	Average system pressure	**m**	**44**	**48**	**40**	**41**	**41**	**41**	**39**	**39**	**38**	**36**	**35**
	Time system pressurised	**%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**98%**	**98%**	**97%**	**91%**	**89%**
	Apparent losses	**%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**22%**	**21%**
	Consumer meter age	%	6%	6%	6%	6%	6%	6%	6%	6%	6%	7%	7%
	Illegal connections	%	6%	6%	6%	6%	6%	6%	6%	6%	6%	7%	7%
	Data transfer	%	8%	8%	8%	8%	8%	8%	8%	8%	8%	7%	7%
Water Balance Calculations	**System input volume**	**kl/annum**	**94 215 724**	**94 215 724**	**140 790 960**	**210 881 559**	**213 735 701**	**219 351 285**	**229 533 831**	**228 655 907**	**231 128 407**	**235 581 129**	**240 023 761**
	Own sources	kl/annum	94 215 724	94 215 724	140 790 960	210 881 559	213 735 701	219 351 285	229 519 305	196 073 916	231 116 917	194 355 617	196 206 973
	Other sources	kl/annum	0	0	0	0	0	0	14 526	32 581 991	11 490	41 225 512	43 816 788
	Authorised Consumption	**kl/annum**	**69 670 864**	**46 595 531**	**70 626 520**	**106 813 028**	**106 813 028**	**106 813 028**	**114 351 977**	**117 037 586**	**114 497 173**	**120 708 402**	**123 956 092**
	Billed authorised	**kl/annum**	**48 837 157**	**44 370 049**	**68 401 038**	**104 587 546**	**104 587 546**	**104 587 546**	**112 126 495**	**114 812 104**	**114 267 940**	**116 006 297**	**119 006 246**
	Billed metered	kl/annum	41 636 914	41 636 914	65 667 903	71 184 428	71 184 428	71 184 428	81 820 605	84 506 214	86 160 157	90 355 154	93 712 623
	Domestic (and non-domestic)	kl/annum	41 636 914	41 636 914	65 667 903	71 184 428	71 184 428	71 184 428	83 598 613	78 381 041	76 356 341	76 715 447	79 471 796
	Non-domestic	kl/annum	0	0	0	0	0	0	-1 778 008	6 125 173	9 803 816	13 639 708	14 240 827
	Export volume	kl/annum	0	0	0	0	0	0	0	0	0	0	0
	Billed unmetered	kl/annum	7 200 243	2 733 135	2 733 135	33 403 118	33 403 118	33 403 118	30 305 890	30 305 890	28 107 784	25 651 143	25 293 623
	Unbilled authorised	**kl/annum**	**20 833 707**	**2 225 482**	**2 225 482**	**2 225 482**	**2 225 482**	**2 225 482**	**2 225 482**	**2 225 482**	**229 233**	**4 702 105**	**4 949 846**
	Unbilled metered	kl/annum	20 833 707	2 225 482	2 225 482	2 225 482	2 225 482	2 225 482	2 225 482	2 225 482	194 913	194 240	328 166
	Unbilled unmetered	kl/annum	0	0	0	0	0	0	0	0	34 320	4 507 865	4 621 680
	Water Losses	**kl/annum**	**24 544 860**	**47 620 193**	**70 164 440**	**104 068 532**	**106 922 673**	**112 538 258**	**115 181 853**	**111 618 321**	**116 631 234**	**114 872 726**	**116 067 669**
	Commercial / Apparent losses	**kl/annum**	**4 908 972**	**9 524 039**	**14 032 888**	**20 813 706**	**21 384 535**	**22 507 652**	**23 132 356**	**22 230 649**	**23 326 247**	**24 735 927**	**24 935 204**
	Physical / Real losses	**kl/annum**	**19 635 888**	**38 096 154**	**56 131 552**	**83 254 825**	**85 538 139**	**90 030 606**	**92 049 498**	**89 387 672**	**93 304 987**	**90 136 799**	**91 132 465**
	UARL	**kl/annum**	**17 500 283**	**19 733 303**	**16 928 504**	**18 110 125**	**18 854 638**	**19 903 105**	**19 835 342**	**20 312 429**	**19 849 500**	**16 722 950**	**14 876 022**
	Potential real loss saving	**kl/annum**	**2 135 605**	**18 362 851**	**39 203 048**	**65 144 701**	**66 683 501**	**70 127 501**	**72 214 155**	**69 075 242**	**73 455 487**	**73 413 849**	**76 256 443**
	Revenue water	**kl/annum**	**48 837 157**	**44 370 049**	**68 401 038**	**104 587 546**	**104 587 546**	**104 587 546**	**112 126 495**	**114 812 104**	**114 267 940**	**116 006 297**	**119 006 246**
	Non-Revenue water	**kl/annum**	**45 378 567**	**49 845 675**	**72 389 922**	**106 294 014**	**109 148 155**	**114 763 740**	**117 407 335**	**113 843 803**	**116 860 467**	**119 574 831**	**121 017 515**
	Projected SIV without WDM	kl/annum			176 385 959	180 026 961	183 772 663	187 627 304	191 595 375	194 917 610	197 968 765	199 754 533	204 016 802
	Projected SIV with WDM	kl/annum			172 002 865	172 783 535	174 380 237	176 049 461	177 793 163	180 335 831	183 200 905	184 915 601	189 063 905
	Comments												

IWA Water Balance Diagram (million m^3/annum) for **Jun-23 (select month)**



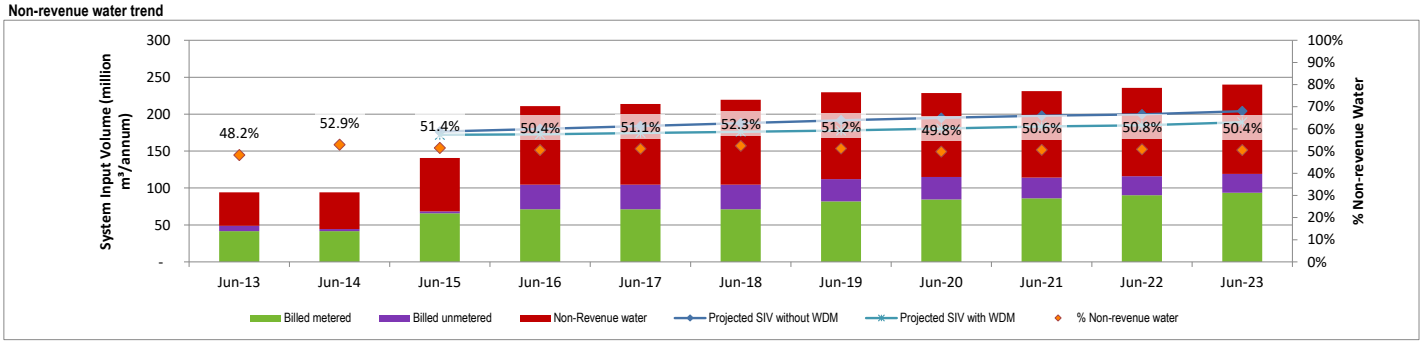
Note : All underlined values have been calculated using trends and / or averages based on previous years.

Municipal IWA Water Balance Information

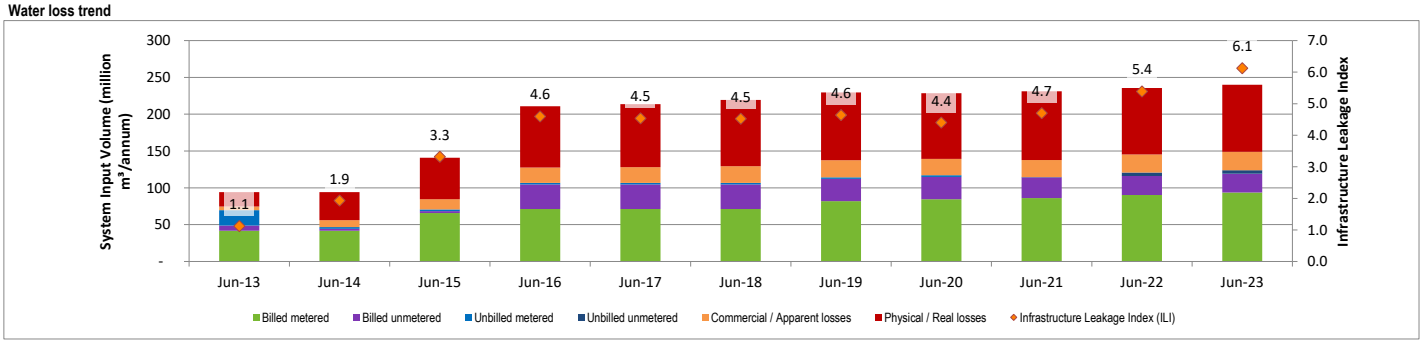
water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

	Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Key performance indicators	Indicator as % of system input volume											
	% Revenue water	51.8%	47.1%	48.6%	49.6%	48.9%	47.7%	48.8%	50.2%	49.4%	49.2%	49.6%
	% Non-revenue water	48.2%	52.9%	51.4%	50.4%	51.1%	52.3%	51.2%	49.8%	50.6%	50.8%	50.4%
	% Water Losses	26.1%	50.5%	49.8%	49.3%	50.0%	51.3%	50.2%	48.8%	50.5%	48.8%	48.4%
	System input volume unit consumption											
	Litres / capita / day	87	86	126	187	184	182	184	179	178	178	174
	m³ / household / month	8	8	12	17	16	16	16	16	16	16	15
	m³ / connection / month	8	8	12	17	16	16	16	15	15	16	17
	Authorised Unit Consumption											
	Litres / capita / day	64	42	63	95	92	89	91	92	88	91	90
	m³ / household / month	6	4	6	9	8	8	8	8	8	8	8
	m³ / connection / month	6	4	6	9	8	8	8	8	7	8	9
	Domestic (& ND) m³ / connection / month	6	4	6	9	8	8	8	7	7	7	8
	Non-domestic m³ / connection / month										220	229
	Water loss indicators											
	Litres / capita / day	23	43	63	92	92	93	92	88	90	87	84
	m³ / household / month	2	4	6	8	8	8	8	8	8	8	7
	m³ / connection / month	2	4	6	8	8	8	8	7	8	8	8
	UARL : Losses (litres / connection / day)	50	55	46	48	48	48	45	45	42	38	35
	CARL : Losses (litres / connection / day)	57	106	152	219	216	215	208	197	199	205	217
	Infrastructure Leakage Index (ILI)	1.1	1.9	3.3	4.6	4.5	4.5	4.6	4.4	4.7	5.4	6.1
	CARL : Losses (m³ / km mains / day)	3	5	8	11	11	11	10	10	10	10	11
	% Population growth	1.19%	1.17%	1.63%	0.88%	1.82%	3.30%	3.79%	2.84%	1.98%	1.77%	3.07%
	% Water demand growth	7.12%	0.00%	49.43%	127.15%	23.21%	1.99%	3.63%	2.10%	0.35%	1.50%	1.91%
	% Water demand growth without WDM				1.02%	2.07%	2.09%	2.11%	1.92%	1.65%	1.23%	1.52%
	% Water demand growth with WDM				0.23%	0.69%	0.94%	0.97%	1.21%	1.51%	1.26%	1.59%
	5 Year Annualised Population Growth	3.65%	3.24%	1.93%	0.97%	1.53%	1.82%	2.23%	2.44%	2.27%	1.81%	2.00%
	5 Year Annualised Water Growth	9.06%	-7.23%	1.08%	19.11%	19.43%	18.41%	19.85%	20.07%	20.07%	20.23%	20.75%

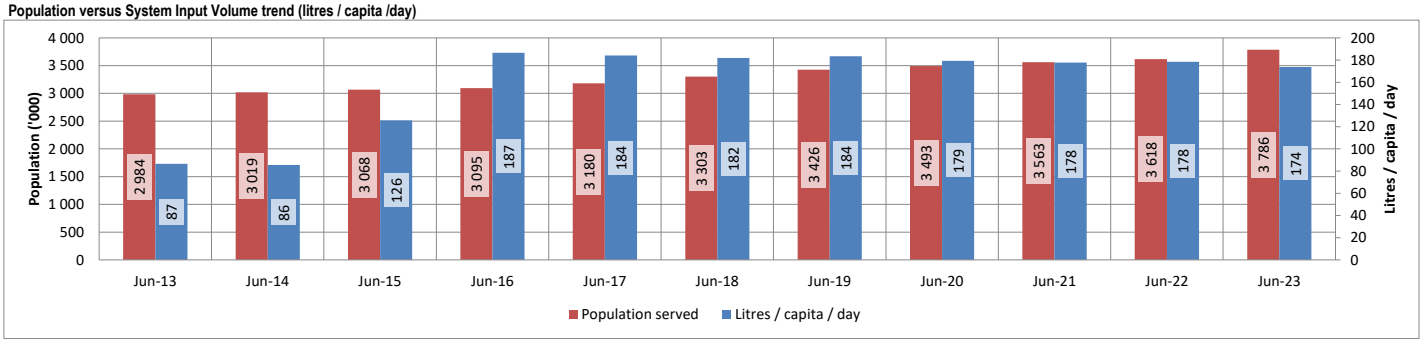
Non-revenue water trend



Water loss trend



Population versus System Input Volume trend (litres / capita /day)



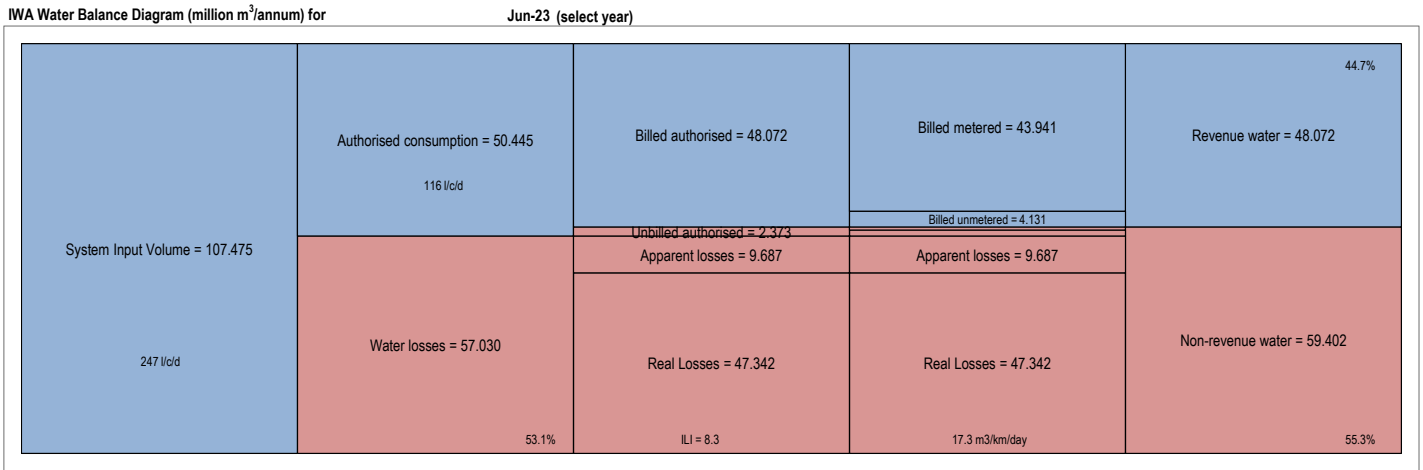
Municipal IWA Water Balance Information

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Province	Northern Cape
Municipal Code	
District Municipality	Namakwa, Pixley Ka Seme, Siyanda, Frances Baard, John Taolo Gaetsewe
Municipality	
Settlements	

		Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Inp	**Population served**	**No**	**1 057 082**	**1 065 911**	**1 077 476**	**1 085 944**	**1 117 113**	**1 140 419**	**1 164 082**	**1 171 658**	**1 182 008**	**1 177 217**	**1 187 425**
	Households served	**No**	**292 661**	**302 186**	311719	321268	335222	342113	349180	351416	354467	349045.2981	346993.5137
	Connections - total	**No**	**292 661**	**302 186**	**301 905**	**312 479**	**330 310**	**323 523**	**329 543**	**331 124**	**329 958**	**324 016**	**324 194**
	Connections - metered	**No**	**252 237**	**260 765**	**269 043**	**275 877**	**277 500**	**279 638**	**293 245**	**296 291**	**295 188**	**278 193**	**279 742**
	Domestic (and non-domestic)	No	252 237	260 765	262 246	269 439	277 143	275 706	289 313	292 049	290 338	272 270	273 048
	Non-domestic	No	0	0	6 797	6 438	357	3 932	3 932	4 243	4 850	5 923	6 694
	Connections - unmetered	**No**	**40 424**	**41 421**	**39 659**	**43 040**	**53 166**	**47 816**	**40 230**	**39 075**	**39 620**	**51 746**	**51 145**
	Households / connection	**No**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**
	Length of mains	**km**	**5 853**	**6 044**	**5 800**	**5 870**	**6 591**	**6 850**	**6 983**	**7 567**	**7 425**	**7 522**	**7 493**
	Connections / km	**No / km**	**50**	**50**	**52**	**53**	**50**	**47**	**47**	**44**	**44**	**43**	**43**
	Average system pressure	**m**	**46**	**46**	**45**	**39**	**39**	**40**	**40**	**40**	**40**	**41**	**41**
	Time system pressurised	**%**	**100%**	**100%**	**96%**	**98%**	**98%**	**99%**	**99%**	**99%**	**99%**	**98%**	**98%**
	Apparent losses	**%**	**20%**	**20%**	**19%**	**19%**	**19%**	**18%**	**18%**	**18%**	**17%**	**17%**	**17%**
	Consumer meter age	%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
	Illegal connections	%	6%	6%	5%	6%	6%	5%	5%	5%	5%	5%	5%
	Data transfer	%	8%	8%	7%	8%	8%	7%	7%	6%	6%	6%	6%
Wat	**System input volume**	**kl/annum**	**79 938 236**	**79 938 236**	**91 909 831**	**97 402 208**	**99 277 738**	**100 383 937**	**101 074 256**	**102 512 511**	**109 244 193**	**107 426 921**	**107 474 516**
	Own sources	kl/annum	79 938 236	79 938 236	91 557 441	95 307 120	97 128 321	100 383 937	101 074 256	97 081 068	100 930 849	99 480 072	99 579 141
	Other sources	kl/annum	0	0	352 390	2 095 088	2 149 416	0	0	5 431 443	8 313 343	7 946 848	7 895 375
	Authorised Consumption	**kl/annum**	**51 222 105**	**51 222 105**	**54 316 734**	**54 787 785**	**53 563 280**	**54 870 575**	**54 362 880**	**52 502 934**	**50 231 942**	**50 312 890**	**50 444 959**
	Billed authorised	**kl/annum**	**50 275 286**	**50 275 286**	**53 681 709**	**51 756 140**	**49 733 271**	**51 618 282**	**51 163 473**	**49 932 406**	**48 680 415**	**47 985 686**	**48 072 109**
	Billed metered	kl/annum	47 192 566	47 192 566	52 720 468	44 002 367	43 448 540	46 511 767	46 498 244	45 273 300	45 127 992	43 854 838	43 941 261
	Domestic (and non-domestic)	kl/annum	47 192 566	47 192 566	52 550 992	43 166 081	42 245 356	39 065 256	38 754 878	38 087 647	36 508 416	32 471 539	32 543 598
	Non-domestic	kl/annum	0	0	13 866	833 870	1 068 472	7 446 511	7 534 956	6 926 723	8 351 426	11 110 334	11 124 698
	Export volume	kl/annum	0	0	155 610	2 416	134 712	0	208 410	258 930	268 150	272 966	272 966
	Billed unmetered	kl/annum	3 082 720	3 082 720	961 241	7 753 773	6 284 731	5 106 515	4 665 228	4 659 106	3 552 423	4 130 848	4 130 848
	Unbilled authorised	**kl/annum**	**946 819**	**946 819**	**635 025**	**3 031 645**	**3 830 009**	**3 252 292**	**3 199 407**	**2 570 528**	**1 551 527**	**2 327 204**	**2 372 850**
	Unbilled metered	kl/annum	904 819	904 819	589 487	2 567 256	2 567 256	549 539	496 654	1 087 864	66 492	771 732	817 378
	Unbilled unmetered	kl/annum	42 000	42 000	45 538	464 389	1 262 753	2 702 753	2 702 753	1 482 664	1 485 035	1 555 472	1 555 472
	Water Losses	**kl/annum**	**28 716 131**	**28 716 131**	**37 593 097**	**42 614 423**	**45 714 457**	**45 513 362**	**46 711 376**	**50 009 577**	**59 012 251**	**57 114 030**	**57 029 557**
	Commercial / Apparent losses	**kl/annum**	**5 743 226**	**5 743 226**	**7 213 698**	**8 270 749**	**8 700 985**	**8 222 747**	**8 236 773**	**8 835 523**	**10 152 730**	**9 701 789**	**9 687 439**
	Physical / Real losses	**kl/annum**	**22 972 905**	**22 972 905**	**30 379 399**	**34 343 674**	**37 013 472**	**37 290 615**	**38 474 603**	**41 174 053**	**48 859 521**	**47 412 242**	**47 342 117**
	UARL	**kl/annum**	**5 756 033**	**5 943 369**	**5 416 085**	**5 002 695**	**5 351 515**	**5 459 853**	**5 675 189**	**5 726 234**	**5 680 331**	**5 753 056**	**5 700 627**
	Potential real loss saving	**kl/annum**	**17 216 872**	**17 029 536**	**24 963 315**	**29 340 978**	**31 661 957**	**31 830 762**	**32 799 414**	**35 447 819**	**43 179 190**	**41 659 185**	**41 641 490**
	Revenue water	**kl/annum**	**50 275 286**	**50 275 286**	**53 681 709**	**51 756 140**	**49 733 271**	**51 618 282**	**51 163 473**	**49 932 406**	**48 680 415**	**47 985 686**	**48 072 109**
	Non-Revenue water	**kl/annum**	**29 662 950**	**29 662 950**	**38 228 122**	**45 646 068**	**49 544 467**	**48 765 655**	**49 910 783**	**52 580 105**	**60 563 778**	**59 441 234**	**59 402 407**
	Projected SIV without WDM	kl/annum	112 247 001	115 571 350	119 025 335	121 447 491	123 940 799	126 508 006	129 151 993	131 875 782	134 262 479	136 699 939	139 189 364
	Projected SIV with WDM	kl/annum	104 021 938	107 361 526	110 800 272	111 544 528	112 919 236	114 367 843	115 893 230	118 057 719	120 444 416	122 881 875	125 371 301
Source of information													
omments													

IWA Water Balance Diagram (million m^3/annum) for **Jun-23 (select year)**



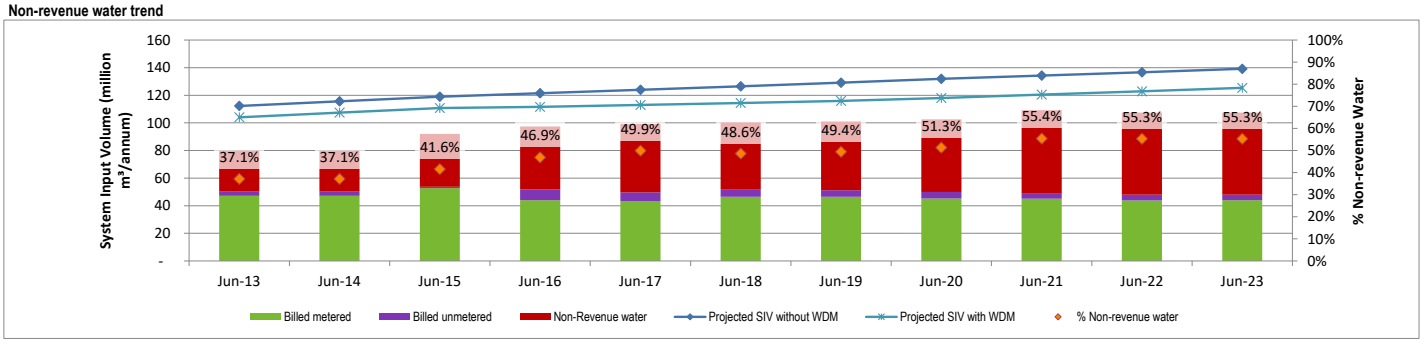
Note : All underlined values have been calculated using trends and / or averages based on previous years.

Municipal IWA Water Balance Information

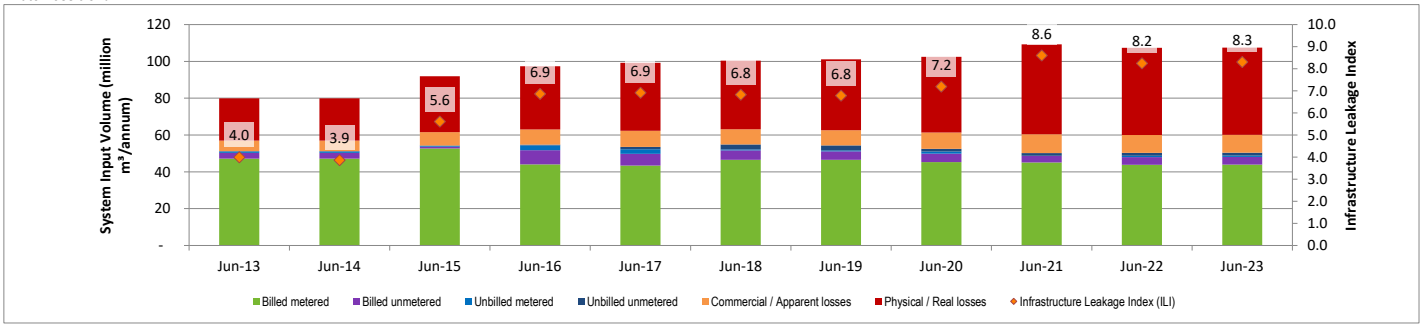
water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Key	Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
	Indicator as % of system input volume											
	% Revenue water	62.9%	62.9%	58.4%	53.1%	50.1%	51.4%	50.6%	48.7%	44.6%	44.7%	44.7%
	% Non-revenue water	37.1%	37.1%	41.6%	46.9%	49.9%	48.6%	49.4%	51.3%	55.4%	55.3%	55.3%
	% Water Losses	35.9%	35.9%	40.9%	43.8%	46.0%	45.3%	46.2%	48.8%	54.0%	53.2%	53.1%
	System input volume unit consumption											
	Litres / capita / day	207	205	233	246	243	241	237	239	253	249	247
	m³ / household / month	23	22	25	25	25	24	24	24	26	26	26
	m³ / connection / month	23	22	25	26	25	26	26	26	28	28	28
	Authorised Unit Consumption											
	Litres / capita / day	133	132	138	138	131	132	127	122	116	116	116
	m³ / household / month	15	14	14	14	13	13	13	12	12	12	12
	m³ / connection / month	15	14	15	15	13	14	14	13	13	13	13
	Domestic (& ND) m³ / connection / month	15	14	15	14	13	12	12	11	11	10	10
	Non-domestic m³ / connection / month			0	11	249	158	160	136	144	156	138
	Water loss indicators											
	Litres / capita / day	74	74	96	108	112	109	110	117	137	133	132
	m³ / household / month	8	8	10	11	11	11	11	12	14	14	14
	m³ / connection / month	8	8	10	11	12	12	12	13	15	15	15
	UARL : Losses (litres / connection / day)	54	54	49	44	44	46	47	47	47	49	48
	CARL : Losses (litres / connection / day)	215	208	276	301	307	316	320	341	406	401	400
	Infrastructure Leakage Index (ILI)	4.0	3.9	5.6	6.9	6.9	6.8	6.8	7.2	8.6	8.2	8.3
	CARL : Losses (m³ / km mains / day)	11	10	14	16	15	15	15	15	18	17	17
	% Population growth	0.83%	0.84%	1.08%	0.79%	1.82%	2.48%	2.08%	1.36%	0.77%	0.24%	0.23%
	% Water demand growth	16.50%	0.00%	14.98%		3.93%	1.52%	0.90%	1.05%	3.96%	2.37%	-0.81%
	% Water demand growth without WDM	21.77%	2.96%	2.99%	1.01%	2.04%	2.06%	2.08%	2.10%	1.96%	1.81%	1.82%
	% Water demand growth with WDM	21.80%	3.21%	3.20%	0.33%	0.95%	1.26%	1.31%	1.60%	1.94%	2.02%	2.02%
	5 Year Annualised Population Growth	3.61%	3.37%	1.34%	0.71%	1.28%	1.36%	1.56%	1.50%	1.12%	0.62%	0.39%
	5 Year Annualised Water Growth	1.87%	0.25%	2.95%	7.26%	7.67%	4.66%	#DIV/0!	5.89%	19.22%	22.24%	26.44%

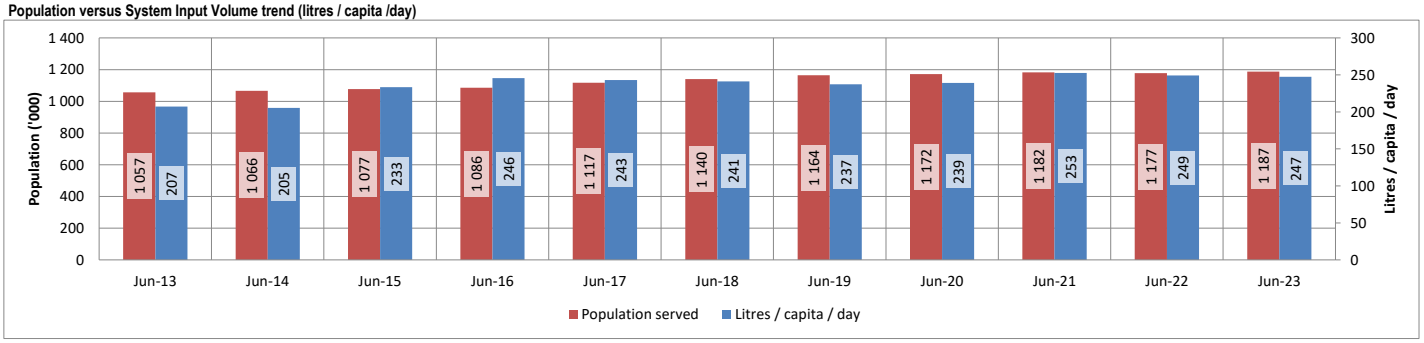
Non-revenue water trend



Water loss trend



Population versus System Input Volume trend (litres / capita /day)



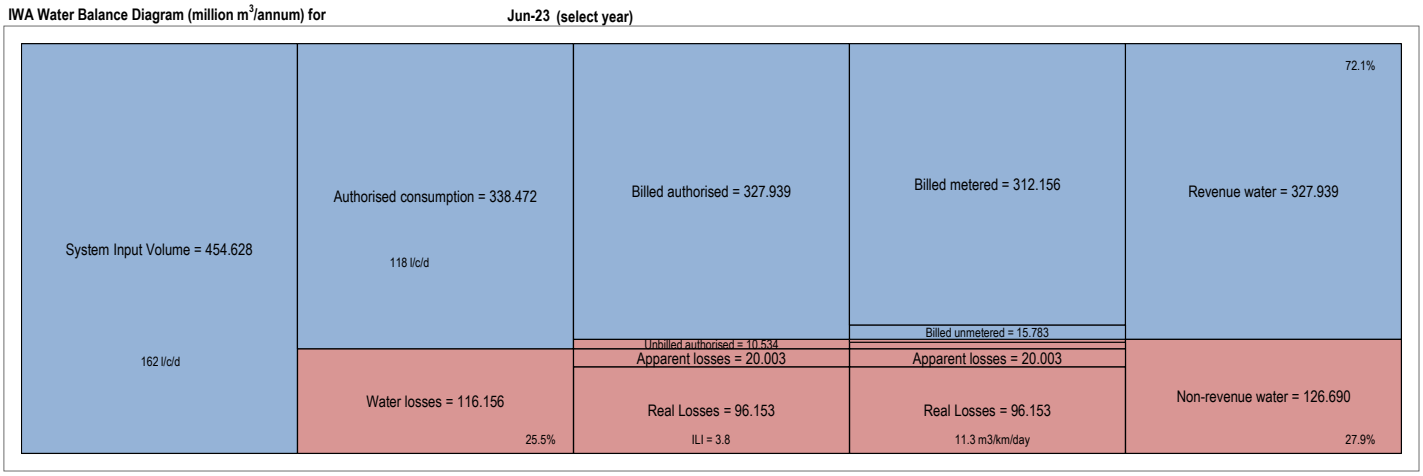
Municipal IWA Water Balance Information

water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Province	Western Cape
Municipal Code	
District Municipality	West Coast, Cape Winelands, Overberg, Eden, Central Karoo
Municipality	
Settlements	

		Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Input Data	**Population served**	**No**	**5 716 869**	**5 839 069**	**5 968 357**	**5 988 277**	**6 179 495**	**6 378 777**	**6 587 909**	**6 695 346**	**6 792 496**	**7 080 236**	**7 210 799**
	Households served	**No**	**1 664 680**	**1 721 865**	**1 779 233**	**1 836 810**	**1 909 572**	**1 909 994**	**1 972 939**	**2 005 110**	**2 034 235**	**2 156 899**	**2 197 947**
	Connections - total	**No**	**1 097 322**	**1 126 438**	**1 140 212**	**1 174 883**	**1 222 858**	**1 228 858**	**1 269 935**	**1 292 210**	**1 313 338**	**1 275 323**	**1 251 011**
	Connections - metered	**No**	**1 104 241**	**1 120 363**	**1 115 699**	**1 149 398**	**1 195 967**	**1 201 490**	**1 241 613**	**1 262 916**	**1 283 778**	**1 247 152**	**1 253 832**
	Domestic (and non-domestic)	No	1 062 217	1 074 402	1 108 181	1 141 857	1 188 398	1 193 957	1 233 811	1 255 391	1 275 882	1 192 841	1 199 304
	Non-domestic	No	42 024	45 962	7 518	7 541	7 569	7 533	7 802	7 525	7 896	54 311	54 528
	Connections - unmetered	**No**	**35 105**	**52 036**	**32 030**	**33 026**	**34 460**	**34 901**	**36 125**	**36 819**	**37 456**	**82 482**	**51 708**
	Households / connection	**No**	**1.5**	**1.5**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.5**	**1.7**	**1.8**
	Length of mains	**km**	**20 950**	**21 826**	**21 830**	**22 456**	**23 353**	**23 425**	**24 185**	**24 615**	**25 096**	**23 091**	**23 225**
	Connections / km	**No / km**	**52**	**52**	**52**	**52**	**52**	**52**	**53**	**52**	**52**	**55**	**54**
	Average system pressure	**m**	**47**	**49**	**49**	**49**	**49**	**50**	**51**	**51**	**51**	**49**	**49**
	Time system pressurised	**%**	**98%**	**98%**	**98%**	**98%**	**98%**	**98%**	**98%**	**98%**	**98%**	**99%**	**99%**
	Apparent losses	**%**	**18%**	**19%**	**19%**	**19%**	**19%**	**19%**	**19%**	**19%**	**19%**	**17%**	**17%**
	Consumer meter age	%	6%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
	Illegal connections	%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	Data transfer	%	7%	7%	7%	7%	7%	7%	7%	7%	7%	6%	6%
Water Balance Calculations	**System input volume**	**kl/annum**	**464 994 952**	**460 730 191**	**497 893 972**	**480 100 513**	**433 318 438**	**329 954 277**	**329 437 925**	**372 696 927**	**400 412 069**	**431 724 832**	**454 628 348**
	Own sources	kl/annum	442 747 798	438 564 799	473 966 962	456 657 708	413 949 492	316 309 894	315 858 403	357 009 535	383 460 990	410 071 703	432 088 395
	Other sources	kl/annum	22 247 154	22 165 392	23 927 010	23 442 805	19 368 946	13 644 383	13 579 522	15 687 391	16 951 079	21 653 129	22 539 953
	Authorised Consumption	**kl/annum**	**390 413 736**	**387 545 144**	**412 184 315**	**399 692 547**	**353 462 763**	**286 957 418**	**273 792 791**	**310 015 037**	**324 960 726**	**327 140 077**	**338 472 397**
	Billed authorised	**kl/annum**	**371 470 695**	**363 504 527**	**388 392 616**	**375 550 485**	**332 186 791**	**266 072 254**	**251 409 918**	**287 474 273**	**301 071 326**	**316 673 284**	**327 938 793**
	Billed metered	kl/annum	370 823 926	362 870 547	387 765 553	374 712 387	331 220 135	265 104 392	250 443 832	286 519 293	299 961 688	301 121 542	312 155 618
	Domestic (and non-domestic)	kl/annum	259 313 932	318 607 454	337 861 618	329 043 506	294 100 802	237 877 504	224 336 397	256 090 905	268 142 392	213 584 289	221 110 860
	Non-domestic	kl/annum	78 475 446	11 689 856	12 139 673	12 112 296	10 640 615	8 462 670	7 716 559	7 633 398	7 326 551	58 797 599	61 848 758
	Export volume	kl/annum	33 034 548	32 573 237	37 764 262	33 556 585	26 478 719	18 764 217	18 390 876	22 794 991	24 492 745	28 739 654	29 196 000
	Billed unmetered	kl/annum	646 769	633 979	627 063	838 098	966 656	967 862	966 086	954 980	1 109 638	15 551 742	15 783 175
	Unbilled authorised	**kl/annum**	**18 943 041**	**24 040 617**	**23 791 698**	**24 142 062**	**21 275 972**	**20 885 164**	**22 382 873**	**22 540 763**	**23 889 400**	**10 466 793**	**10 533 603**
	Unbilled metered	kl/annum	15 938 136	14 378 853	14 112 167	14 445 174	11 582 262	11 236 946	12 670 307	12 460 104	13 296 009	3 311 392	3 416 213
	Unbilled unmetered	kl/annum	3 004 905	9 661 764	9 679 532	9 696 888	9 693 710	9 648 218	9 712 567	10 080 659	10 593 391	7 155 401	7 117 391
	Water Losses	**kl/annum**	**74 581 216**	**73 185 048**	**85 709 657**	**80 407 966**	**79 855 675**	**42 996 859**	**55 645 133**	**62 681 890**	**75 451 343**	**104 584 755**	**116 155 952**
	Commercial / Apparent losses	**kl/annum**	**13 057 583**	**13 544 994**	**15 863 032**	**14 881 802**	**14 779 585**	**7 957 803**	**10 298 729**	**11 601 083**	**13 964 437**	**18 010 366**	**20 003 023**
	Physical / Real losses	**kl/annum**	**61 523 634**	**59 640 054**	**69 846 625**	**65 526 164**	**65 076 090**	**35 039 056**	**45 346 404**	**51 080 807**	**61 486 906**	**86 574 388**	**96 152 929**
	UARL	**kl/annum**	**21 268 339**	**22 724 165**	**22 918 885**	**23 603 815**	**24 561 125**	**25 275 656**	**26 286 206**	**26 925 639**	**27 570 655**	**25 467 046**	**25 164 923**
	Potential real loss saving	**kl/annum**	**40 255 295**	**36 915 889**	**46 927 740**	**41 922 349**	**40 514 965**	**9 763 400**	**19 060 198**	**24 155 168**	**33 916 252**	**61 107 342**	**70 988 006**
	Revenue water	**kl/annum**	**371 470 695**	**363 504 527**	**388 392 616**	**375 550 485**	**332 186 791**	**266 072 254**	**251 409 918**	**287 474 273**	**301 071 326**	**316 673 284**	**327 938 793**
	Non-Revenue water	**kl/annum**	**93 524 257**	**97 225 665**	**109 501 356**	**104 550 028**	**101 131 647**	**63 882 023**	**78 028 007**	**85 222 654**	**99 340 743**	**115 051 548**	**126 689 555**
	Projected SIV without WDM	kl/annum	542 685 254	566 857 989	586 038 713	605 898 366	625 798 946	643 982 672	662 166 398	680 350 124	698 533 849	716 717 575	737 258 671
	Projected SIV with WDM	kl/annum	508 799 436	518 082 715	533 231 622	544 292 254	555 536 056	566 838 377	578 140 698	589 443 018	600 745 339	612 047 660	632 588 756
	Source of information												
	Comments												

IWA Water Balance Diagram (million m^3/annum) for **Jun-23 (select year)**



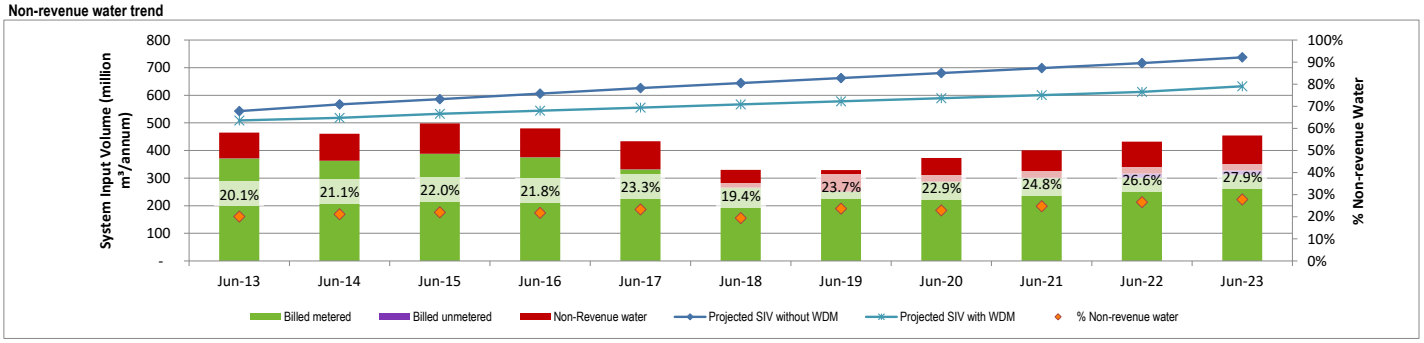
Note : All underlined values have been calculated using trends and / or averages based on previous years.

Municipal IWA Water Balance Information

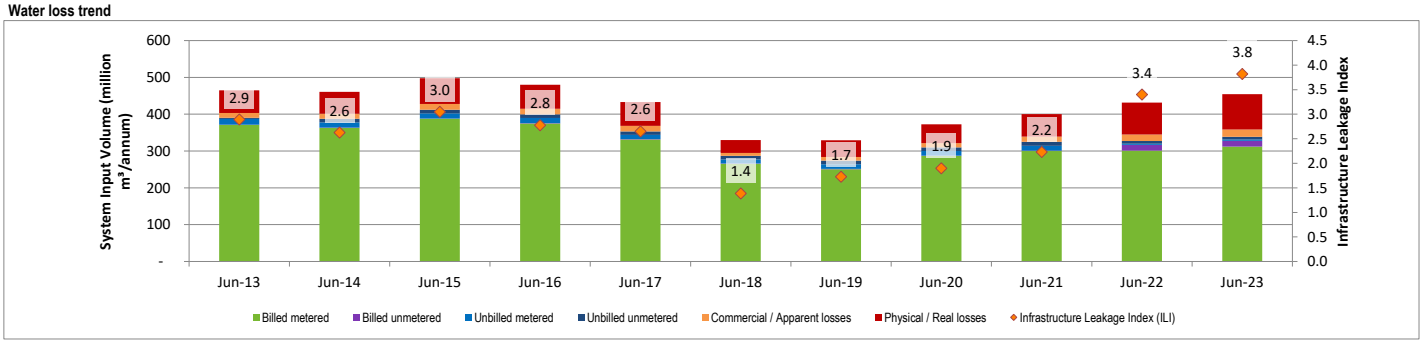
water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

	Year ending	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Key performance indicators	Indicator as % of system input volume											
	% Revenue water	79.9%	78.9%	78.0%	78.2%	76.7%	80.6%	76.3%	77.1%	75.2%	73.4%	72.1%
	% Non-revenue water	20.1%	21.1%	22.0%	21.8%	23.3%	19.4%	23.7%	22.9%	24.8%	26.6%	27.9%
	% Water Losses	16.0%	15.9%	17.2%	16.7%	18.4%	13.0%	16.9%	16.8%	18.8%	24.2%	25.5%
	System input volume unit consumption											
	Litres / capita / day	207	201	211	204	180	134	129	143	152	156	162
	m³ / household / month	22	21	22	20	18	14	13	15	15	16	16
	m³ / connection / month	33	32	34	32	28	21	20	23	24	26	28
	Authorised Unit Consumption											
	Litres / capita / day	171	167	172	168	145	115	106	118	121	115	118
	m³ / household / month	18	17	18	17	14	12	11	12	12	12	12
	m³ / connection / month	27	26	27	26	22	18	17	19	19	19	21
	Domestic (& ND) m³ / connection / month	21	25	26	25	22	18	16	18	19	16	16
	Non-domestic m³ / connection / month	156	21	135	134	117	94	82	85	77	90	95
	Water loss indicators											
	Litres / capita / day	36	34	39	37	35	18	23	26	30	40	44
	m³ / household / month	4	4	4	4	3	2	2	3	3	4	4
	m³ / connection / month	6	5	6	6	5	3	4	4	5	7	8
	UARL : Losses (litres / connection / day)	53	55	55	55	55	56	57	57	58	55	55
	CARL : Losses (litres / connection / day)	154	145	168	153	146	78	98	108	128	186	211
	Infrastructure Leakage Index (ILI)	2.9	2.6	3.0	2.8	2.6	1.4	1.7	1.9	2.2	3.4	3.8
	CARL : Losses (m³ / km mains / day)	8	7	9	8	8	4	5	6	7	10	11
	% Population growth	2.14%	2.14%	2.21%	0.06%	1.75%	3.21%	3.25%	2.45%	1.54%	2.83%	3.03%
	% Water demand growth	-1.68%	-0.92%	8.07%	-6.18%	-6.71%	-17.10%	-12.81%	6.28%	10.25%	7.63%	6.56%
	% Water demand growth without WDM	2.37%	4.45%	3.38%	1.67%	3.34%	3.09%	2.86%	2.78%	2.71%	2.64%	2.73%
	% Water demand growth with WDM	1.69%	1.82%	2.92%	1.03%	2.07%	2.05%	2.01%	1.97%	1.94%	1.90%	2.62%
	5 Year Annualised Population Growth	2.61%	2.83%	2.32%	1.36%	2.00%	1.78%	1.94%	2.02%	1.67%	1.86%	1.71%
	5 Year Annualised Water Growth	0.38%	-0.39%	1.33%	0.30%	-1.73%	-6.46%	-8.43%	-4.14%	-1.03%	6.54%	5.31%

Non-revenue water trend



Water loss trend



Population versus System Input Volume trend (litres / capita /day)