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Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Benchmarking of Water Loss, Water Use Efficiency and Non-Revenue Water in South African Municipalities (2004/05 to 2015/16)

PEP: WP11084(WP11047 - PEP4)



July 2017



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July 2017

Prepared by: Business Intelligence Support Team

Document control

PEP:	WP11084 (WP11047-PEP4): National WS Master Plan: Water Conceptual Design and Strategic Analysis Related to Feasibility/IRS/Non-Revenue and Other Related Study Categories
Title of document:	Benchmarking of Water Loss, Water Use Efficiency and Non-Revenue Water in South African Municipalities (2004/05 to 2015/16)
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Reviewer:	A Wensley
Report status:	Final
Date:	July 2017
Issued to:	A Wensley
Keywords:	Business Intelligence Support, NRW, Water losses, Efficiency, all municipalities

Version control

Version	Date	Comments
Final Draft	June 2017	
Final	July 2017	

Approval

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EXECUTIVE SUMMARY

INTRODUCTION

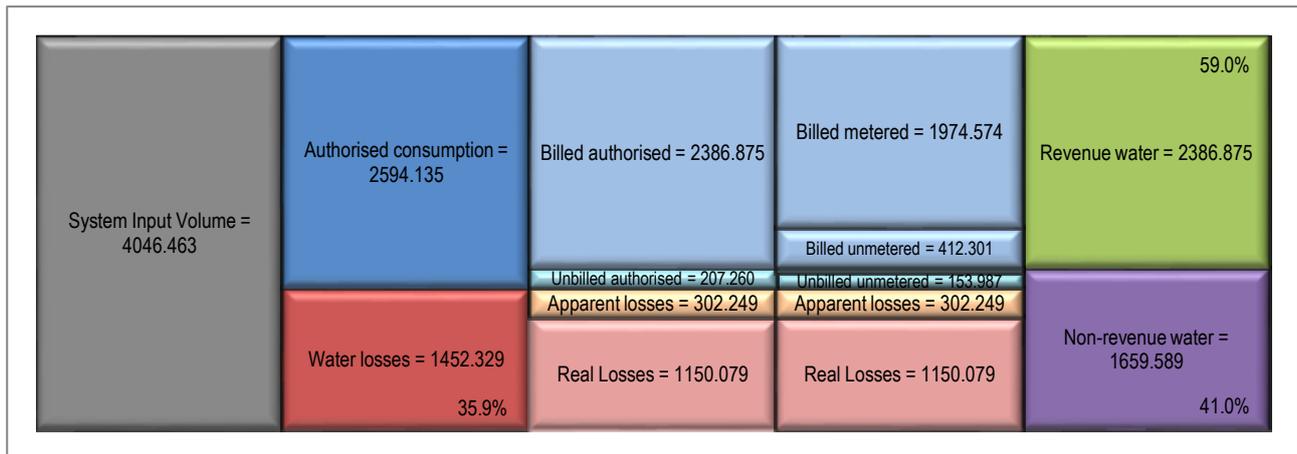
The “National Development Plan – Vision 2030” (NDP) and the Second Edition of the National Water Resource Strategy (NWRS2) state that reducing growth in water demand is just as important as increasing its supply. South Africa is a water-stressed country and is facing a number of water challenges and concerns, which include security of supply, environmental degradation and resource pollution, and the inefficient use of water. In light of the urgency to protect our water resources and the adverse effects of climate change, the NWRS2 submits that water conservation and water demand management (WCWDM) should be one of the top priorities, and measures to reconcile demand and supply in order to provide for the national goals of a better life for all through job creation and inclusive economic growth.

Progress made with the implementation of WCWDM can only be measured against an accurate baseline. The last comprehensive baseline assessment, of non-revenue water (NRW) and water losses in South Africa, was published in 2015 with the No Drop publication of *First Order Assessment of Water Loss, Water Use Efficiency and Non-Revenue Water in Municipalities* (DWS and SWPN, Oct 2015). The key objectives of this study were as follows:

- report on system input volume, non-revenue water, water loss and efficiency trends, based on 2004/05 to 2015/16 municipal financial year data
- calculate a 2015/16 water balance for each municipality where no better information exists
- disseminate non-revenue water / water loss benchmarking information in municipalities, government organisations and consumers throughout South Africa to create awareness.

RESULTS

The estimated 2015/16 water balance, for all municipalities, indicate water losses of 1414.49 million m³/a (35.9%) and NRW of 1632.93 million m³/a (41.0%). These figures are higher than the 2012/13 No Drop assessment of 27.6% water losses and 34.6% NRW. The 2013/14 No Drop assessment was based on 71 data sets, with an SIV of 2 997.6 million m³/a. The increased water losses and NRW are attributed to the improved estimate of water losses and NRW in category B3 and B4 (rural) municipalities.

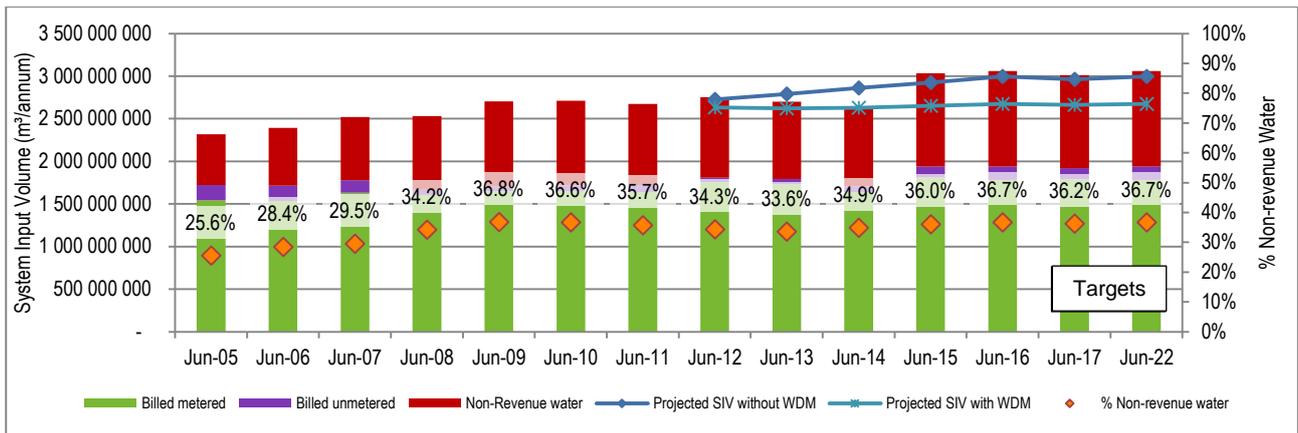


The estimated national water balance for 2015 /16, broken down per province is summarised in the table below. The highest and lowest figure for each key performance indicator are highlighted in red and green respectively.

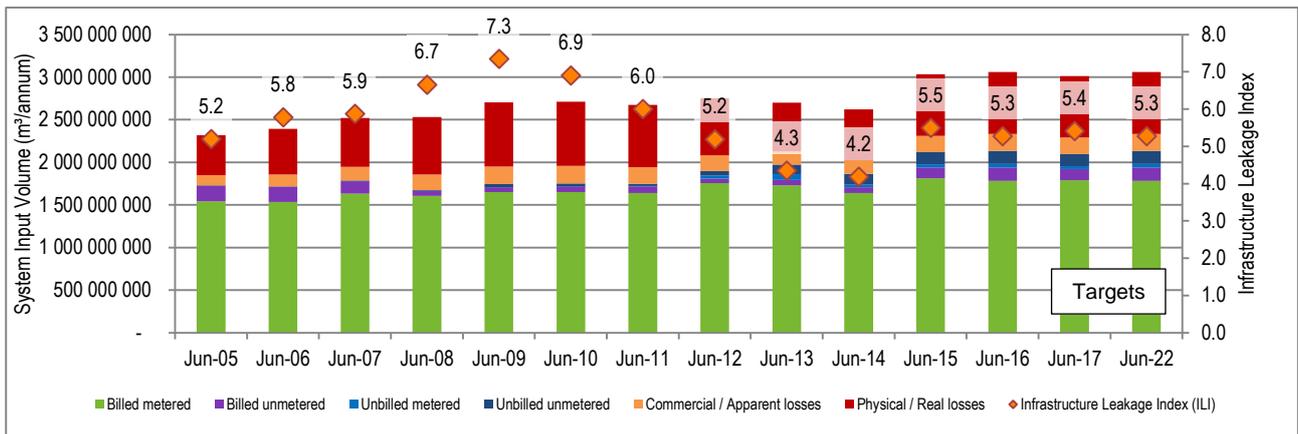
Province	Population	SIV (m ³ /annum)	NRW (m ³ /annum)	% NRW	% WL	l/c/d	ILI
EC	4 477 918	332 151 376	158 647 165	47.8%	45.0%	200	4.8
FS	2 723 028	207 835 805	106 908 574	51.4%	46.6%	209	4.8
GT	12 978 281	1 473 100 700	528 839 540	35.9%	27.4%	305	5.8
LIM	4 225 967	281 235 907	155 016 679	55.1%	55.1%	182	1.3
KZN	8 491 508	697 751 184	327 444 107	46.9%	43.0%	225	6.2
NW	3 039 995	206 496 825	105 577 898	51.1%	51.1%	186	4.7
NC	1 085 944	94 205 305	45 418 308	48.2%	45.5%	238	7.1
WC	6 108 993	482 695 411	102 720 237	21.3%	16.7%	201	2.4
MP	3 622 506	270 990 713	129 852 490	47.9%	43.9%	205	4.3
National	46 754 140	4 046 463 225	1 659 588 711	41.0%	35.9%	233	5.3

Gauteng is the largest water user in the country, and with KwaZulu-Natal and Western Cape, account for 66% of the total demand. Gauteng and KwaZulu-Natal account for 52% of the NRW by volume. Limpopo has the highest percentage NRW and water losses but these figures are contradicted by a low litres / capita / day (l/c/d) and infrastructure leakage Index (ILI). This needs further investigation. Western Cape is the overall best performing province. Gauteng has the highest per capita consumption due to the high number of wet industries in the supply area.

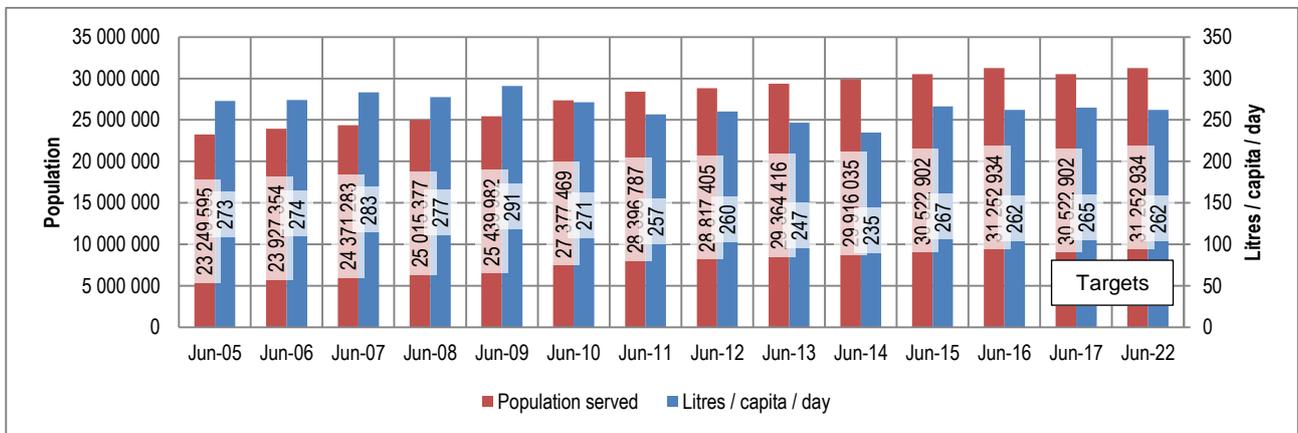
To obtain an understanding of the water loss trends in the country, the water balance information for 107 municipalities, which submit information on a regular basis, was analysed. The system input volume for the 107 municipalities has been consistently increasing since 2006 and the NRW has been increasing since 2013. Water losses seemed to improve until 2014 but have subsequently deteriorated again to 2012 levels. The municipalities have been tracking the projected water demand without WCWDM and they are unlikely to achieve their 2017 targets.



The figure above shows that NRW has increased in the past two years but is influenced, in some areas, by the imposed water restrictions. NRW tends to increase as the SIV reduces. More municipalities are also indicating some of their water losses as unbilled unmetered consumption. This shift emphasises the extent of leakage on private properties and the need for metering and billing systems, mechanisms to control consumer demand, the War-on-Leaks programme and consumer education and awareness.



The figure below shows that the per capita consumption has remained constant over the past 5 years, which is commendable, but WCWDM efforts must be elevated considering these figures are significantly above international benchmarks of approximately 180 l/c/d and the country is one of the 30 driest in the world.



CONCLUSION

The **Eastern Cape** municipalities have not achieved their 2016 targets and have been tracking the projected water demand without WCWDM. Municipalities in the Eastern Cape are unlikely to achieve their 2017 targets. The estimated 2015/16 water balance, for all municipalities in the Eastern Cape, indicates water losses of 149.61 million m³/a (45.0%) and NRW of 158.65 million m³/a (47.8%). The water balance has a low confidence due to the limited number of data sets and is highly influenced by the Nelson Mandela Bay and Buffalo City metros, which account for 55% of the total demand.

In the **Free State**, Mangaung has been enforcing water restrictions since July 2015 and it exceeded its June 2016 target by 12.2 million m³/a or 16%. Only Mangaung submits information on a regular basis and leakage levels fluctuate considerably. It is difficult to assess if any progress is being made with the reduction of NRW and water losses. The estimated 2015/16 water balance, for all municipalities in the Free State, indicates water losses of 96.91 million m³/a (46.6%) and NRW of 106.91 million m³/a (51.4%). The water balance has a low confidence due to the limited number of data sets. WCWDM must be implemented as a matter of priority to sustain current trends and considering that water restrictions have already been imposed in several Free State municipalities. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input volume, NRW, water losses and efficiency.

Gauteng has been unable to reduce their demand in the past 9 years, although water use efficiency seems to have been improving in the past 5 years. The estimated 2015/16 water balance, for all municipalities in Gauteng, indicates water losses of 404.07 million m³/a (27.4%) and NRW of 528.84 million m³/a (35.9%). NRW and water loss levels have come down, which is commendable, but WCWDM implementation levels must be elevated to ensure the targets of the Greater Vaal reconciliation strategy are achieved. There is significant scope for improvement in the reduction of system input volume, NRW, water losses and efficiency. Data accuracy and reporting are excellent at metro-level but can improve for some of the smaller municipalities.

KwaZulu Natal has managed to maintain their system input, leakage levels and per capita consumption in the past 5 to 6 years. The estimated 2015/16 water balance, for all KwaZulu-Natal municipalities, indicates water losses of 299.80 million m³/a (43.0%) and NRW of 327.44 million m³/a (46.9%). There is however, significant scope for improvement in the reduction of system input, NRW and water losses in the province and WCWDM implementation levels must be elevated to ensure the targets of the KZN Metropolitan areas reconciliation strategy are achieved, especially with the looming / imposed water restrictions in the province. Data accuracy and reporting are excellent at metro and secondary city level but there is significant scope for improvement in reporting levels and data accuracy for the smaller municipalities.

The **Limpopo** province has been unable to reduce their demand in the past 9 years and water use efficiency is at an all-time high of 209 ℓ/c/d. The estimated 2015/16 water balance, for all municipalities in Limpopo, indicates water losses and NRW of 155.02 million m³/a (55.1%). The water balance has a low confidence due to the limited number of data sets. Leakage levels and NRW are also consistently increasing and WCWDM must be implemented as a matter of priority. There is significant scope for improvement in reporting levels, data accuracy and reduction of system input volume, NRW, water losses and efficiency.

The **Mpumalanga** province has been unable to reduce their demand in the past 8 years with some signs of improvement in 2013, although this requires further investigation. The estimated 2015/16

water balance, for all North West municipalities, indicates water losses and NRW of 105.58 million m³/a (51.1%). The water balance has a low confidence level due to the low number of data sets. NRW and water losses have reduced slightly over the past 8 years despite a significant increase in the system input volume and WCWDM must be implemented as a matter of priority. There is significant scope for improvement in reporting levels, data accuracy and reduction of system input volume, NRW, water losses and efficiency.

The **North West** province has been unable to reduce their demand in the past 9 years, except for 2011, and shows significant growth in the past 2 years. The estimated 2015/16 water balance, for all North West municipalities, indicates water losses and NRW of 105.58 million m³/a (51.1%). NRW have reduced slightly in the past year but water losses are consistently increasing. WCWDM must be implemented as a matter of priority. There is significant scope for improvement in reporting levels, data accuracy and reduction of system input volume, NRW, water losses and efficiency.

Northern Cape has managed to maintain their system input, NRW and per capita consumption in the past 5 to 6 years. The estimated 2015/16 water balance for all Northern Cape municipalities indicates water losses of 42.0 million m³/a (44.6%) and NRW of 44.5 million m³/a (47.3%). The water balance has a medium confidence level and is highly influenced by //Khara Hais (Upington) and Sol Plaatjie (Kimberley) which accounts for approximately 67% of the demand. Increased efforts are required by municipalities to implement WCWDM to ensure targets are achieved and water restrictions are mitigated in the driest province. There is significant scope for improvement in reporting levels, data accuracy, reduction of system input, NRW and water losses in the province.

The **Western Cape** has been doing well to maintain their system input volume for the past 3 to 4 years, while reducing their water losses and per capita consumption. The 2015/16 water balance for the 20 data sets, indicates water losses of 80.48 million m³/a (16.7%) and NRW of 102.7 million m³/a (21.3%). Municipalities must continue their current trends and increase their efforts to implement WCWDM.

Nationally, the system input volume has been consistently increasing since 2006 but the NRW has been improving since 2011 and water losses since 2009. The estimated 2015/16 water balance, for all municipalities, indicate water losses of 1462.01 million m³/a (36.1%) and NRW of 1659.59 million m³/a (41.0%). Per capita consumption has remained almost constant over the past 9 years, which is commendable, but WCWDM efforts must be elevated considering these figures are significantly above international benchmarks of approximately 180 l/c/d and the country is one of the 30 driest in the world. The reduction in NRW is encouraging but the figures are highly influenced by the metros that have made considerable progress to reduce their non-revenue water while there is significant scope for improvement in most of the other municipalities. The reduction in water losses is mainly due to the shift of water losses to unbilled consumption in the water balance.

Only continuous monitoring and analyses will provide a credible benchmark against which the progress made with the implementation of WCWDM may be measured. WCWDM must be implemented as a matter of urgency in all provinces, especially with the looming and reported droughts in the country. There is significant scope for improvement in reporting levels, data accuracy and reduction of system input, NRW, water losses and improved efficiency across the country.

RECOMMENDATIONS

The following recommendations are suggested to address the progress made with the implementation of WCWDM in the eight large water distribution systems.

- Maintenance of the reconciliation strategies must continue and be used to monitor the progress made in the implementation of WCWDM. Municipalities must actively participate and report at these meetings and use the outcomes to prioritise resources and budgets.
- Municipalities should increase their efforts to achieve the targets set under the various water reconciliation strategies to ensure water security. Targets need to be reviewed and reported on a regular basis.
- 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 and actively participate, budget through the Integrated Development Plans (IDP) process and implement the results from the reconciliation strategies.
- Budgets are allocated towards new infrastructure projects through ACIP, MWIG, RBIG, MIG, etc. funding programmes but the management of these funds is fragmented with emphasis on new infrastructure and insufficient focus on WCWDM.
- Ongoing monitoring and reporting of municipal NRW and water loss performance by DWS against determined targets and baselines is critical.
- 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 International Water Association's water balance should become the backbone of all water related management and decision support systems.
- Municipalities should increase their efforts to reduce NRW and the negative impact it has on their ability to generate own income and run a viable water business.
- Municipalities should, through on-going awareness programmes, encourage the consumer to appreciate the value of water and enforce the user pays principle.
- Municipalities should increase payment levels, encourage consumer fixing of leaks, and prosecution of illegal water connections and reduce theft of water.
- Municipal asset management needs to be improved to ensure greater sustainability of water supply services.
- There are close correlation between operations, maintenance, low water losses and NRW. Municipalities should implement proactive operations and maintenance programmes to coincide with WCWDM programmes.
- Closer involvement and collaboration with National Treasury and CoGTA is critical to ensure issues related to funding of WCWDM programmes, metering and billing issues are resolved with municipal finance departments.
- WCWDM should be included in the performance plans of organisations and senior executives to ensure execution and achievement of these plans.
- On-going provision of mentorship to municipalities through the DWS Regional Offices is critical.
- DWS Regional Offices / CMAs must upscale their skills and capacity to provide WCWDM support to municipalities, monitoring and reporting.

- Some Regional Offices appointed a PSP to provide support with the development of reporting templates, meeting with municipalities to confirm targets, analyse the water balance information and provide feedback. The reporting structures in these regions are well established and all municipalities are reporting on a quarterly basis. The initiative was supported by Regulations sending directives to municipalities who did not respond. A similar approach could be followed for all the other provinces to improve communications and water balance reporting.
- The Regulations Relating to Compulsory National Standards and Measures to Conserve Water (R509, 2001) state 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 their leaks. DWS should consider a policy whereby water services institutions are forced to either measure and control or fix leaks on private properties, but government cannot continue to fund new infrastructure projects to supplement leakage as a result of poor operations and maintenance. DWS is already encouraging the fixing of leaks through the War on Leaks programme.
- The national non-revenue water assessment completed in 2011 suggests that 45% of municipalities cannot provide basic information such as monthly consumption figures. One of the key challenges with gathering the information is the poor communication channels with municipalities which includes 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, various questionnaires, RPMS, Green drop, Blue drop etc. Government needs to revisit communication channels with municipalities. Communications should be more formal, avoid duplication and targeted at senior management in the organization. In this regard, the circulars provided by National Treasury provide clear guidelines to municipalities and communications are only with the mayor, municipal manager and CFO.
- The results from the No Drop audit must be used to motivate for funding in the next financial year. The No Drop incentive-based regulation programme should be rolled-out as planned in conjunction with the other Drop programmes to elevate WCWDM in the municipal environment. DWS should also enforce its regulatory mandate to penalise municipalities that do not comply.
- Closer involvement and collaboration with CoGTA and SALGA is critical to address issues relating to human resources' skills and capacity in municipalities, as well as resolving payment for services and unauthorised water use.
- Closer collaboration is required with other national, provincial and local departments that are big water users. These include Departments of Education, Correctional Services, Public Works and Housing to ensure leakages and wastage are brought under control.
- The recommendations of the Second Edition of the National Water Resource Strategy (DWA, June 2013), which calls for greater emphasis on meeting specific targets to reduce water loss, must be implemented. WCWDM measures will have multiple benefits in terms of the postponement of infrastructure augmentation, mitigation against climate change, support to economic growth and ensuring that adequate water is available for equitable allocation.
- The recommendations of South Africa's National Development Plan (Vision for 2030)(NPC, 2013), which calls for clear national and local targets to be achieved by 2017 and 2022, must be implemented.

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Appendix A : Municipal water balance scorecards	

ACRONYMS

CARL	Current Annual Real Losses
DWS	Department of Water and Sanitation
IDP	Integrated Development Plan
ILI	Infrastructure Leakage Index
IWA	International Water Association
KPI	Key Performance Indicator
NDP	National Development Plan – Vision for 2030 (2011)
NRW	Non-Revenue Water
NWRS2	National Water Resource Strategy 2 (2013)
SIV	System Input Volume
UARL	Unavoidable Annual Real Losses
WCWDM	Water Conservation Water Demand Management
WSA	Water Services Authority
WSP	Water Services Provider

1 INTRODUCTION

1.1 BACKGROUND

The “National Development Plan – Vision for 2030” (NDP) states that reducing growth in water demand is just as important as increasing its supply. The NDP assumes it is possible to achieve an average reduction in water demand of 15% below baseline levels (“business as usual levels”) in urban areas by 2030. Detailed targets have been set for different areas through the Reconciliation Strategies and the All-Town Studies. The NDP also calls for a dedicated national water conservation and water demand management (WCWDM) programme by 2012, with clear national and local targets for 2017 and 2022.

The Second Edition of the National Water Resource Strategy (NWRS2) builds on the first National Water Resource Strategy (NWRS1) published in 2004. The purpose of the NWRS2 is to ensure that national water resources are protected, used, developed, conserved, managed and controlled in an efficient and sustainable manner. The NWRS2 acknowledges that South Africa is a water-stressed country and is facing a number of water challenges and concerns, which include security of supply, environmental degradation and resource pollution, and the inefficient use of water. In light of the urgency to protect our water resources and the adverse effects of climate change, the NWRS2 submits that WCWDM should be one of the top priorities, and measures to reconcile demand and supply in order to provide for the national goals of a better life for all through job creation and economic growth.

Progress made with the implementation of WCWDM can only be measured against an accurate baseline. The last comprehensive baseline assessment, of non-revenue water (NRW) and water losses in South Africa, was published in 2015 with the No Drop publication of First order assessment of water loss, water use efficiency and non-revenue water in municipalities (DWS and SWPN, Oct 2015). The first order No Drop assessment was undertaken in 2014 as part of the 2014 Blue Drop Assessment and focussed on all municipalities in South Africa. The No Drop component focussed on three (3) key performance areas, namely water balance, strategy and planning, and performance and compliance. The report was based on 2013/14 data and key outcomes included:

- A total of 4 712 677 (87.6%) of all connections were metered and 669 936 (12.4%) were unmetered
- In total, 30% of the water supply systems obtained >50% No Drop score, with the balance of 70% attaining <50%. An overall National No Drop Score of 56.5% was achieved, which falls within the No Drop category of “Average Performance”. Water Services Authorities (WSA) need to achieve above 90% to achieve No Drop certification
- Up to 51% of the 152 water services authorities had proper or partial WCWDM Strategies and Plans in place, and were busy with some form of implementation in the field. Coupled with 38% to 40% of WSAs having proper or partial Water Balances in place, and a savings potential of R 3 billion/annum, this makes a strong case to focus on improvement in the quality of planning and the intensity and acceleration of implementation. Of concern was that 62% of WSAs did not have WCWDM contained within their Integrated Development Plans (IDP).
- The national water balance for the 2012/13 audit year showed a total System Input Volume (SIV) of 2 997.58 million kl/annum of which 2 168.97 million kl/a (72.4%) was authorised consumption and 828.61 million kl/a (27.6%) was water losses. The water losses was made

up of 165.32 million kl/a (20%) apparent losses and 663.29 million kl/a (80%) real losses, which result in a NRW of 1 038.05 million kl/annum (34.6%).

- A total volume of 1 038.05 million kl/annum was lost as NRW which, calculated at a unit cost of R 6 / kl, amounted to R 6,228 million per annum for the country as a whole. By implementing WCWDM projects, a potential saving of 331.65 million kl/annum could be achieved, which translates to R1 989.9 million per year.

Reporting by all municipalities is therefore very important as it facilitates transparency, awareness, provides management information for decision support systems and provides warning mechanisms for councils, officials, business, industry, residents and Department of Water and Sanitation (DWS) to monitor water security, improve municipal performance and improve efficiency among consumers.

1.2 OBJECTIVES

The key objectives of this study were as follows:

- Report on SIV, NRW, water loss and efficiency trends, based on 2004/05 to 2015/16 municipal financial year data
- Calculate a 2015/16 water balance for each municipality where no better information exists
- Disseminate NRW / water loss benchmarking information in municipalities, government organisations and consumers throughout South Africa to create awareness.

1.3 IWA WATER BALANCE

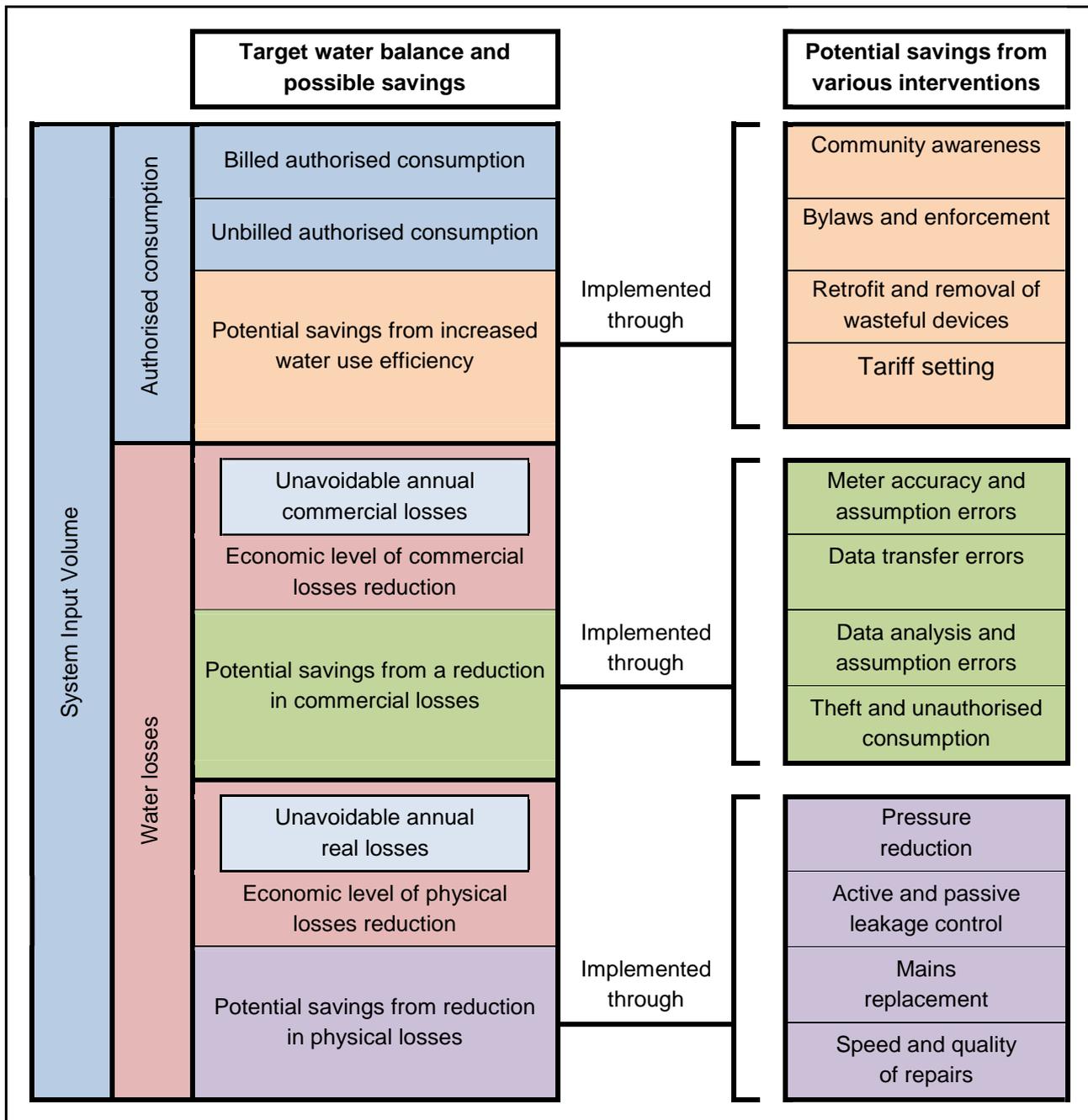
The modified International Water Association (IWA) water balance was accepted as the standard reporting format for NRW and water losses in South Africa in the late 1990s. The IWA water balance is now generally accepted throughout most countries in the world as the most standard, robust and comprehensive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

System Input Volume	Authorised Consumption	Billed Authorised Consumption	Billed Metered Consumption	Free basic Revenue Water		
		Unbilled Authorised Consumption	Billed Unmetered Consumption	Non Revenue Water		
Water Losses	Apparent Losses	Real Losses	Unbilled Metered Consumption			
			Unbilled Unmetered Consumption			
	Real Losses	Real Losses	Unauthorised Consumption			
			Customer Meter Inaccuracies			
			Leakage on Transmission and Distribution Mains			
			Leakage and Overflows at Storage Tanks			
		Leakage on Service Connections up to point of Customer Meter				

Modified IWA water balance

- *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, allowing for all known errors (i.e. errors on bulk water meters) as well as any water imported from other sources, also 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* is the sum of the physical and commercial losses and is calculated as the difference between the SIV and the authorised consumption. In most countries, water losses are also considered to be unaccounted for water (UFW) although the exact definition of UFW can vary from country to country;
- *billed authorised consumption* is effectively the 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* are made up from the unauthorised consumption (theft or illegal use), plus all technical and administrative inaccuracies associated with customer metering. If commercial losses are reduced, generally more revenue will be 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. In most cases, real losses represent the unknown component in the overall water balance. The purpose of most water balance models is therefore to estimate the magnitude of real losses so that the water utility can gauge whether or not it has a serious leakage problem. Real losses are generally calculated as the difference between total losses and estimated commercial losses; and
- *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 key performance indicators (KPI) 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, 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 WCWDM intervention to address these losses. It is therefore important to obtain a clear understanding of what impact various WCWDM interventions would have to ensure that targets are achieved. Alignment of the IWA water balance against various WCWDM interventions is shown in the figure below.



1.4 WATER BALANCE SHEET

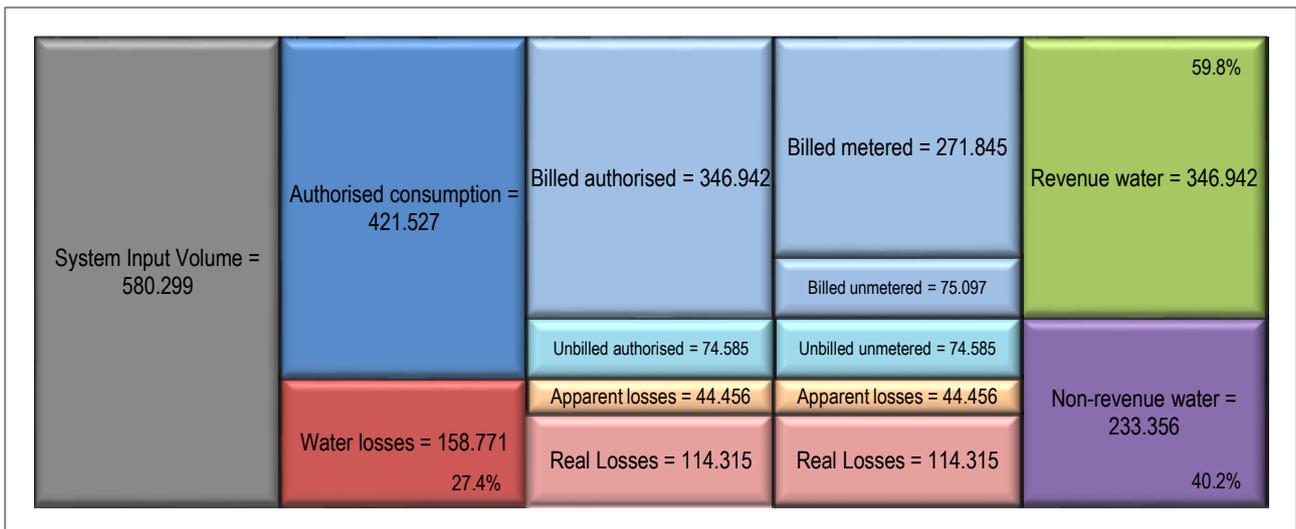
A two-page water balance sheet is included in **Appendix A** for each municipality. Cognisance should be taken of the following:

- All information was provided by the respective municipalities or Water Services Authority unless otherwise indicated
- The water balance sheet is divided into four sections to ease the capturing and display of information. The four sections include input data, water balance calculations, key performance indicators and graphics

- White cells require an input value, while yellow cells are calculated. The municipality is required to provide only 15 values per annum to complete the sheet. The 15 values are split between basic information, such as the population served, and the water balance information. The basic information is used to calculate key performance indicators. The water balance component follows the format of the IWA water balance
- All volumes are in kℓ/annum ($k\ell = m^3 = 1000$ litres) and based on the municipal financial year (July to June). Data for “Year ending - Jun-05” therefore means water supply and demand figures from July 2004 to June 2005
- All underlined values were calculated using trends and / or averages based on previous years
- The last two columns indicate the 2017 and 2022 targets in line with the NDP requirements. The targets were obtained from the relevant reconciliation and all town strategies, unless otherwise indicated
- Targets could not be obtained for all municipalities and were therefore only included for selected municipalities where sufficient information was available. The analysis, evaluation, interpretation and monitoring on the progress made with the implementation of WCWDM in each province are therefore based on limited data sets
- The provincial and district water balances are based on the sum of the municipalities located within the province or district
- The municipalities listed are in accordance with the boundary reform at the time of the municipal election of 3 August 2016.

Example IWA Water Balance Diagram (million m³/annum)

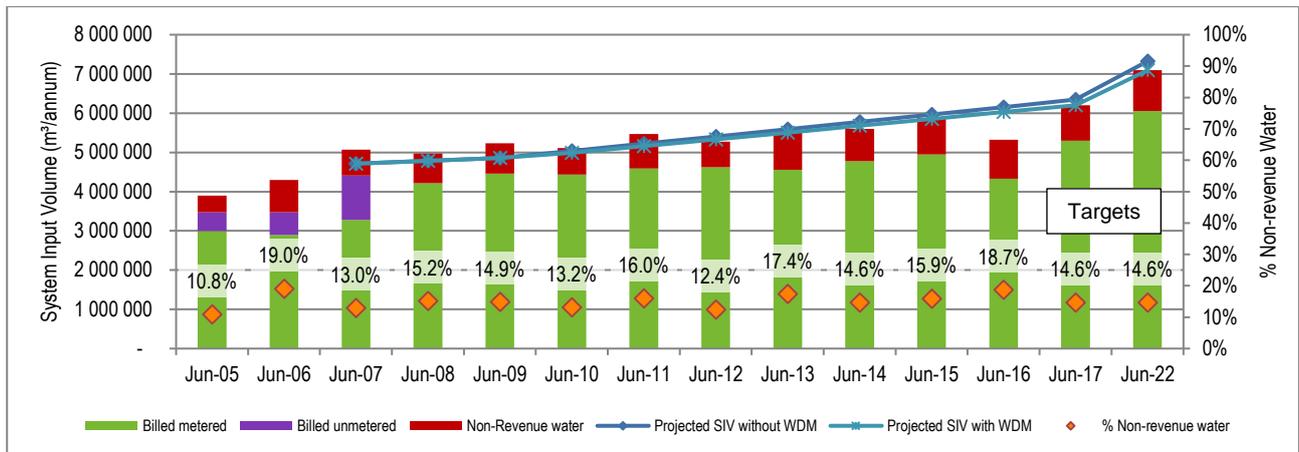
A typical 2015/16 IWA water balance, with percentages for water losses, revenue and non-revenue water, is shown for each municipality and province as shown in the example below:-



Example NRW trend

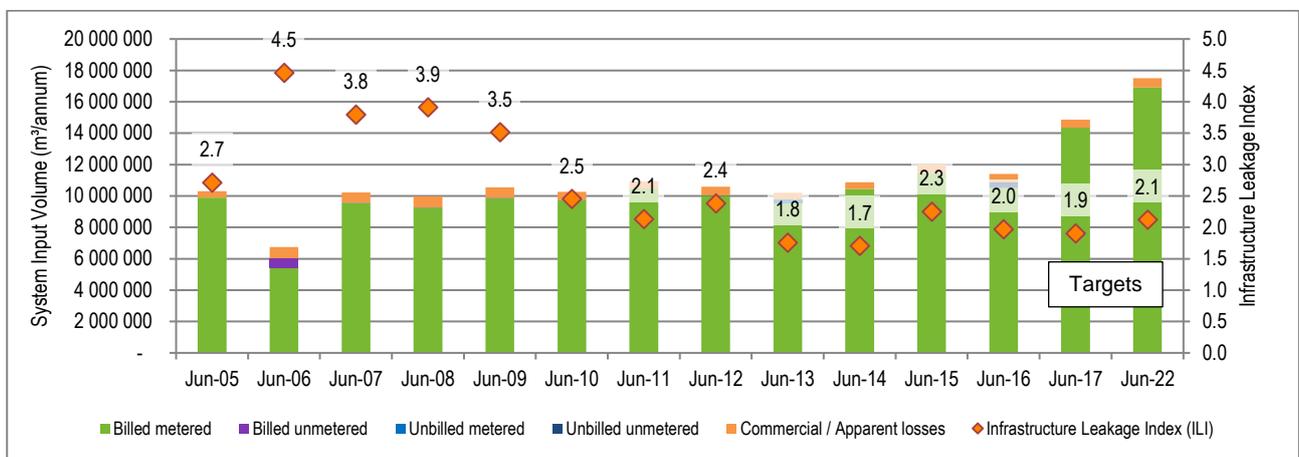
NRW consists of all unbilled authorised consumption and water losses. The example NRW trend graph below shows the increase or decrease in volume and percentage NRW. It also shows the projected demand with and without WCWDM as included in the DWS reconciliation or all town

strategies, unless otherwise indicated. The 2017 and 2022 targets were obtained from the reconciliation or all town strategies should be achieved to meet the objectives of the NDP.



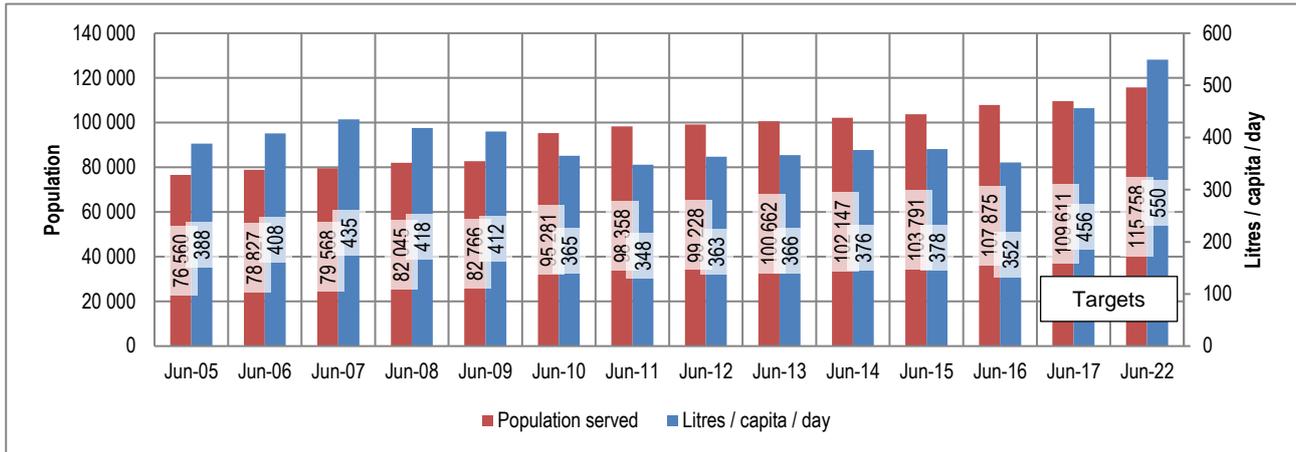
Example water losses trend

Water losses consist of apparent or commercial losses and real or physical losses and typically includes all losses on the municipal side (up to the consumer meter) of the reticulation system. Some municipalities do however, include internal plumbing losses as part of their water losses, although this should be indicated as unbilled authorised consumption. The water losses trend graph therefore indicates the increase or decrease in volume, apparent or commercial losses and real or physical losses. The Infrastructure Leakage Index (ILI) which is an indication of the physical leakage is shown on the right-hand axis. The 2017 and 2022 targets were obtained from the municipality or estimated based on historical and current performance.



Example population versus System Input Volume trend (litres / capita / day)

The per capita consumption (litres / capita / day) is based on the system input volume divided by the population served. The system input volume includes commercial and industrial demand. The 2017 and 2022 targets are based on the projected water demand and population figures.



1.5 MUNICIPAL CATEGORISATION

The data was categorised according to the Municipal Infrastructure Investment Framework (MIIF) and per province. The MIIF categorisation is as follows:

Category	May 2011	Aug 2016	Short description	Long Description
A	8	8	Metros	Metropolitan municipalities
B1	19	19	Major cities	Secondary cities, local municipalities with the largest budgets
B2	27	25	Minor cities	Municipalities with a large town as core
B3	110	100	Rural dense	Municipalities with relatively small population and significant proportion of urban population but with no large town as core
B4	70	61	Rural scattered	Municipalities which are mainly rural with, at most, one or two small towns in their area
Total	234	213		

1.6 2015/16 SAMPLE SIZE

The number of available data sets compared to the 2011/12 DWS study, 3% No Drop (DWS, 2015) study and *The State of non-revenue water in South Africa* (WRC, 2012) are shown in the following table. It is clear from the table that the submission of data by municipalities is deteriorating and a matter of concern. The data sets provided in this report were sourced through the DWS Regional offices and very few municipalities were contacted directly. The submission of data is especially poor in the Eastern Cape, Free State, North West, Limpopo and Mpumalanga. Most municipalities in Gauteng, KwaZulu-Natal and the Western Cape and about 50% to 70% in Northern Cape are submitting data on a regular basis.

Category	State of NRW in SA (2009/10)	DWS (2011/12)	3% No Drop (2012/13)	2015/16
A	8	8	8	8
B1	18	17	15	15
B2	26	21	15	15
B3	55	56	49	43
B4	25	20	14	26
Total	132	122	101	107
Total municipalities	234	234	234	213
Sample size	56%	52%	43%	50%

1.7 2015/16 ESTIMATED WATER BALANCE

All previous benchmarking reports calculated the national water balance based on an extrapolated sample size. The national water balance is highly influenced by the metro and secondary city data, which has high confidence level while data for the category B3 and B4 municipalities have a low confidence and are poorly represented in the sample size. The extrapolated results provided NRW figures between 35 to 40% depending on the methodology followed. To make a proper assessment of the state of water losses in each province, a water balance was estimated for each municipality where no information was available. The water balance was calculated as follows and calibrated if necessary based on available information.

Municipal category	Average l/c/d consumption above RDP	Average l/c/d consumption below RDP	Red Book design figure (Table 9.11)	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	100	25	Yard connections = 50 to 100 l/c/d Standpipe = 10 to 50	10%

The water balance components were calculated as follows:

- System input volume = Average consumption x population served
 - The population served were obtained from the 2016 StatsSA Community Survey
- Free Basic Water (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 2016 StatsSA Community Survey and Division of Revenue Bill (2016/17 to 2018/19)
- The average consumption and billing efficiency were obtained from the table above
- $NRW = SIV - FBW - \text{billed consumption}$

In most cases, close correlation were obtained between historical data and the calculated value. For larger municipalities and municipalities supplied from bulk service providers the average consumption tended to be higher than expected. These communities are often supplied from large water supply schemes at a higher level of development.

The tables below show the distribution of National Treasury's 2016 equitable share per municipal category and province. An indigent household is defined as a household with an income of less than R 2300 per month.

Category	Number of households	Number of indigent households	% Indigent	Free basic water allocation (m ³ /annum)	System Input volume (m ³ /annum)	% billed consumption
A	6 560 289	3 287 219	50%	236 679 789	2 204 322 416	11%
B1	2 301 265	1 263 093	55%	90 942 678	714 128 992	13%
B2	1 235 172	726 120	59%	52 280 637	278 917 501	19%
B3	1 988 542	1 268 049	64%	91 299 461	428 026 024	21%
B4	3 132 593	2 342 651	75%	168 670 823	421 068 293	40%
Total	15 217 861	8 887 132	58%	639 873 388	4 046 463 225	16%

The results indicate that almost 9 million households or 58% are considered indigent and the municipality receive equitable share on a monthly basis from National Treasury for the provision of free basic water of 6 kl/month. Free basic water is billed at a zero rate and forms part of the authorised billed metered or unmetered consumption in the IWA water balance. The free basic water allocation in the category B4 municipalities is significant and means that on average the NRW cannot be more than 60%. Limpopo has the highest percentage indigent households in the country.

Province	Number of households	Number of indigent households (<R 2300 pm)	% Indigent	Free basic water allocation (m ³ /annum)	System Input volume (m ³ /annum)	% billed consumption
EC	1 733 805	1 187 761	69%	85 518 788	332 151 376	26%
FS	845 236	523 800	62%	37 713 618	207 835 805	18%
GT	4 183 543	2 091 387	50%	150 579 894	1 473 100 700	10%
KZN	2 638 912	1 659 922	63%	119 514 360	697 751 184	17%
LP	1 488 967	1 052 087	71%	75 750 240	281 235 907	27%
MP	1 147 059	705 259	61%	50 778 622	270 990 713	19%
NC	315 069	177 888	56%	12 807 951	94 205 305	14%
NW	1 138 712	704 370	62%	50 714 638	206 496 825	25%
WC	1 746 785	798 324	46%	57 479 307	482 695 411	12%
Total	15 238 087	8 900 799	58%	640 857 418	4 046 463 225	16%

2 LITERATURE REVIEW

2.1 INTRODUCTION

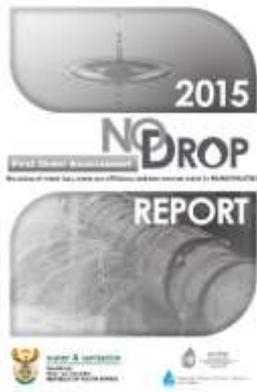
Various previous assessments of NRW have been undertaken in South Africa since the standard IWA methodology was introduced in the late 1990s. The following main reports provide the background to the latest assessment:

- 2002 – Development of a simple and pragmatic approach to benchmark real losses in potable water distribution systems in South Africa. WRC Report TT 159/01 by Mckenzie and Lambert.
- 2005 – Benchmarking of Leakage from Water Reticulation Systems in South Africa. WRC Report TT 244/05 by Mckenzie and Seago.
- 2007 – Non-Revenue Water in South Africa. WRC Report TT 300/07 by Seago and Mckenzie.
- 2012 – The State of Non-revenue Water in South Africa (2012). WRC Report TT by Mckenzie, Sigalaba and Wegelin.
- 2013 - Metropolitan Municipality Non-Revenue / Water Loss Assessment by DWA Water Services Directorate: Planning and Information - Business Intelligence Team.
- 2013 – Secondary City Non-Revenue / Water Loss Assessment by DWA Water Services Directorate: Planning and Information - Business Intelligence Team.
- 2014 – National Non-Revenue / Water Loss Assessment by DWA Water Services Directorate: Planning and Information - Business Intelligence Team.
- 2014 - A 2011/12 Assessment of Non-Revenue and Water Losses in South Africa by DWA Water Services Directorate: Planning and Information - Business Intelligence Team.
- 2015 - No Drop Report - First order assessment of water loss, water use efficiency and non-revenue water in municipalities, DWS and SWPN, Oct 2015.
- 2015 No Drop Report - The status of water loss, water use efficiency and non-revenue water in metropolitan municipalities, DWS and SWPN, Oct 2015.
- 2015 No Drop Report - Benchmarking of Water Loss, Water Use Efficiency and Non-Revenue Water in South African Municipalities (2004/05 to 2012/13), DWS and SWPN, Oct 2015.

These assessments provided updated and more reliable information on municipal water use than the previous estimates, and in each case, the available database was expanded to include additional municipalities which had not previously provided any useful information.

Key results from the latest three studies are summarised in the following section while the remaining studies are available from the Water Research Commission (WRC) or the Department of Water and Sanitation (DWS).

2.2 NO DROP 2015 NATIONAL FIRST ORDER ASSESSMENT



The purpose of this study was to provide an overview of the status of municipalities as pertaining to their water losses, non-revenue water and water use efficiency, based on the 2012/13 financial year. The assessment is fully documented in the 2015 report entitled **“2015 No Drop Report - First order assessment of water loss, water use efficiency and non-revenue water in municipalities, DWS and SWPN, Oct 2015”**.

Based on verified evidence and data sets, the No Drop audit concluded that all 152 water services authorities participated in the No Drop assessment. Data sets were received for 71 water services authorities, representing a total population of 32 580 710 and 9 043 534 households which is approximately 62% of the country's total population. These

households are supplied via a total mains network of 121 449 km and 5 382 613 connections, with an average of 44 connections per km pipeline. A total of 4 712 677 (87.6%) of all connections are metered and 669 936 (12.4%) are unmetered. The average system pressure is 45 m, ranging between 52 m and 36 m reported by the various municipalities.

A total of 949 water supply systems have been assessed. In total, 30% of the water supply systems obtained >50% No Drop score, with the balance of 70% attaining <50%. An overall National No Drop Score of 56.5% was achieved, which falls within the No Drop category of 'Average Performance'. This (weighted) national score bodes well for the future of WCWDM in the country, given that it is a first time assessment and steep learning curve for the municipalities. The higher score is positively influenced by the good scores obtained by the metropolitan municipalities and some of the municipalities with larger capacity systems.

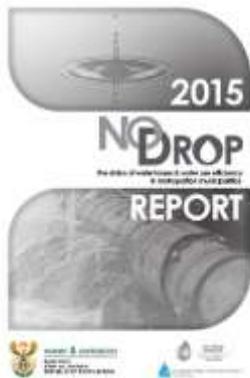
Up to 51% of the 152 water services authorities have proper or partial WCWDM Strategies and Plans in place, and are busy with some form of implementation in the field. Coupled with 38% to 40% of WSAs having proper or partial Water Balances in place, and a savings potential of R 3 billion/annum, this makes a strong case to focus on improvement in the quality of planning and the intensity and acceleration of implementation. Of concern is that 62% of WSAs do not have WCWDM contained within their IDPs. This is a fundamental requirement to ensure that projects are rolled out in the field. Regulatory letters to Mayors and Municipal Managers, annexed to their No Drop results, will serve to rectify this omission.

The National Water Balance for the 2012/13 audit year shows a total SIV 2 997.58 million kl/annum of which 2 168.97 million kl/a (72.4%) is Authorised Consumption and 828.61 million kl/a (27.6%) is Water Losses. The Water Losses is made up of 165.32 million kl/a (20%) apparent Losses and 663.29 million kl/a (80%) real losses, which result in a NRW of 1 038.05 million kl/annum (34.6%).

A total volume of 1 038.05 million kl/annum is lost as NRW which, calculated at a unit cost of R 6 / kl, amounts to R 6,228 million per annum for the country as a whole. By implementing WCWDM projects, a potential saving of 331.65 million kl/annum can be achieved, which translates to R1 989.9 million per year. Savings in excess of R 3 billion can be projected if all 152 water services authorities' water balances are considered. The potential savings that can be realised by investing in WCWDM in Category A and B1 municipalities is 84% of the national savings potential.

Water use efficiency is typically one of the key performance indicators and reported at national government level. The average water use efficiency is 237 ℓ /c/d and 234 ℓ /c/d for the Provinces and the WSA Categories, respectively. The reported efficiencies are significantly above the international benchmark of 180 ℓ /c/d and municipalities must continue to plan for improvement towards an average consumption of below 200 ℓ /c/d.

2.3 NO DROP 2015 FULL METRO ASSESSMENT



This report is the first full No Drop audit of metropolitan municipalities. The assessment is fully documented in the 2015 report entitled **“2015 No Drop Report - The status of water loss, water use efficiency and non-revenue water in metropolitan municipalities, DWS and SWPN, Oct 2015”**.

All metros have strategies and business plans to address the NRW, water losses and efficiency. Significant progress has been made with the implementation of these strategies and business plans, but there is still a lack of political support, budgets, alignment to the Department’s reconciliation strategies and understanding of the possible consequences of water restriction. The targets set under the various reconciliation

strategies are included in the NDP and NWRS2 and it is critical that these targets are achieved to avoid possible water restriction and the subsequent detrimental economic impact. All metros must revise their strategies and business plans to ensure targets are achieved and the risk of water restrictions is minimised.

Asset management has a direct impact on WCWDM. Without proper operation and maintenance, it will not be possible to monitor the water losses in a distribution system and perform basic functions such as metering, billing and cost recovery. All metros could improve the operations and maintenance of their assets, which have a direct impact on water loss control.

No water services authority would be able to implement WCWDM without the necessary staff capacity and skills. Most WCWDM activities and preventative maintenance could be performed as part of the daily operation and maintenance of the system. Staff capacity and skills obtained the second lowest score of all the criteria and should be addressed as a matter of priority. A standard must be developed to specify the skills and capacity required to operate and maintain a water distribution system.

The information used to prepare a monthly water balance is, in general, credible, plausible and readily available. Proper management, reading and billing of consumer meters cannot happen if there is not a good relationship between the finance and technical departments. The finance and technical departments in all metros should interact on a daily basis to ensure consumer meters are properly installed, repaired, inspected, read and billed. All metros should strive to meter and bill, based on actual meter readings, to ensure the financial sustainability of the metro and customer satisfaction.

Key performance indicators and compliance with the water demand management regulations contributed most to the overall score. Metros should endeavour to fix all leaks within 48 hours of becoming aware thereof, improve water losses, NRW and efficiency and implement pressure

management. Improved compliance and performance will significantly improve the overall score of all metros. The large number of unmetered connections and deemed (flat rate) consumers must be addressed as a matter of priority to promote water use efficiency and generate income for the metros. The results indicate that average system pressures are high and there is scope for aggressive pressure reduction in all metros. Pressure reduction is a cost effective WCWDM measure and should be implemented as a priority.

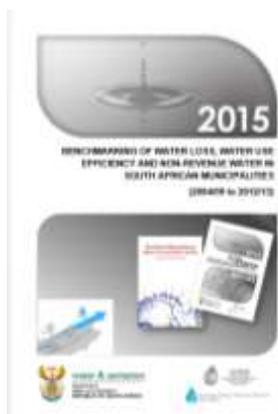
All metros have the necessary policies and bylaws, but enforcement could be improved through political support and additional human resources. Metros will receive the benefit through reduced water theft, consumer awareness and equality.

There is significant scope for increased community awareness in all metros. Consumers need to be made aware that South Africa is a water scarce country and the value of water should be appreciated. Community awareness programmes will improve the relationship between the metro and its customers, create more informed consumers and reduce the risk of service delivery unrest.

Metros could benefit from WCWDM programmes through improved service delivery, sustainable resources, financial viability, social and economic improvement. The key WCWDM interventions identified by the metros, include pressure management, top consumer audits, household leak repair programmes, metering of unmetered properties and water reuse, have been proven to provide a very good return on investment, with payback periods of less than 3 years.

Metros require approximately R 2 billion per annum to fund their WCWDM programmes and currently have a shortfall of R 500 million. A 10% reduction in SIV and reducing NRW to 25% can generate approximately R 2 billion additional income for metros, through reduced water purchases and increased water sales. There is a business case for obtaining funding from financial institutions, as the estimated savings are equivalent to the average annual budget required for WCWDM.

2.4 NO DROP 2015 BENCHMARKING REPORT



This report is an update of the first comprehensive baseline assessment, of NRW and water losses in South Africa, which was made in 2012 with the publication of the *The State of Non-revenue water in South Africa (2012)* (WRC, Report TT522/12). The assessment is fully documented in the 2015 report entitled “**Benchmarking of Water Loss, Water Use Efficiency and Non-Revenue Water in South African Municipalities (2004/05 to 2012/13), DWS and SWPN, Oct 2015**”

The **Eastern Cape** has managed to maintain leakage levels and per capita consumption in the past 5 years but, especially with the looming drought situation, there is significant scope for improvement in reporting levels, data accuracy and a reduction of NRW and water losses.

The **Free State** has been unable to reduce their demand in the past 9 years and water use efficiency is at an all-time high of 270 l/c/d. Leakage levels fluctuate considerably and it is difficult to assess if any progress is being made with the reduction of NRW and water losses. WCWDM must be implemented as a matter of priority, considering that water restrictions have already been imposed in Mangaung metro. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input volume, NRW, water losses and efficiency.

Gauteng has been unable to reduce their demand in the past 9 years, although water use efficiency seems to have been improving in the past 5 years. NRW and water loss levels have come down, which is commendable, but WCWDM implementation levels must be elevated to ensure the targets of the Greater Vaal reconciliation strategy are achieved. There is significant scope for improvement in the reduction of system input volume, NRW, water losses and efficiency. Data accuracy and reporting are excellent at metro-level but can improve for some of the smaller municipalities.

KwaZulu Natal has managed to maintain their system input, leakage levels and per capita consumption in the past 5 to 6 years. There is however, significant scope for improvement in the reduction of system input, NRW and water losses in the province and WCWDM implementation levels must be elevated to ensure the targets of the KZN Metropolitan areas reconciliation strategy are achieved, especially with the looming / imposed water restrictions in the province. Data accuracy and reporting are excellent at metro and secondary city level but there is significant scope for improvement in reporting levels and data accuracy for the smaller municipalities.

The **Limpopo** province has been unable to reduce their demand in the past 9 years and water use efficiency is at an all-time high of 205 l/c/d. Leakage levels and NRW are also consistently increasing and WCWDM must be implemented as a matter of priority. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input volume, NRW, water losses and efficiency.

The **Mpumalanga** province has been unable to reduce their demand in the past 8 years with some signs of improvement in 2013, although this requires further investigation. NRW and water losses have reduced slightly over the past 8 years despite a significant increase in the system input volume and WCWDM must be implemented as a matter of priority. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input volume, NRW, water losses and efficiency.

The **North West** province has been unable to reduce their demand in the past 9 years and have shown significant growth in the past 2 years. NRW have reduced slightly in the past year but water losses are consistently increasing. WCWDM must be implemented as a matter of priority. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input volume, NRW, water losses and efficiency.

Northern Cape has managed to maintain their system input, NRW and per capita consumption in the past 5 to 6 years. Increased efforts are required by municipalities to implement WCWDM to ensure targets are achieved and water restrictions are mitigated in the driest province. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input, NRW and water losses in the province.

Municipalities in the **Western Cape** have been doing well to maintain their system input volume for the past 3 to 4 years, while reducing their water losses and per capita consumption. Municipalities must continue their current trends and increase their efforts to implement WCWDM.

Nationally, the system input volume has been consistently increasing since 2006 but the NRW has been improving since 2011 and water losses since 2009. Per capita consumption has remained almost constant over the past 9 years, which is commendable, but WCWDM efforts must be elevated considering these figures are significantly above international benchmarks of approximately 180 l/c/d and the country is one of the 30 driest in the world.

The reduction in non-revenue water is encouraging but the figures are highly influenced by the metros that have made considerable progress to reduce their non-revenue water while there is significant scope for improvement in most of the other municipalities. The reduction in water losses is mainly due to the shift of water losses to unbilled consumption in the water balance. This shift emphasises the extent of leakage on private properties and the need for metering and billing systems, mechanisms to control consumer demand, the War-on-Leaks programme and consumer education and awareness.

Only continuous monitoring and analyses will provide a credible benchmark against which the progress made with the implementation of WCWDM may be measured. WCWDM must be implemented as a matter of urgency in all provinces, especially with the looming and reported droughts in the country. There is significant scope for improvement in reporting levels, data accuracy and reduction of system input, NRW, water losses and improved efficiency across the country.

2.5 OTHER SOURCES OF INFORMATION



- **Population and households served** figures were obtained from the DWS National Water Services Knowledge System (<https://www.dwa.gov.za/wsksl/>). These figures are compiled by DWS, in close collaboration with StatsSA, and are used for all planning purposes, including the development of Water Services Development Plans. Any household with access to potable water, regardless of the level of service, is considered served. Municipalities should contact the Directorate Water Services Planning and Information if they disagree with any of the figures.
- **Number of metered and unmetered connections** was obtained from Census 2011 and Community Survey 2016, where all house and yard connections were considered metered. The balance between households served and metered connections were considered unmetered connections. Municipalities should update this information from their billing system. Close correlation between households served and number of connections is expected, except in some municipalities with a high number of townhouse developments, with single connection, or backyard dwellers.

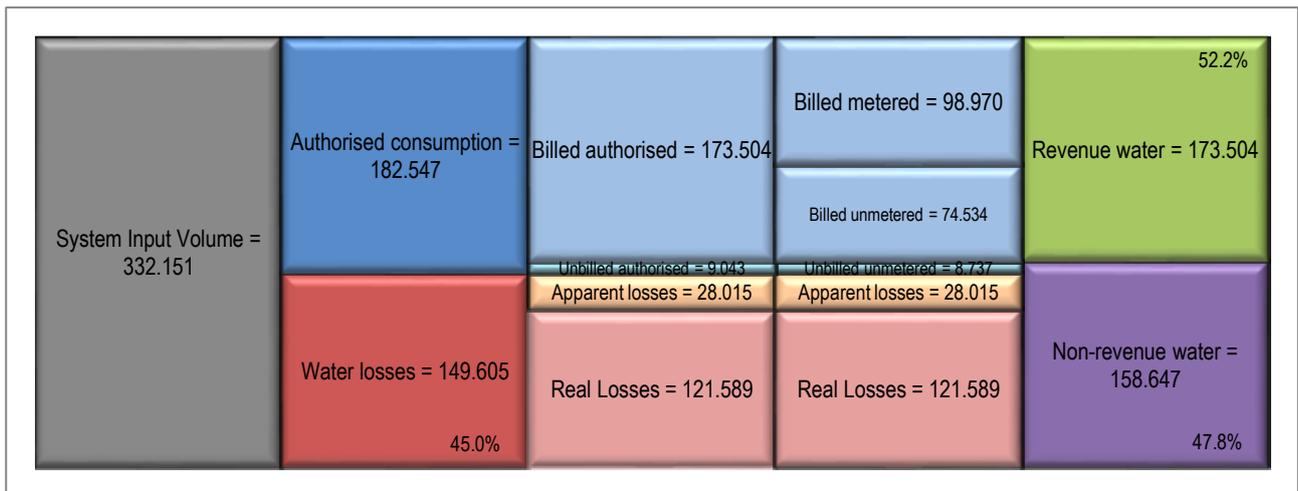
3 WATER BALANCE TRENDS

The water balance trends for the nine provinces and a national perspective are provided in the following sections. The water balance sheet for each municipality is included in **Appendix A**.

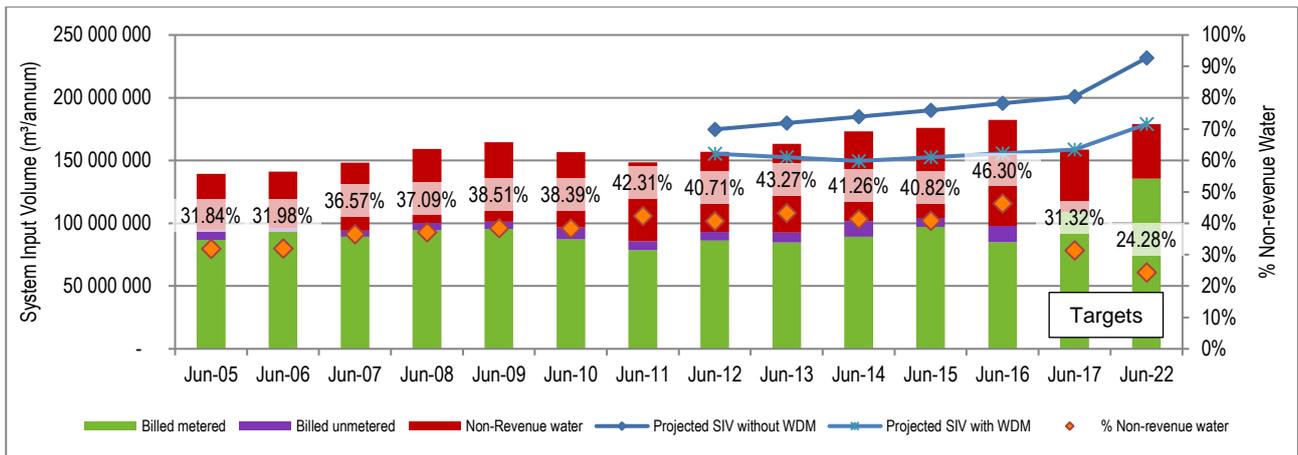
3.1 EASTERN CAPE PROVINCE

Reporting in the Eastern Cape has been very poor in recent years with only the Nelson Mandela Bay and Buffalo City metros submitting water balance information on a regular basis. The DWS regional office has no active WCWDM reporting and meeting programme in place.

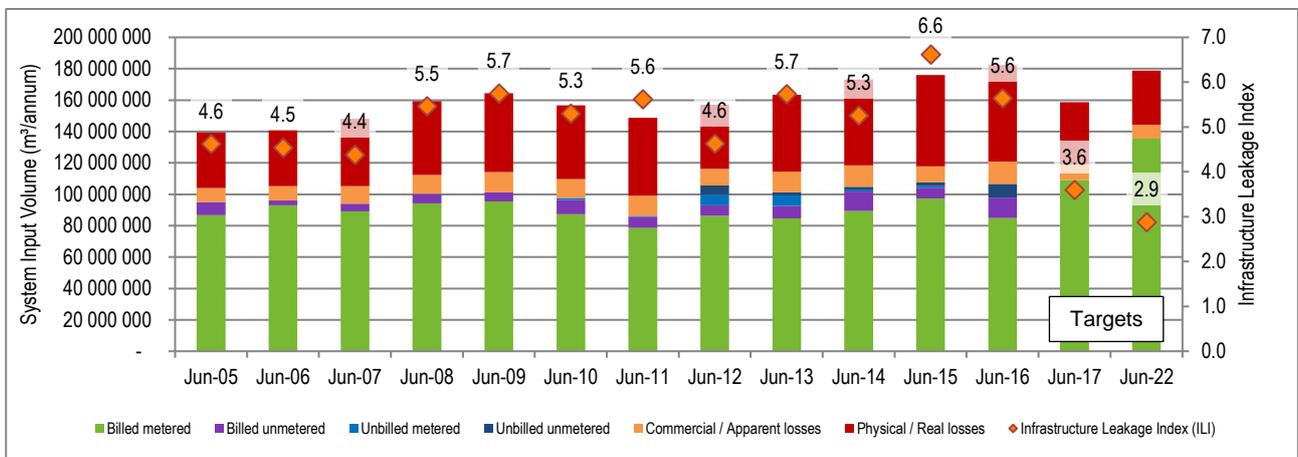
The estimated 2015/16 water balance, for all municipalities in the Eastern Cape, indicates water losses of 149.61 million m³/a (45.0%) and NRW of 158.65 million m³/a (47.8%). The water balance has a low confidence due to the limited number of data sets and is highly influenced by the Nelson Mandela Bay and Buffalo City metros, which account for 55% of the total demand. These figures are slightly higher than the 2012/13 No Drop assessment of 40.3% water losses and 44.5% NRW. The No Drop assessment was based on 19 data sets with a SIV of 219.75 million m³/a. The increase is due to the increased losses in the metros and the inclusion of all category B3 and B4 municipalities, which tend to have less budget and resources with subsequent higher losses and NRW.



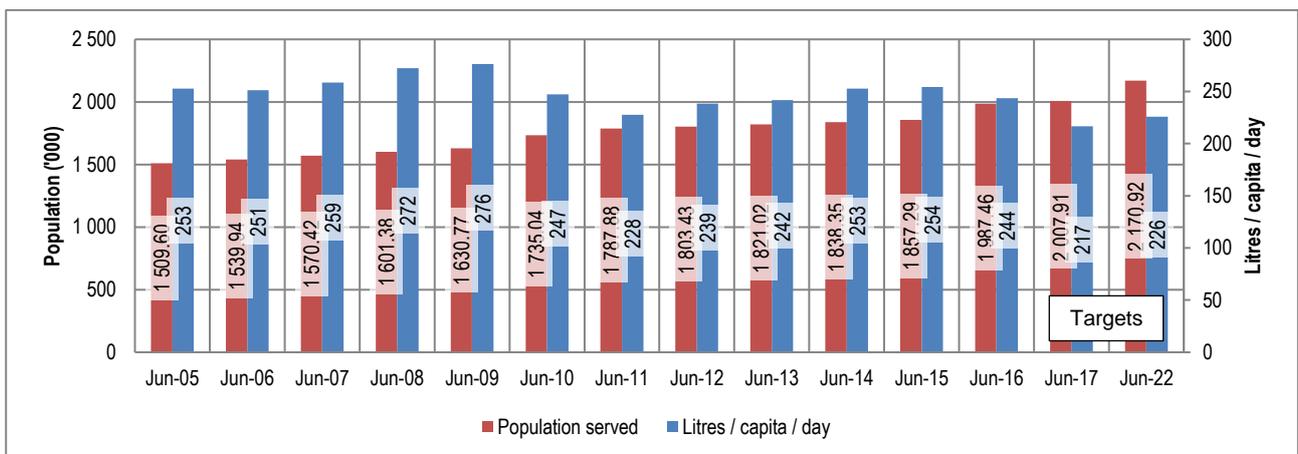
The water balance and trends for the Eastern Cape are based on the two plausible data sets of the metros of a possible 33 municipalities. NRW and water loss trends for the Eastern Cape metros show a gradual increase from 2011 until 2016. The drop in demand from 2009 to 2011 is mainly due to the water restrictions imposed in the Nelson Mandela Bay metro. Indications are that the system input volume is quickly returning to previous levels since the lifting of the drought restrictions. NRW has increased significantly in the past year but water losses have improved slightly. The results indicate that metros in the Eastern Cape have not achieved their 2016 targets and have been tracking the projected water demand without WCWDM. Municipalities in the Eastern Cape are unlikely to achieve their 2017 targets.



The ILI for the two metros reached an all-time high of 6.6 in June 2015. In 2016, the ILI reduced to 5.6 due to an increase in commercial losses and unbilled consumption and not reduced real losses.



Per capita consumption for the two metros increased from 2005 and peaked in 2009 at 276 l/c/d. Since 2010 the per capita consumption has averaged 246 l/c/d. The reduction in the per capita consumption from 2015 to 2016 is due to a correction in the population figures and not as a result of improved efficiency.

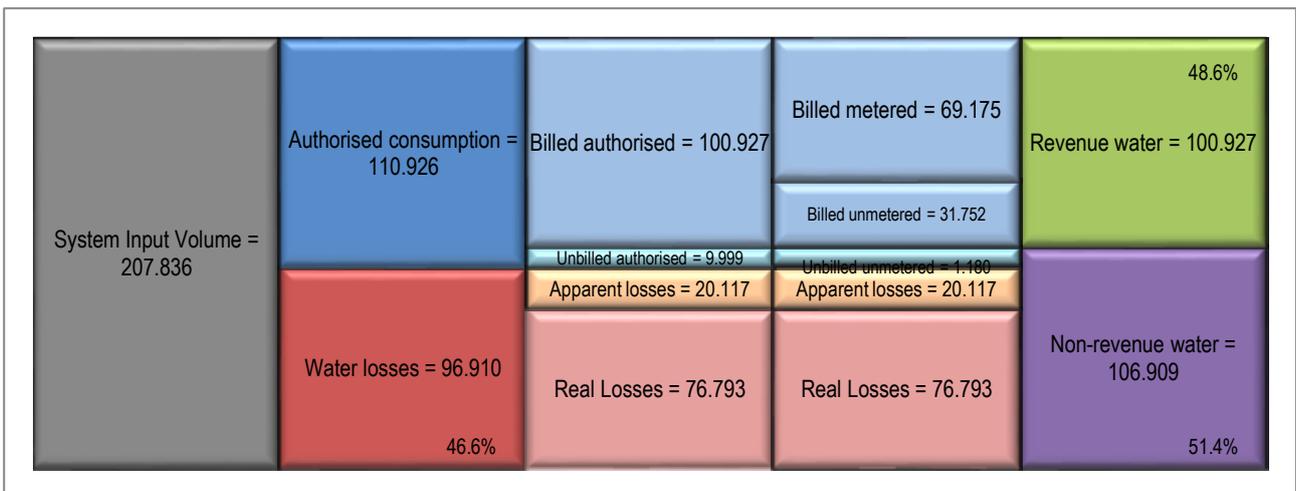


The Eastern Cape has managed to maintain leakage levels and per capita consumption in the past 7 years but, especially with the looming drought situation, there is significant scope for improvement in reporting levels, data accuracy and a reduction of SIV, NRW and water losses.

3.2 FREE STATE PROVINCE

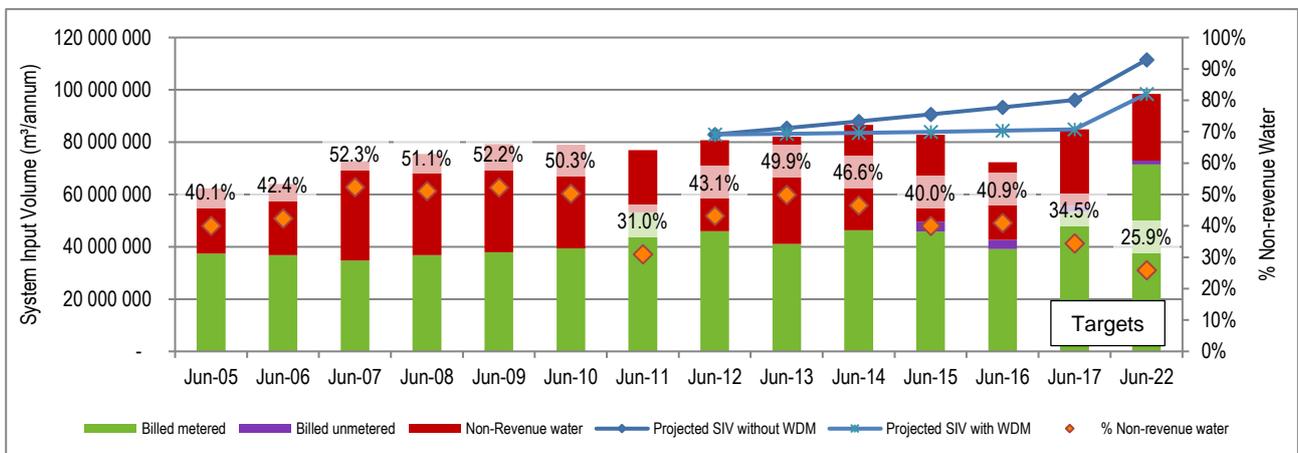
Reporting in the Free State has been very poor in recent years with only Mangaung metro submitting water balance information on a regular basis. The DWS regional office has no active WCWDM reporting and meeting programme in place.

The estimated 2015/16 water balance, for all municipalities in the Free State, indicates water losses of 96.91 million m³/a (46.6%) and NRW of 106.91 million m³/a (51.4%). The water balance has a low confidence due to the limited number of data sets. These figures are significantly higher than the 2012/13 No Drop assessment of 30.7% water losses and 36.5% NRW. The No Drop assessment was based on 11 data sets with a SIV of 204.15 million m³/a. The fluctuation is attributed to the poor quality of data for the province. The water balance information is highly influenced by the Mangaung metro and Matjhabeng municipality, which accounts for approximately 52% of the demand.



The water balance trend for the Free State is based on Mangaung metro as no other municipality is submitting water balance information on a regular basis.

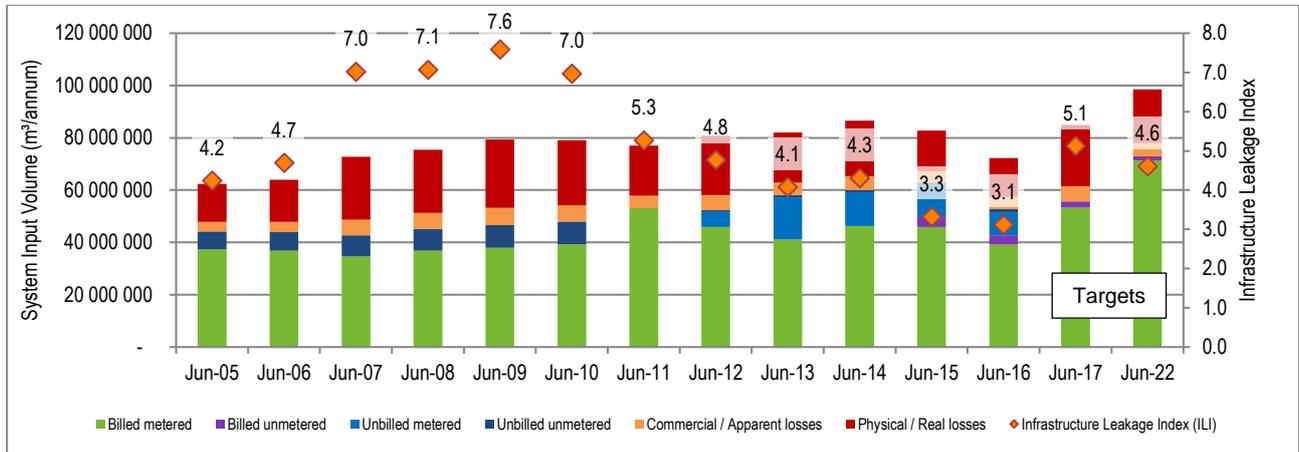
The SIV in Mangaung grew consistently from 2005 to 2014 with a slight improvement in 2011. SIV, NRW and water losses have improved since 2014, mainly as a result of the WCWDM interventions and 20% water restrictions undertaken in Mangaung municipality. The SIV, NRW and water losses are expected to return to previous levels once the water restrictions have been lifted.



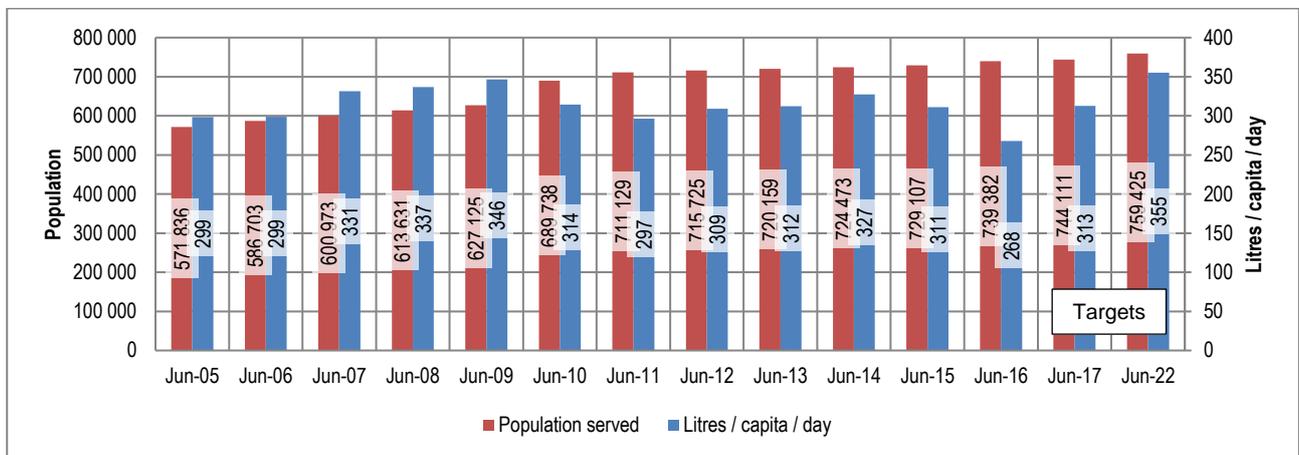
Mangaung has been enforcing water restrictions since July 2015 and it exceeded its June 2016

target by 12.2 million m³/a or 16%. The NRW of Mangaung remains above 40% for the past 10 years. Mangaung has been tracking the projected demand with WCWDM and will most likely achieve its 2017 target if water restrictions remain in place.

ILI for Mangaung has steadily been declining since 2009 and reached an all-time low of 3.1 in June 2016. The results are encouraging and should be sustained. The ILI for Mangaung is below the national average of 5.8.



Per capita consumption in Mangaung improved significantly in the past two years as a result of WCWDM interventions and 20% water restrictions but remains high compared to the national average of 233 litres per capita per day. Per capita consumption is an indication of water use efficiency and high consumption could be as a result of poor metering and billing systems and lack of awareness among consumers.

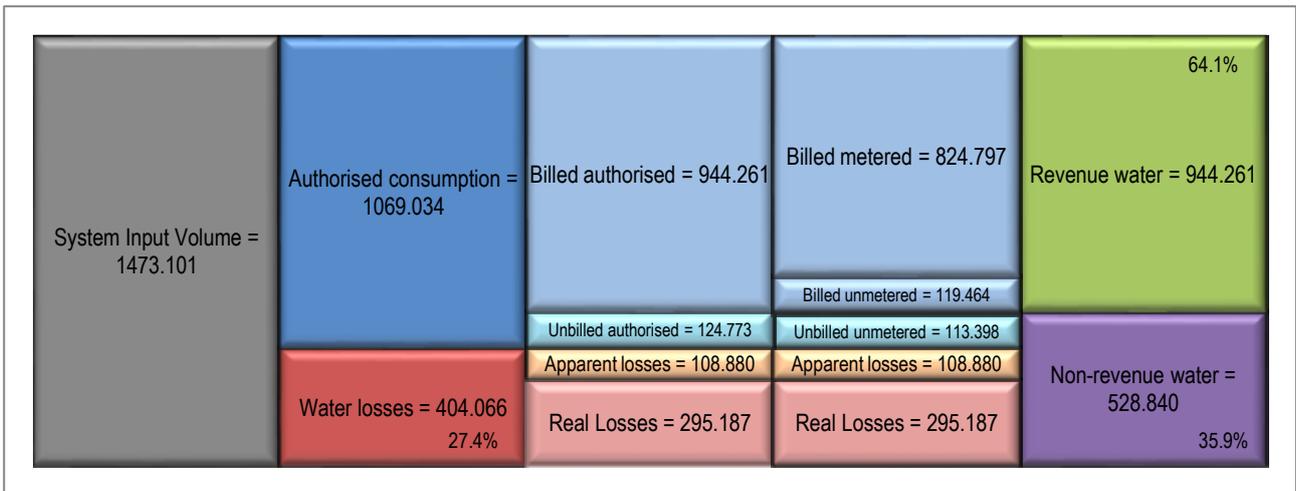


WCWDM must be implemented as a matter of priority to sustain current trends and considering that water restrictions have already been imposed in several Free State municipalities. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input volume, NRW, water losses and efficiency.

3.3 GAUTENG PROVINCE

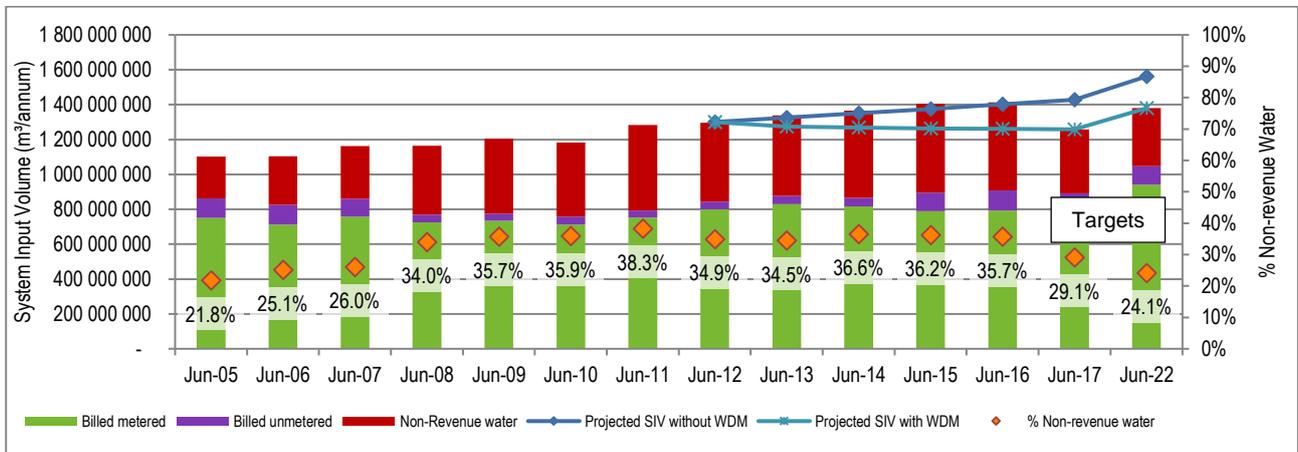
Reporting in the Gauteng has been good with most municipalities submitting water balance information on a regular basis. The DWS regional office has an active WCWDM reporting programme in place and is lauded for their efforts to implement active monitoring and reporting mechanisms..

The estimated 2015/16 water balance, for all municipalities in Gauteng, indicates water losses of 404.07 million m³/a (27.4%) and NRW of 528.84 million m³/a (35.9%). The water balance has a high confidence level and is highly influenced by City of Johannesburg, City of Tshwane, Ekurhuleni and Emfuleni, which account for 95% of the demand. These figures are slightly higher than the 2012/13 No Drop assessment of 25.8% water losses and 34.5% NRW. The No Drop assessment was based on 6 data sets with a SIV of 1337.54 million m³/a.

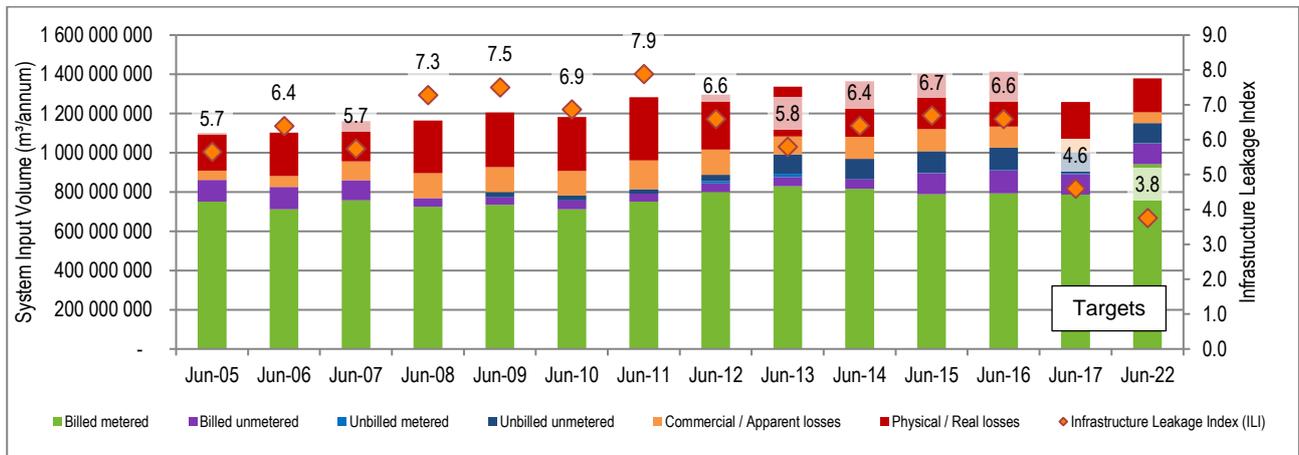


The water balance trends for the Gauteng are based on 6 (60%) plausible data sets of a possible 10 municipalities. The municipalities include City of Johannesburg, Ekurhuleni, City of Tshwane, Emfuleni, Lesedi and Midvaal municipalities, which accounts for approximately 96% of the demand.

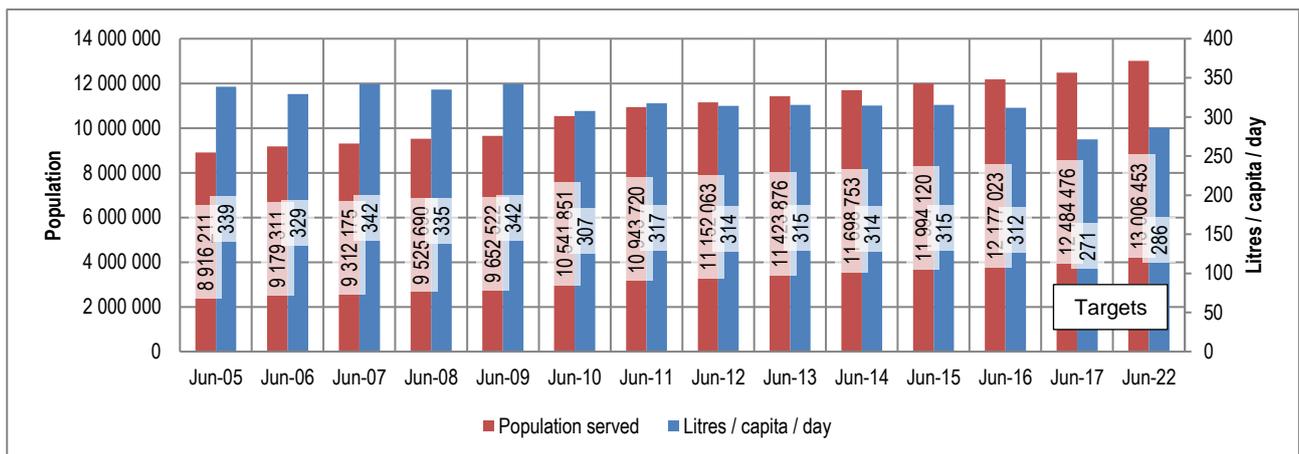
NRW and water losses have remained stable for the past 5 years but SIV has been consistently increasing. Municipalities in Gauteng have been tracking the high population no WCWDM projection and it is unlikely that the 2017 target will be achieved. There is a noticeable increase in the unbilled consumption, which was previously included in the water loss component of the water balance.



Water losses have remained almost constant in the past 5 years with signs of improvement in 2013 but have subsequently returned to 2012 levels of 6.6 in 2016. The ILI for the six municipalities is above the national average of 5.8.



Per capita consumption has effectively remained constant over the past 6 years. The per capita consumption is based on the total system input volume and include industrial and commercial use. Ekurhuleni is the metro with the highest number of wet industries.

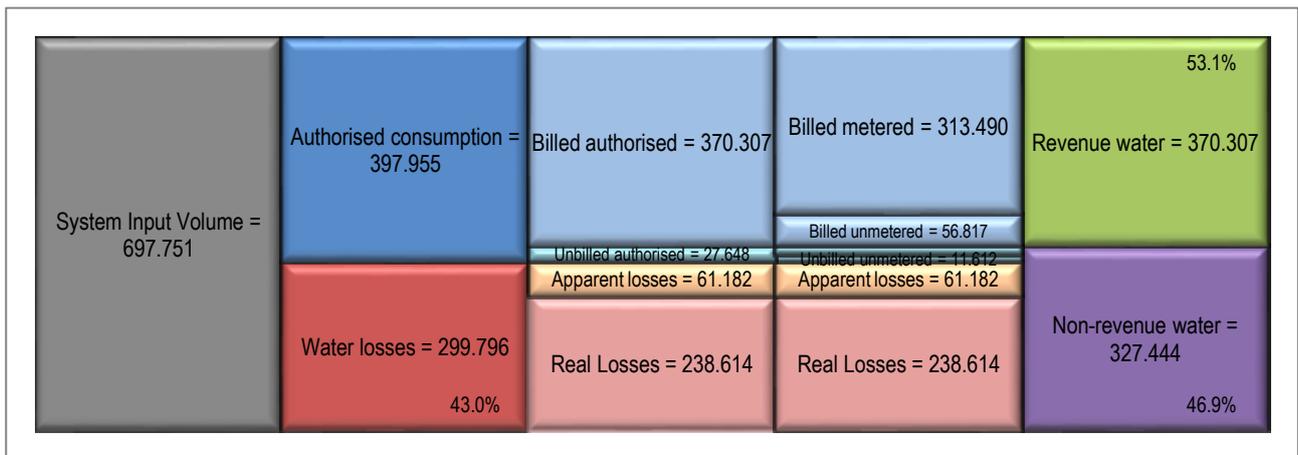


Gauteng has been unable to reduce their demand in the past 11 years, although water use efficiency, NRW and water losses have remained almost constant. WCWDM implementation levels must be elevated to ensure the targets of the Vaal reconciliation strategy are achieved. There is significant scope for improvement in the reduction of system input volume, NRW, water losses and efficiency. Data accuracy and reporting are excellent at metro level but can improve for some of the smaller municipalities.

3.4 KWAZULU-NATAL PROVINCE

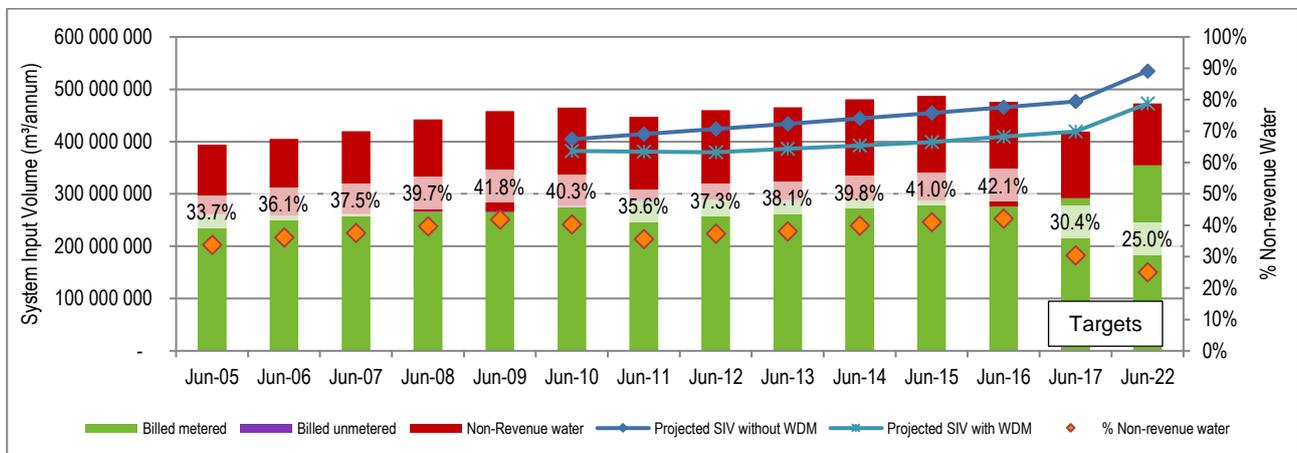
Reporting in the KwaZulu-Natal has been good with most municipalities submitting water balance data on a regular basis. The DWS regional office has an active reporting and meeting programme in place and is lauded for their efforts to implement active monitoring and reporting mechanisms.

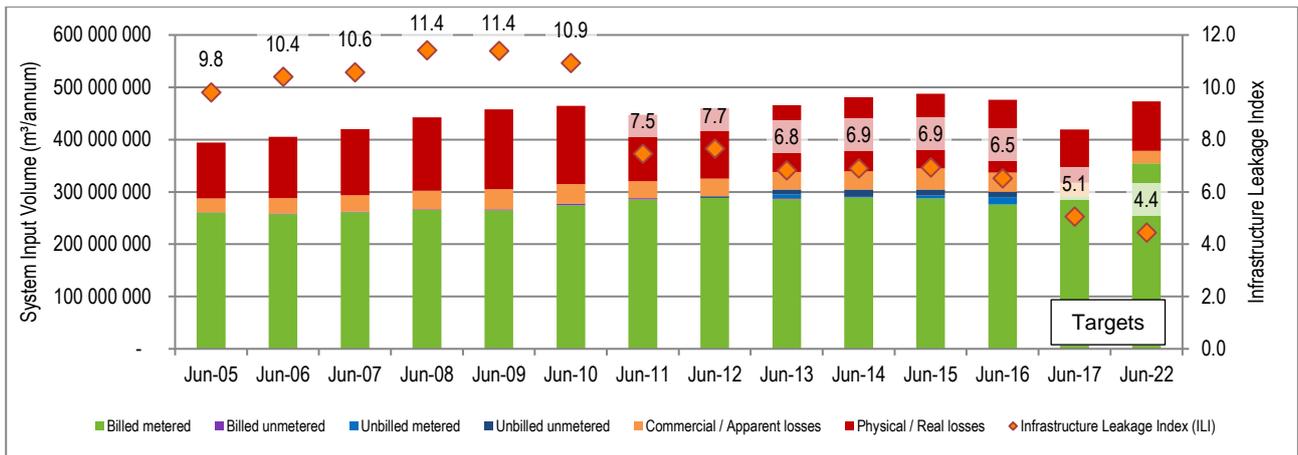
The estimated 2015/16 water balance, for all KwaZulu-Natal municipalities, indicates water losses of 299.80 million m³/a (43.0%) and NRW of 327.44 million m³/a (46.9%). Some of water balance data sets submitted by the municipalities are questionable and the provincial water balance has a medium confidence level. These figures are higher than the 2012/13 No Drop assessment of 37.6% water losses and 40.4% NRW. The No Drop assessment was based on 12 data sets with a SIV of 541.54 million m³/a.



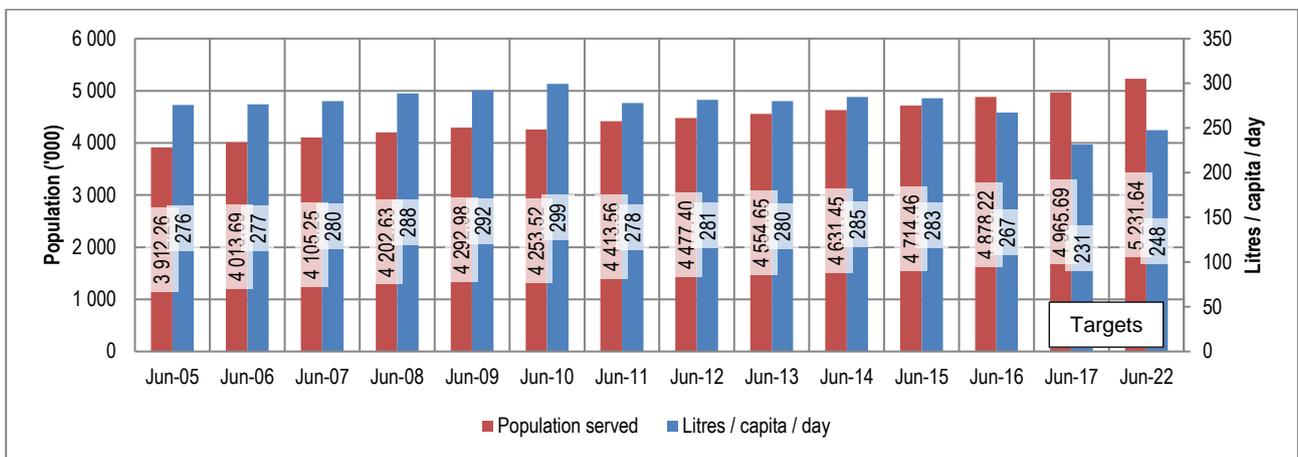
The water balance trends for the KwaZulu Natal are based on 4 plausible data sets of a possible 44 municipalities. These municipalities are eThekweni metro, Msunduzi, Newcastle and City of uMhlathuze, which account for approximately 69% of the demand.

SIV and NRW for the KwaZulu Natal show a gradual increase from 2011. Water losses have improved slightly over the same period but there is a noticeable increase in the unbilled consumption, which was previously included in the water loss component of the water balance. The four municipalities have been tracking the projected water demand without WCWDM and it is unlikely that they will achieve their 2017 targets.





Per capita consumption in KwaZulu Natal has remained almost constant in the 5 years except for the last year which shows a reduction as a result of the water restriction enforced in most of the municipalities.

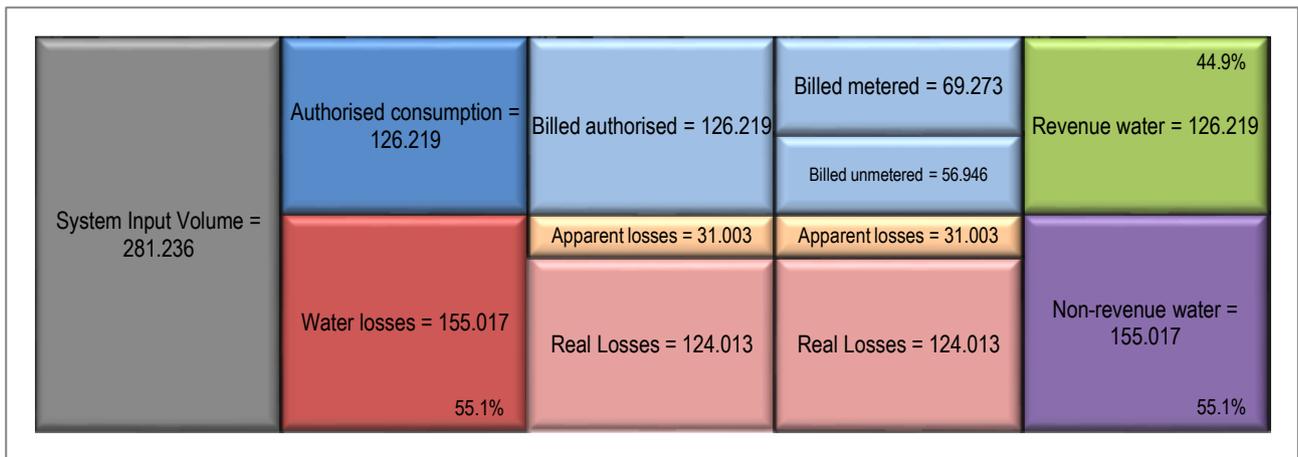


KwaZulu Natal has managed to maintain leakage levels and per capita consumption in the past 5 years. With the enforced water restrictions in the province, there is significant scope for improvement in reporting levels, data accuracy and a reduction of system input, NRW and water losses in the province.

3.5 LIMPOPO PROVINCE

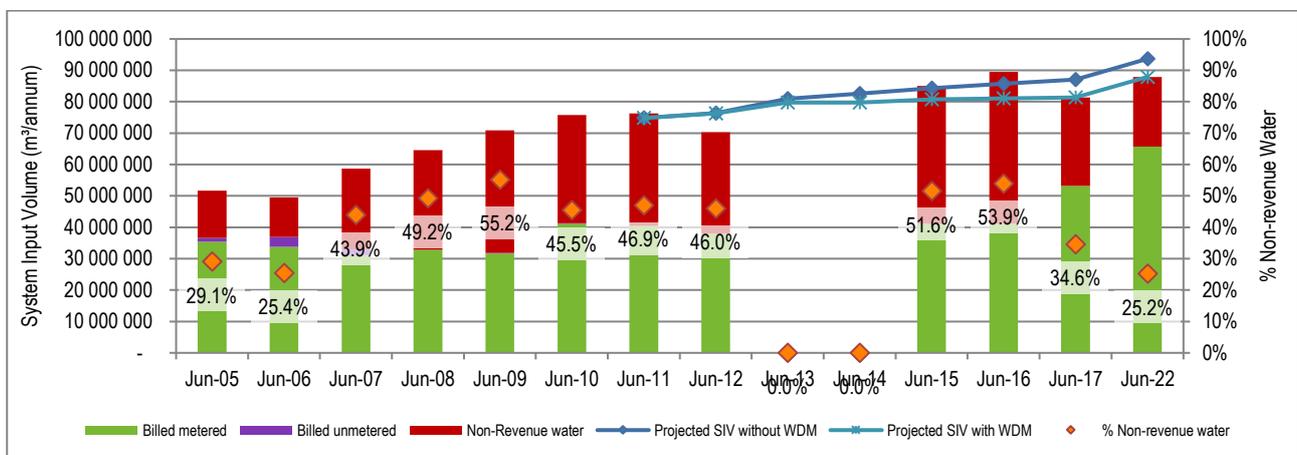
Reporting in the Limpopo has been very poor in recent years with only Polokwane municipality submitting water balance information on a regular basis. Despite several attempts, the DWS regional office has been unsuccessful to establish active reporting and meeting programmes.

The estimated 2015/16 water balance, for all municipalities in Limpopo, indicates water losses and NRW of 155.02 million m³/a (55.1%). The water balance has a low confidence due to the limited number of data sets. The NRW and water loss figures are slightly higher than the 2012/13 No Drop assessment of 51.4%. The No Drop assessment was based on 12 data sets, of a possible 25 municipalities, with an SIV of 247.91 million m³/a.



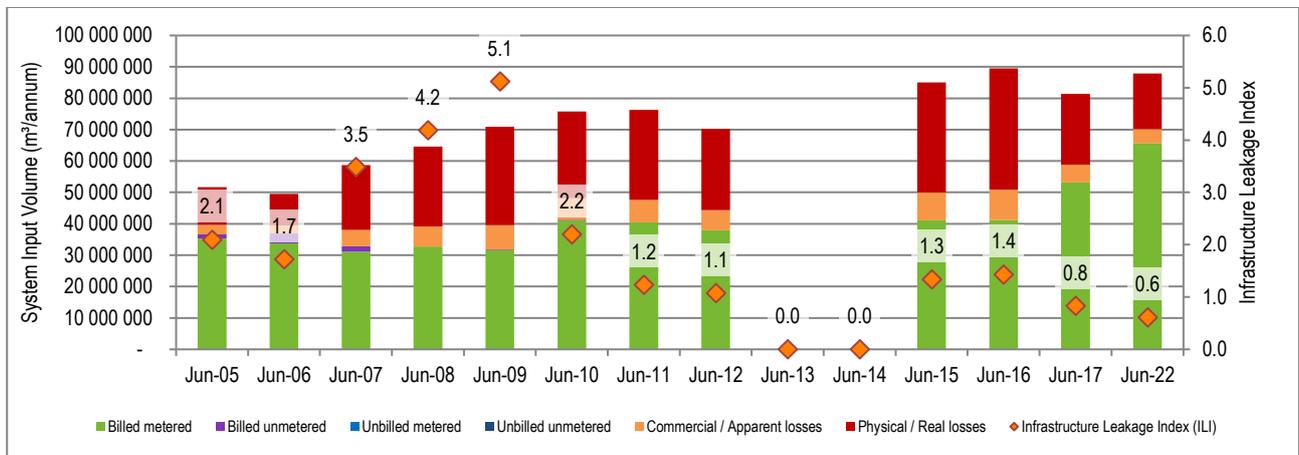
The water balance trends for the Limpopo are based on 5 (23%) plausible data sets of a possible 22 municipalities. The data accuracy has a very low confidence level since very few municipalities submit water balance data on a regular basis. Polokwane is the only secondary city included in the data set and accounts for only 15% of the total demand. The other large users are rural municipalities such as Greater Tzaneen, Ba-Phalaborwa and Thulamela (Thohoyandou).

The NRW and water trends indicate consistent growth in system input volume, NRW and water losses over the past 9 years with a slightly improvement from 2010 to 2012. Urgent attention must be given to the implementation of WCWDM as the water demand already exceeds the supply in large parts of the province.

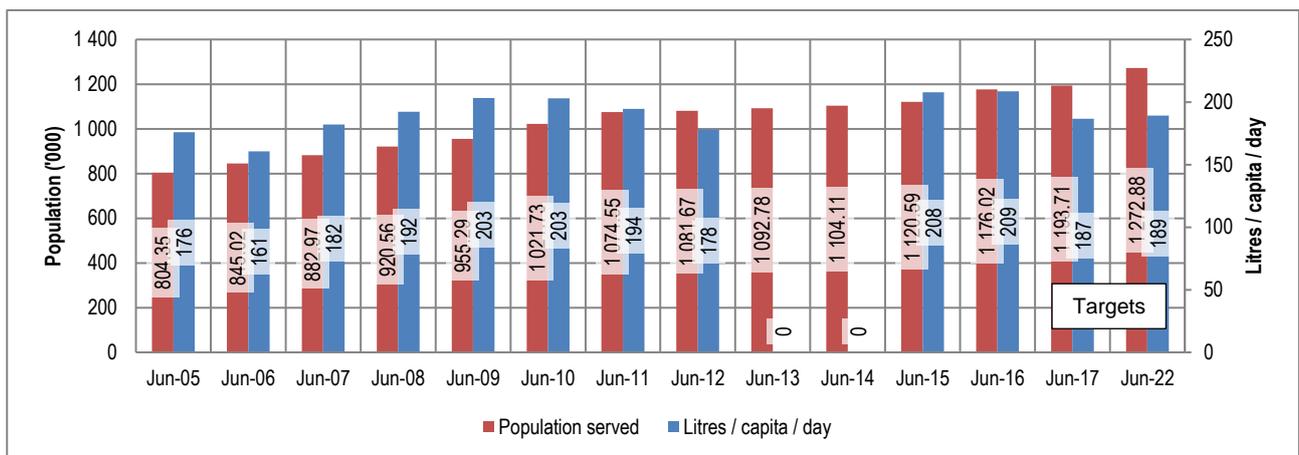


The ILI for Limpopo is unrealistically low considering the high NRW and poor efficiency. For analysis

purposes, it was assumed that all systems are 100% pressurised. StatsSA Community Survey 2016, however, indicates that Limpopo has a 40% reliability of supply, the lowest in the country. The ILI is expected to increase with accurate number of connections, average pressure, time pressurised and length of mains. An ILI of between 4 and 8 is expected based on international standards.



Per capita consumption for Limpopo indicates consistent growth from 2012 to 2016 and is currently at an all-time high of 209 ℓ /c/d. The growth in per capita consumption aligns with the growth in SIV, NRW and water losses. The growth could be an indication of deteriorating municipal structures and the ability to meter and bill based on actual consumption.

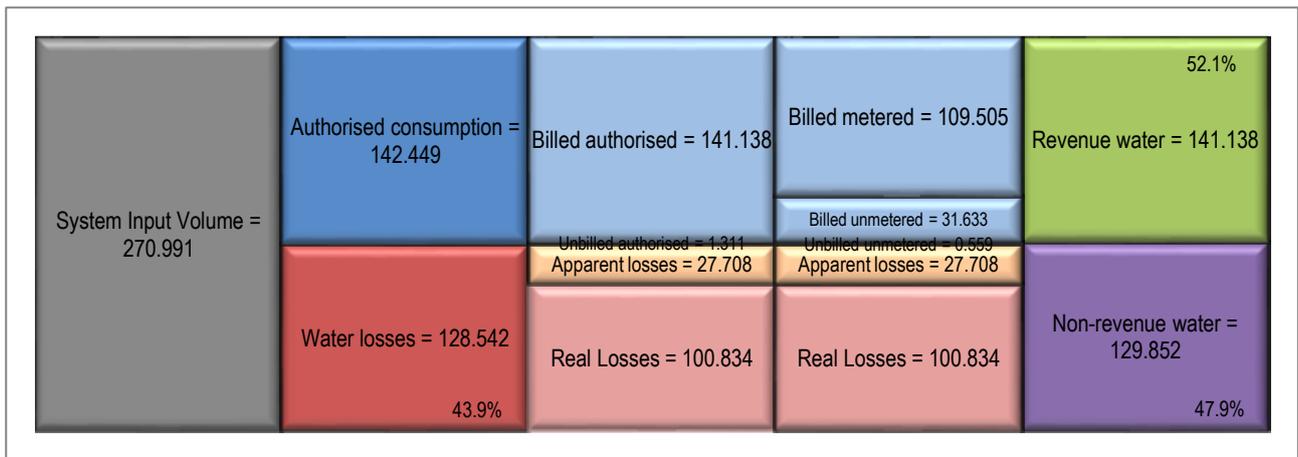


The Limpopo province has been unable to reduce their demand in the past 9 years and water use efficiency is at an all-time high of 209 ℓ /c/d. Leakage levels and NRW are also consistently increasing and WCWDM must be implemented as a matter of priority. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input volume, NRW, water losses and efficiency.

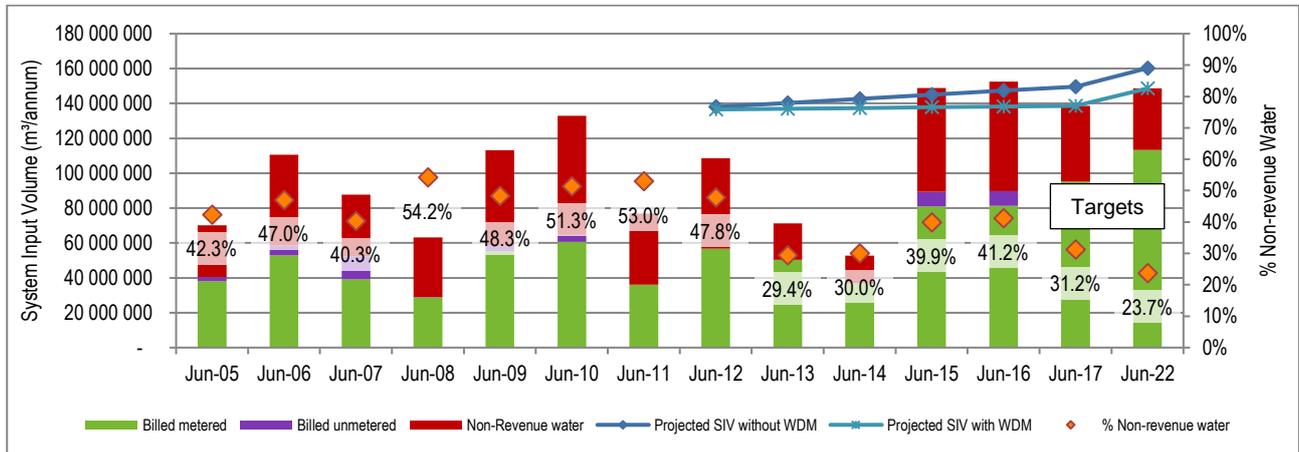
3.6 MPUMALANGA PROVINCE

Reporting in the Mpumalanga has been very poor in recent years with no municipality submitting water balance information on a regular basis and there are no active reporting systems in place.

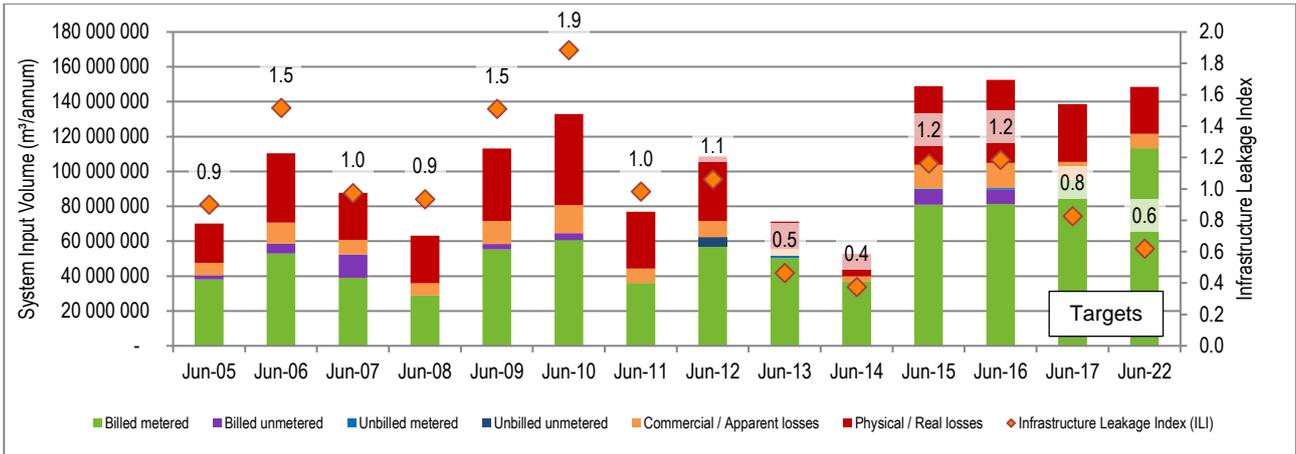
The estimated 2015/16 water balance, for all municipalities in Mpumalanga province, indicates water losses of 118.86 million m³/a (43.9%) and NRW of 129.85 million m³/a (47.9%). The water balance has a medium confidence level and is highly influenced by the four secondary cities of Govan Mbeki, Emalaheni, Steve Tshwete and Mbombela, which account for 56% of the demand. These figures are significantly higher than the 2012/13 No Drop assessment of 39.2% water losses and 39.8% NRW. The No Drop assessment was based on five data sets with a SIV of 76.6 million m³/a.



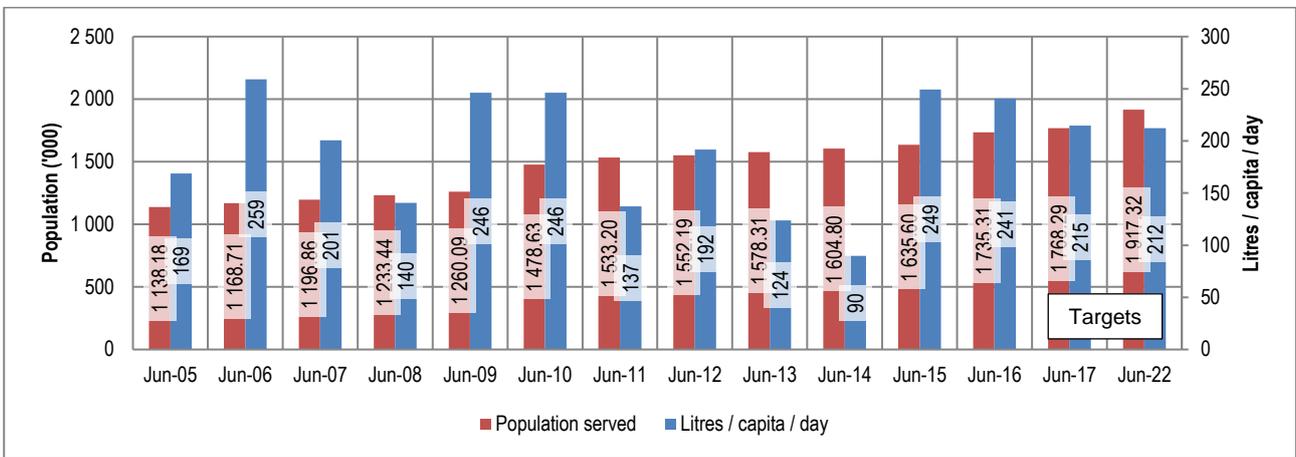
The water balance trends for the Mpumalanga are based on eight plausible data sets of a possible 17 municipalities. It is difficult to assess the trend due to the poor data quality but NRW, water losses and the SIV seem to have increased over the past two years.



The ILI for Mpumalanga is unrealistically low considering the high NRW and poor efficiency. For analysis purposes, it was assumed that all systems are 100% pressurised. StatsSA Community Survey 2016, however, indicates that Mpumalanga has a 58% reliability of supply. The ILI is expected to increase with accurate number of connections, average pressure, time pressurised and length of mains. An ILI of between 4 and 8 is expected based on international standards.



Per capita consumption seems to have stabilised at between 241 and 249 l/c/d. The per capita consumption is high for the level of development and WCWDM should be implemented as a matter of priority.

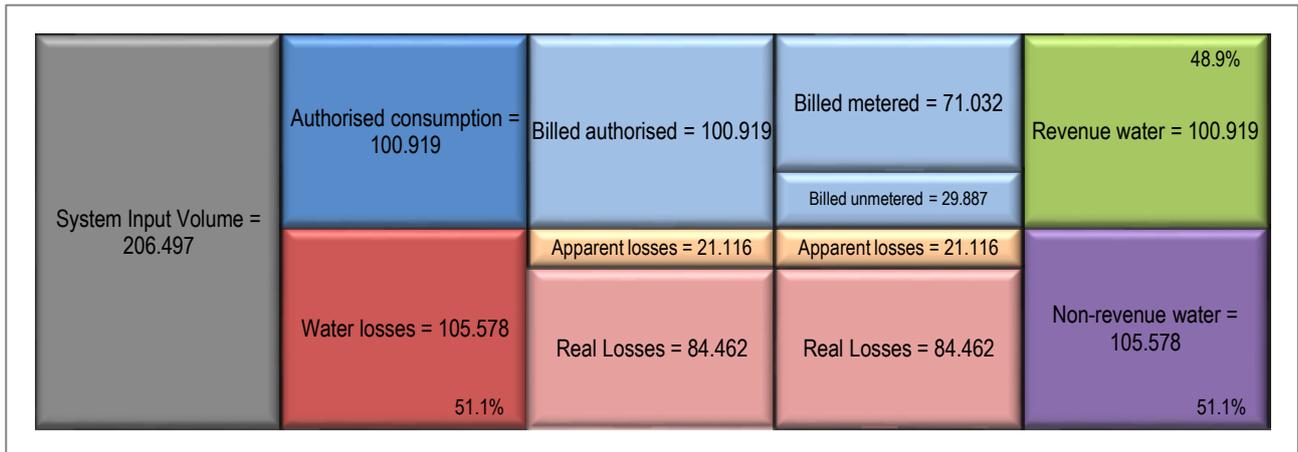


The Mpumalanga province has been unable to reduce its demand in the past 10 years. NRW and water losses have remained stable over the past 10 years, despite an increase in the system input volume. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input volume, NRW, water losses and efficiency.

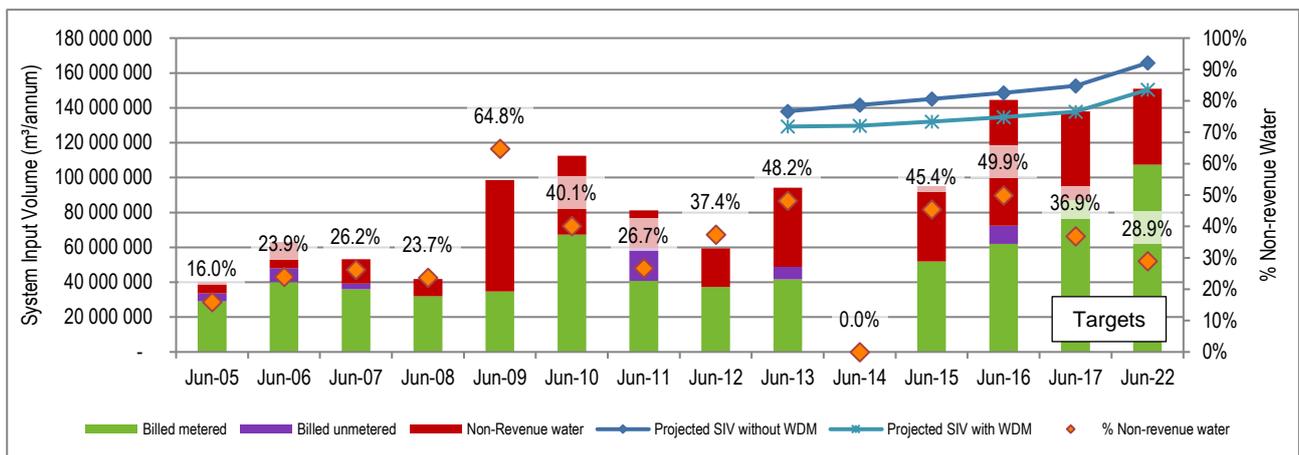
3.7 NORTH WEST PROVINCE

Reporting in the North West has been very poor in recent years with no municipality submitting water balance information on a regular basis and there are no active reporting systems in place.

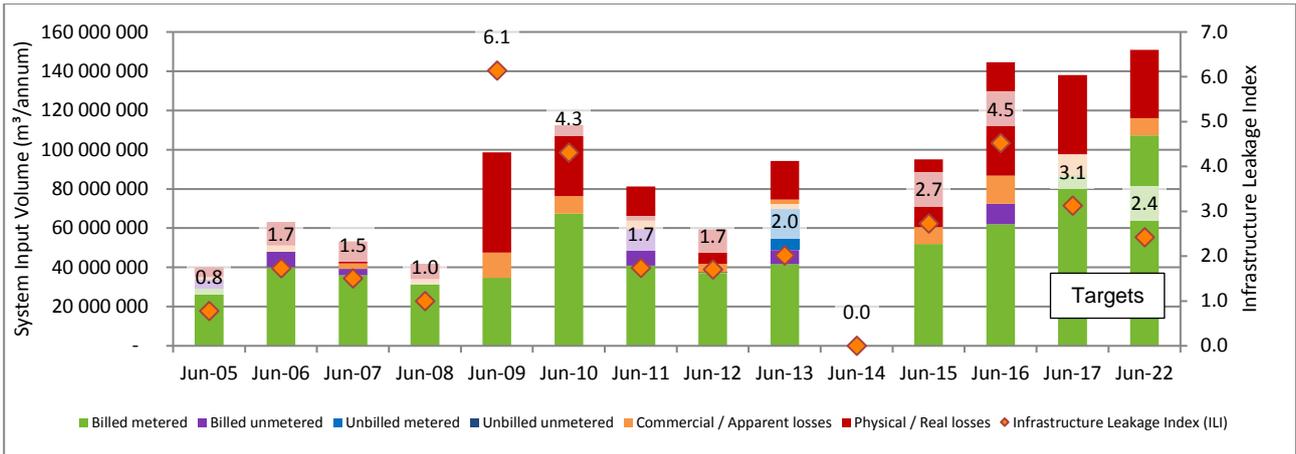
The estimated 2015/16 water balance, for all North West municipalities, indicates water losses and NRW of 105.58 million m³/a (51.1%). The water balance has a low confidence level due to the low number of data sets. Water losses are well above the 2012/13 No Drop assessment of 26.5% but the NRW is in line at 48.2%. The No Drop assessment was based on 3 data sets with a SIV of 94.2 million m³/a.



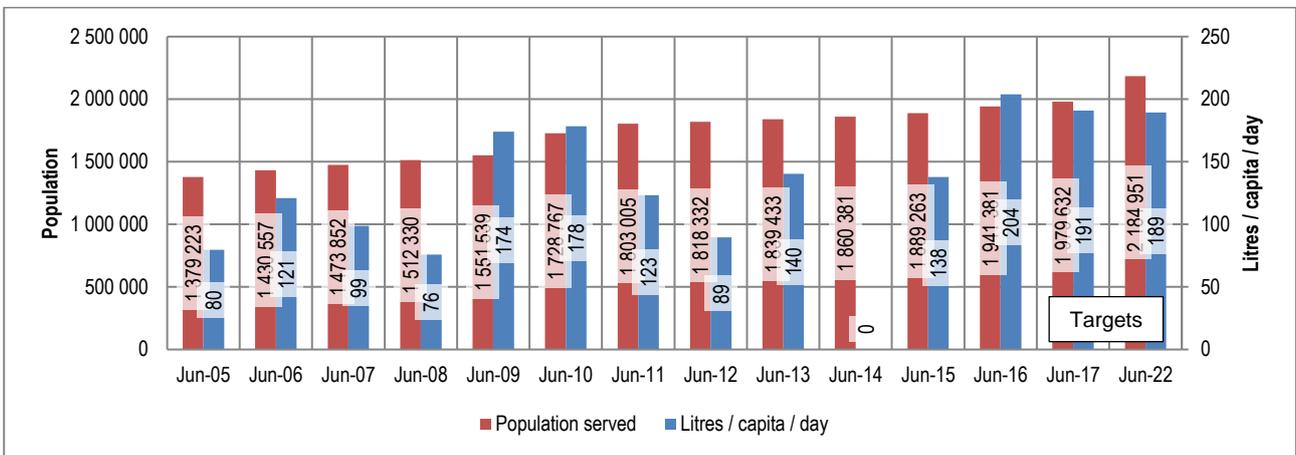
The water balance trends for North West are based on 7 (11%) plausible data sets of a possible 18 municipalities. Madibeng, Rustenburg, Ventersdorp / Tlokwe and City of Motlosana, all secondary cities, are included in the data set. Water balance information in North West province is exceptionally poor and it is difficult to assess the trend. Water losses and NRW seem to be increasing which is expected considering the lack of monitoring, evaluation and reporting.



The estimated 2015/2016 ILI for North West is in line with expected international standards of between 4 and 8 but is expected to increase with improved average pressure, time pressurised, length of mains and number of connection figures. The ILI for the others years seems too low for the high levels of leakage and NRW.



Per capita consumption has been increasing consistently in the North West. The current per capita consumption of 204 l/c/d is in line with the level of development and considered the most realistic estimate. The per capita consumption for most other years seems unrealistically low.

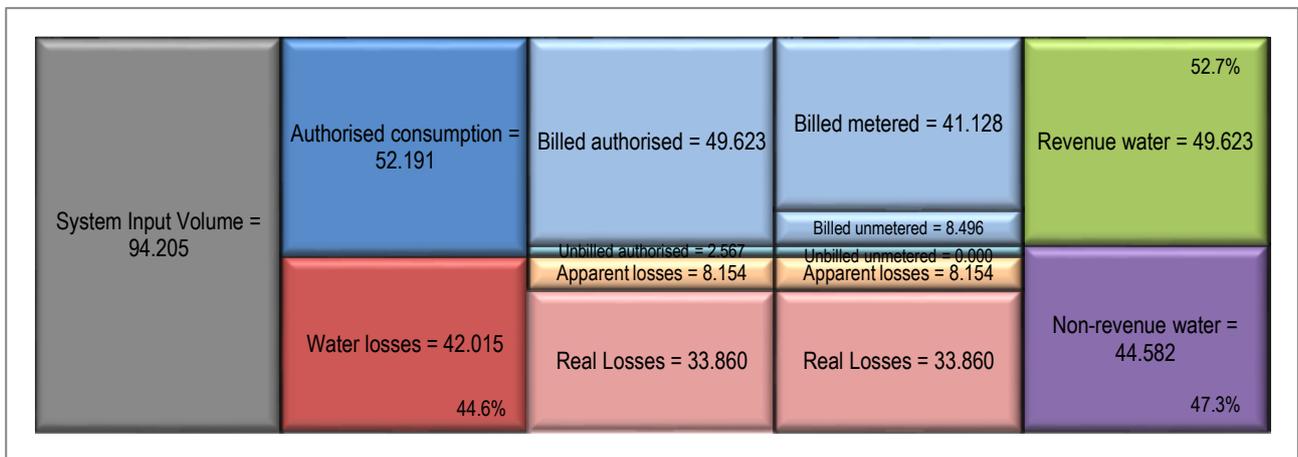


The North West province has been unable to submit plausible data sets in the past 9 years, and it is difficult to assess the NRW, water loss and demand trends. WCWDM must be implemented as a matter of priority. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input volume, NRW, water losses and efficiency.

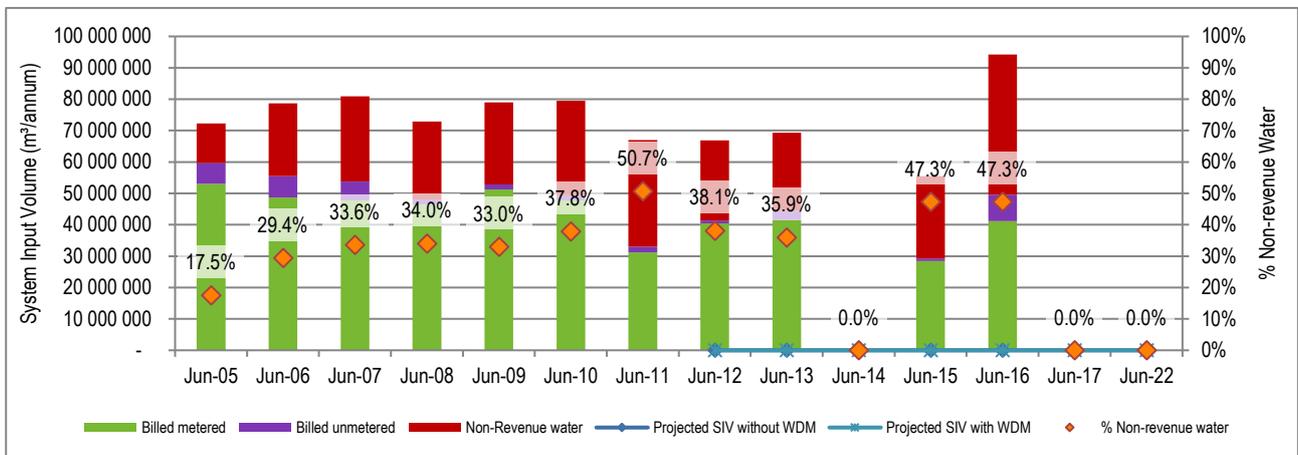
3.8 NORTHERN CAPE PROVINCE

Reporting in the Northern Cape has been reasonable with approximately 50% of the municipalities submitting water balance information on an irregular basis. The DWS regional office has an active reporting programme in place.

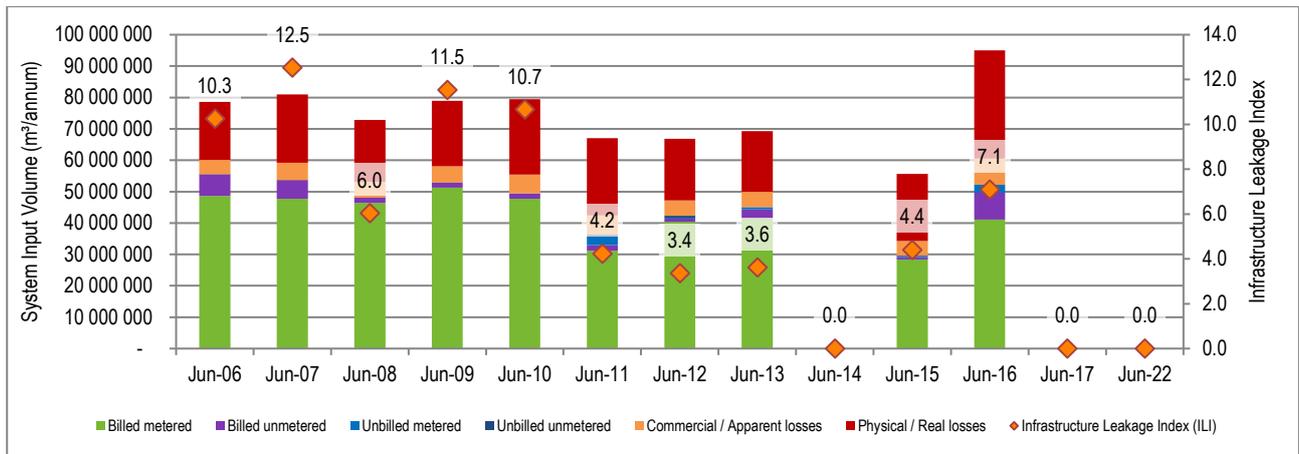
The estimated 2015/16 water balance for all Northern Cape municipalities indicates water losses of 42.0 million m³/a (44.6%) and NRW of 44.5 million m³/a (47.3%). The water balance has a medium confidence level and is highly influenced by //Khara Hais (Upington) and Sol Plaatjie (Kimberley) which accounts for approximately 67% of the demand. These figures are well above the 2012/13 No Drop assessment of 37.1% water losses and 38.1% NRW. The increase is attributed to the inclusion of municipalities that have little or no understanding of their water losses and NRW. The water losses and NRW in these municipalities tend to be above the average for municipalities who have a clear understanding of their water balance. The No Drop assessment was based on 14 data sets, with an SIV of 62.4 million m³/a.



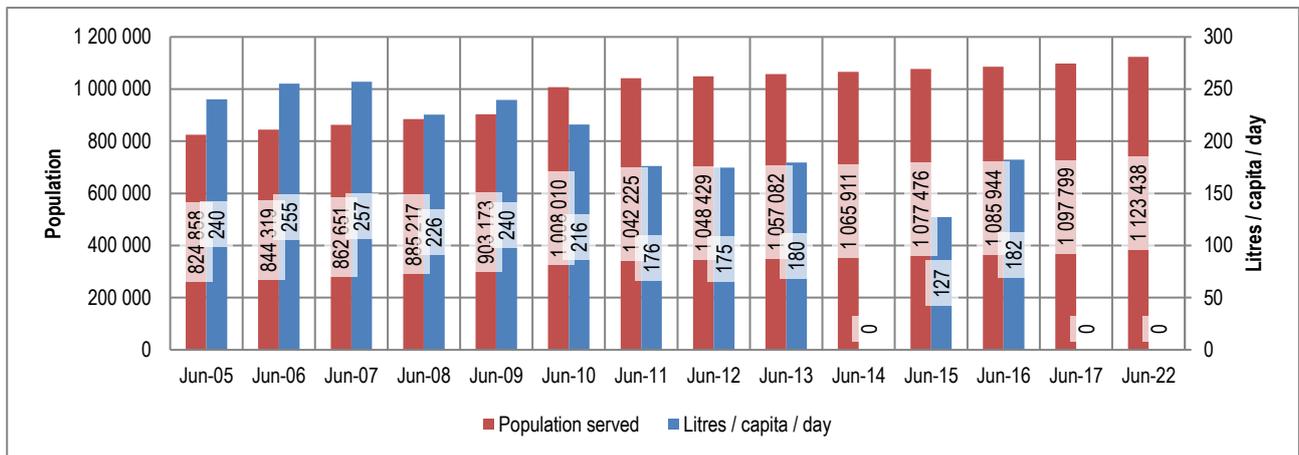
The water balance and trends for the Northern Cape are based on 14 (52%) plausible data sets of a possible 27 municipalities. NRW, water losses and system input volume increased consistently from 2005 to 2010, but have improved over the past three years. The drop in demand and spike in NRW and water losses during 2011 is unclear and requires further investigation. Municipalities have managed to control their demands at the same levels for the past 6 to 7 years, which is commendable.



The estimated 2015/2016 ILI for Northern Cape is in line with expected international standards of between 4 and 8.



Per capita consumption reduced from 2009 to 2013, which is commendable and could be an indication of the WCWDM interventions taking effect in the province.

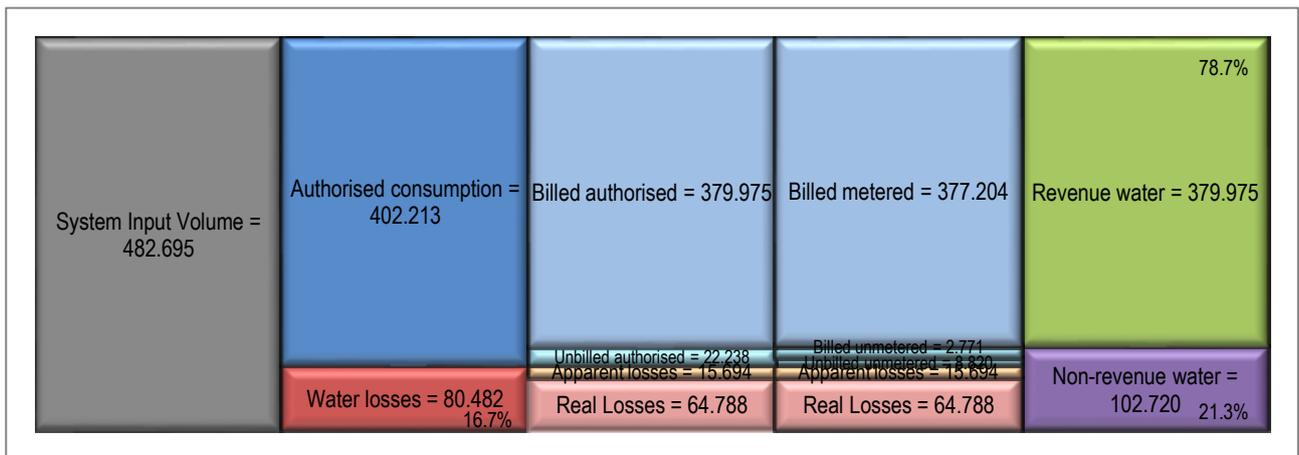


Northern Cape has managed to maintain their system input, NRW and per capita consumption in the past 5 to 6 years. Increased efforts are required by municipalities to implement WCWDM to ensure targets are achieved and water restrictions are mitigated in the driest province. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input, NRW and water losses in the province.

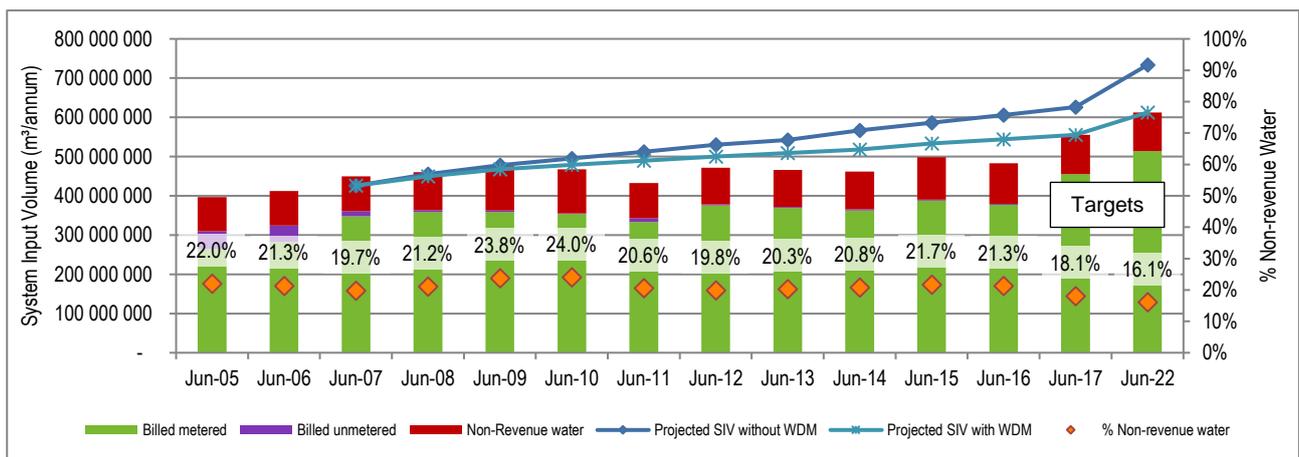
3.9 WESTERN CAPE PROVINCE

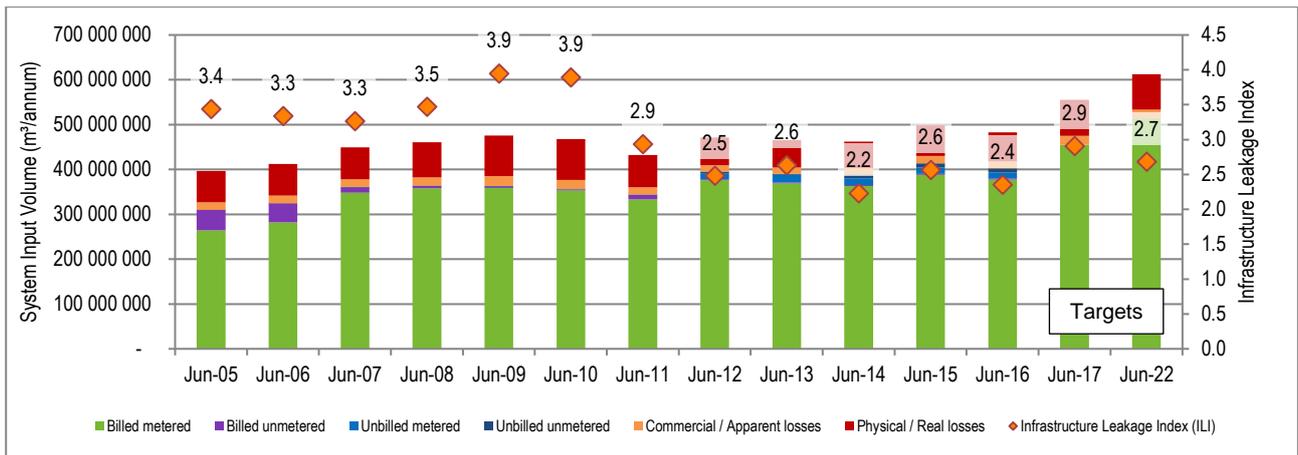
Reporting in the Western Cape is very good with >95% of municipalities submitting water balance information on a regular basis. The DWS regional office has an active reporting programme in place and is lauded for their efforts to implement active monitoring and reporting mechanisms.

The 2015/16 water balance for the 20 data sets, indicates water losses of 80.48 million m³/a (16.7%) and NRW of 102.7 million m³/a (21.3%). The water balance has a high confidence level and is highly influenced by City of Cape Town, Drakenstein, Stellenbosch and George which, account for approximately 77% of the demand. These figures compare well with the 2012/13 No Drop assessment of 15.8% water losses and 20.5% NRW. The No Drop assessment was based on 18 data sets, with an SIV of 444.3 million m³/a.

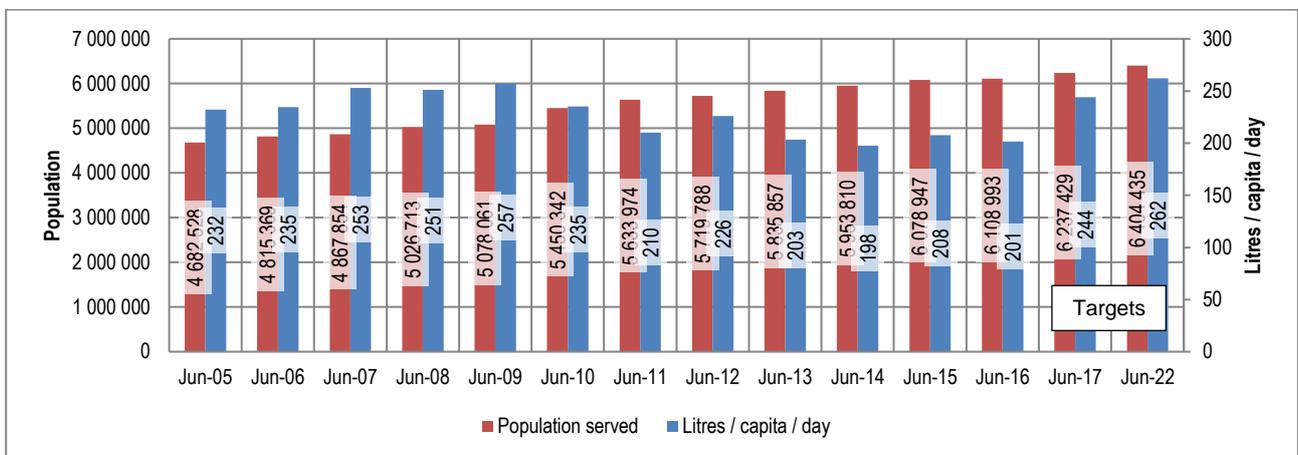


The water balance and trends for the Western Cape are based on 20 (80%) plausible data sets of a possible 25 municipalities. Municipalities in the Western Cape have maintained their system input and NRW in the past 3 to 4 years and water losses have been significantly reduced. The reduction could be attributed to the continuous driving, monitoring and reporting, by both the DWS Regional office and municipalities.





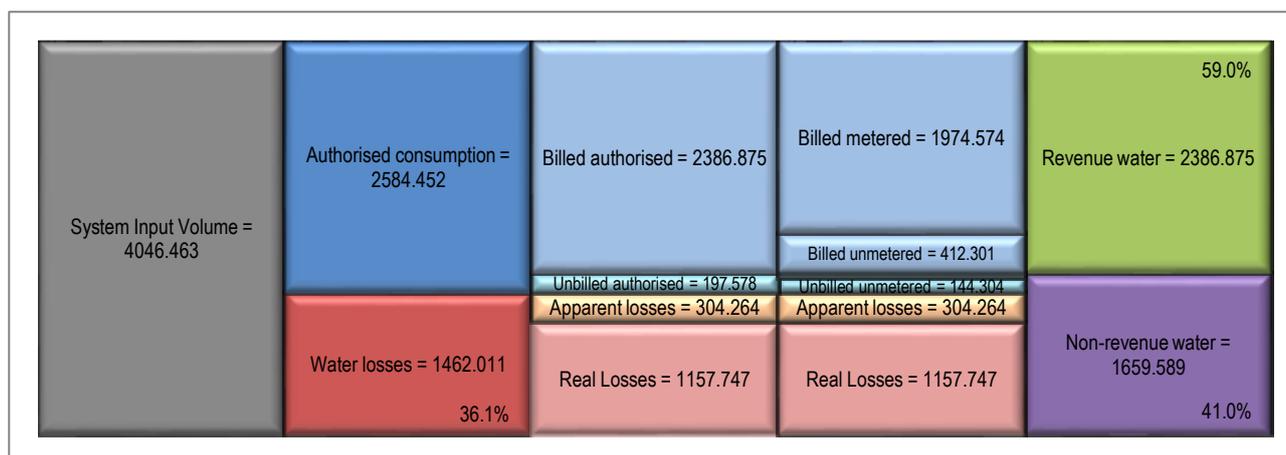
Per capita consumption has consistently been decreasing since 2009, which is commendable.



Municipalities in the Western Cape have been doing well to maintain their system input volume for the past 3 to 4 years, while reducing their water losses and per capita consumption. Municipalities must continue their current trends and increase their efforts to implement WCWDM.

3.10 NATIONAL WATER BALANCE TRENDS

The estimated 2015/16 water balance, for all municipalities, indicate water losses of 1462.01 million m³/a (36.1%) and NRW of 1659.59 million m³/a (41.0%). These figures are higher than the 2012/13 No Drop assessment of 27.6% water losses and 34.6% NRW. The No Drop assessment was based on 71 data sets, with an SIV of 2 997.6 million m³/a. The increased water losses and NRW are attributed to the improved estimate of water losses and NRW in category B3 and B4 municipalities.



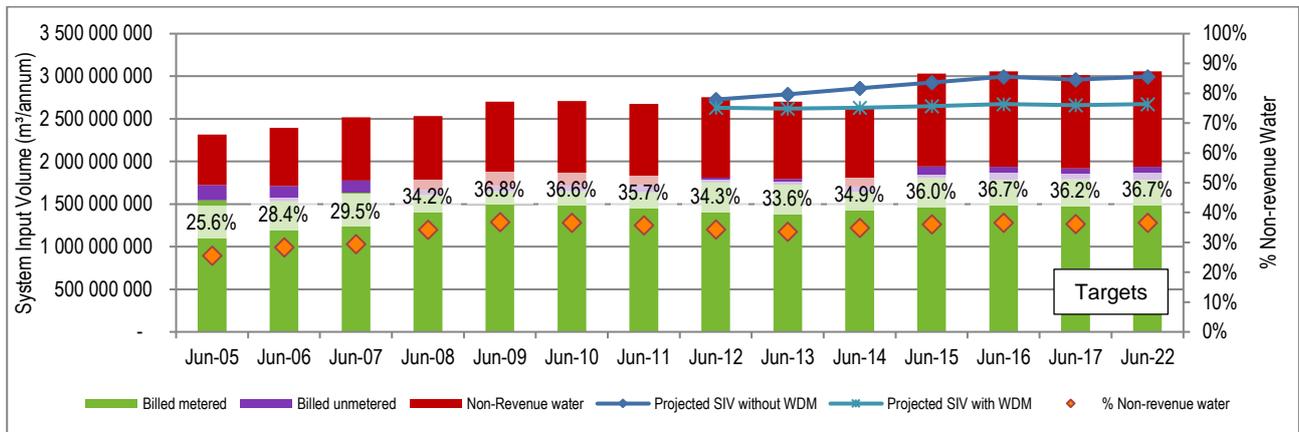
The estimated national water balance for 2015 /16, broken down per province, is summarised in the table below. The highest and lowest figure for each key performance indicator are highlighted in red and green respectively.

Province	Population	SIV (m ³ /annum)	NRW (m ³ /annum)	% NRW	% WL	l/c/d	ILI
EC	4 477 918	332 151 376	158 647 165	47.8%	45.0%	200	4.8
FS	2 723 028	207 835 805	106 908 574	51.4%	46.6%	209	4.8
GT	12 978 281	1 473 100 700	528 839 540	35.9%	27.4%	305	5.8
LIM	4 225 967	281 235 907	155 016 679	55.1%	55.1%	182	1.3
KZN	8 491 508	697 751 184	327 444 107	46.9%	43.0%	225	6.2
NW	3 039 995	206 496 825	105 577 898	51.1%	51.1%	186	4.7
NC	1 085 944	94 205 305	44 582 022	47.3%	44.6%	238	7.0
WC	6 108 993	482 695 411	102 720 237	21.3%	16.7%	201	2.4
MP	3 622 506	270 990 713	129 852 490	47.9%	43.9%	205	4.3
National	46 754 140	4 046 463 225	1 659 588 711	41.0%	36.1%	233	5.3

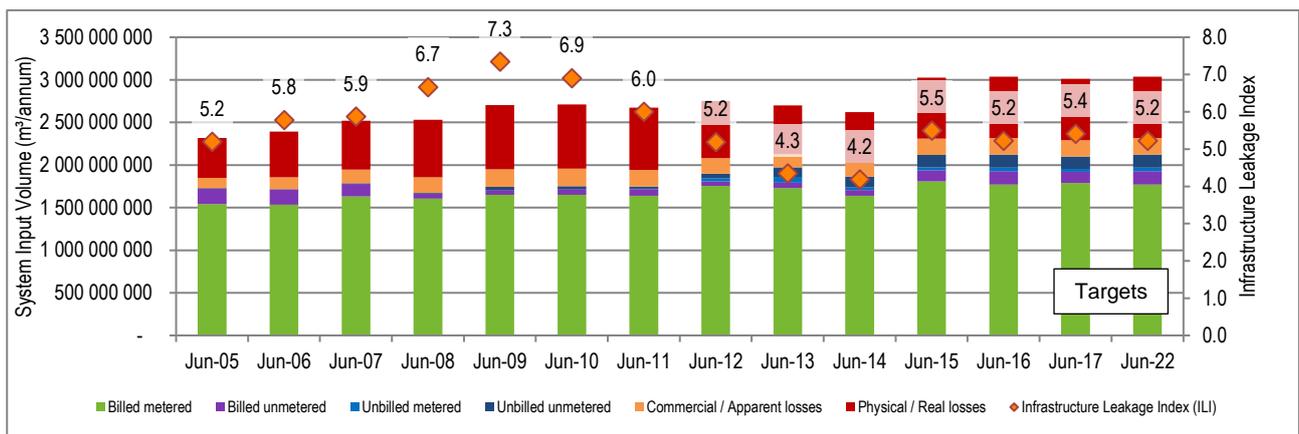
Gauteng is the largest water user in the country, and with KwaZulu-Natal and Western Cape, account for 66% of the total demand. Gauteng and KwaZulu-Natal account for 52% of the NRW by volume. Limpopo has the highest percentage NRW and water losses but these figures are contradicted by a low l/c/d and ILI. This needs further investigation. Western Cape is the overall best performing province. Gauteng has the highest per capita consumption due to the high number of wet industries in the supply area.

To obtain an understanding of the water loss trends in the country, the water balance information for 107 municipalities, which submit information on a regular basis, was analysed as indicated in the figures below. The system input volume for the 107 systems has been consistently increasing since

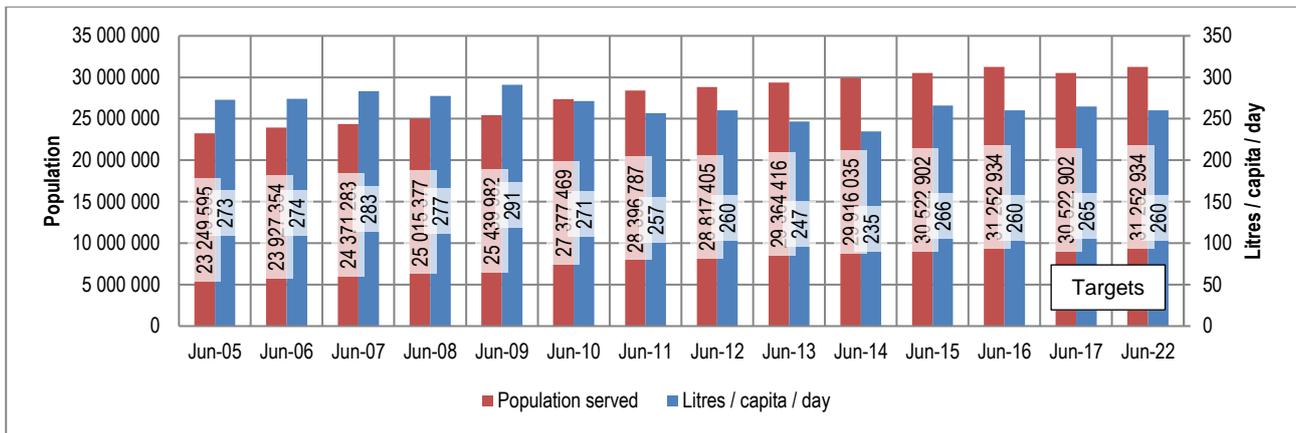
2006 and NRW has been increasing since 2013. Water losses seemed to improve until 2014 but have subsequently deteriorated again to 2012 levels. Municipal demands have been tracking the projected water demand without WCWDM and they are unlikely to achieve their 2017 targets.



NRW has increased in the past two years but is influenced, in some areas, by the imposed water restrictions. NRW tends to increase as the SIV reduces. More municipalities are also indicating some of their water losses as unbilled unmetered consumption. This shift emphasises the extent of leakage on private properties and the need for metering and billing systems, mechanisms to control consumer demand, the War-on-Leaks programme and consumer education and awareness.



As shown in the figure below, per capita consumption has remained constant over the past 5 years, which is commendable, but WCWDM efforts must be elevated considering these figures are significantly above international benchmarks of approximately 180 l/c/d and the country is one of the 30 driest in the world. The per capita consumption is also significantly higher compared to the previous study, *The State of non-revenue water in South Africa* (WRC, 2012) which was estimated at 235 l/c/d.



3.11 WATER BALANCE COMPARISON

The results from this study, compared to the 3% No Drop (DWS, 2015) figures and *The State of non-revenue water in South Africa* (WRC, 2012) are shown in the following table. The highest and lowest figure for each key performance indicator are highlighted in red and green respectively.

Category	State of NRW in SA (2009/10)				3% No Drop (2012/13)				2015/16 Nat Benchmark			
	No	% NRW	ILI	l/c/d	No	% NRW	ILI	l/c/d	No	% NRW	ILI	l/c/d
A	8	34.3%	8.2	291	8	32.3%	5.4	280	8	34.4%	5.3	283
B1	18	41.3%	7.4	241	15	41.5%	6.5	261	19	48.1%	5.9	260
B2	26	30.5%	5.7	230	15	26.2%	4.8	321	25	44.3%	4.4	204
B3	55	37.0%	4.7	164	49	37.1%	4.2	217	100	52.7%	4.2	172
B4	25	72.5%	7.8	65	14	49.5%	4.0	90	61	49.6%	3.4	158
Total	132	36.8%	6.8	235	101	34.6%	6.2	252	213	41.0%	5.3	237

The results indicate that NRW has increased, physical losses have improved and per capita consumption has remained almost constant. The NRW increase is attributed to the inclusion of municipalities that have little or no understanding of their water losses and NRW. The water losses and NRW in these municipalities tend to be above the average for municipalities who have a clear understanding of their water balance.

Only continuous monitoring and analyses will provide a credible benchmark against which the progress made with the implementation of WCWDM can be measured. WCWDM must be implemented as a matter of urgency in all provinces, especially with the looming and reported droughts in the country. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input, NRW, water losses and improved efficiency across the country.

3.12 2015/16 KEY PERFORMANCE INDICATORS PER CATEGORY

The key performance indicators per municipal category are shown in **Figure 3.1** to **Figure 3.5**.

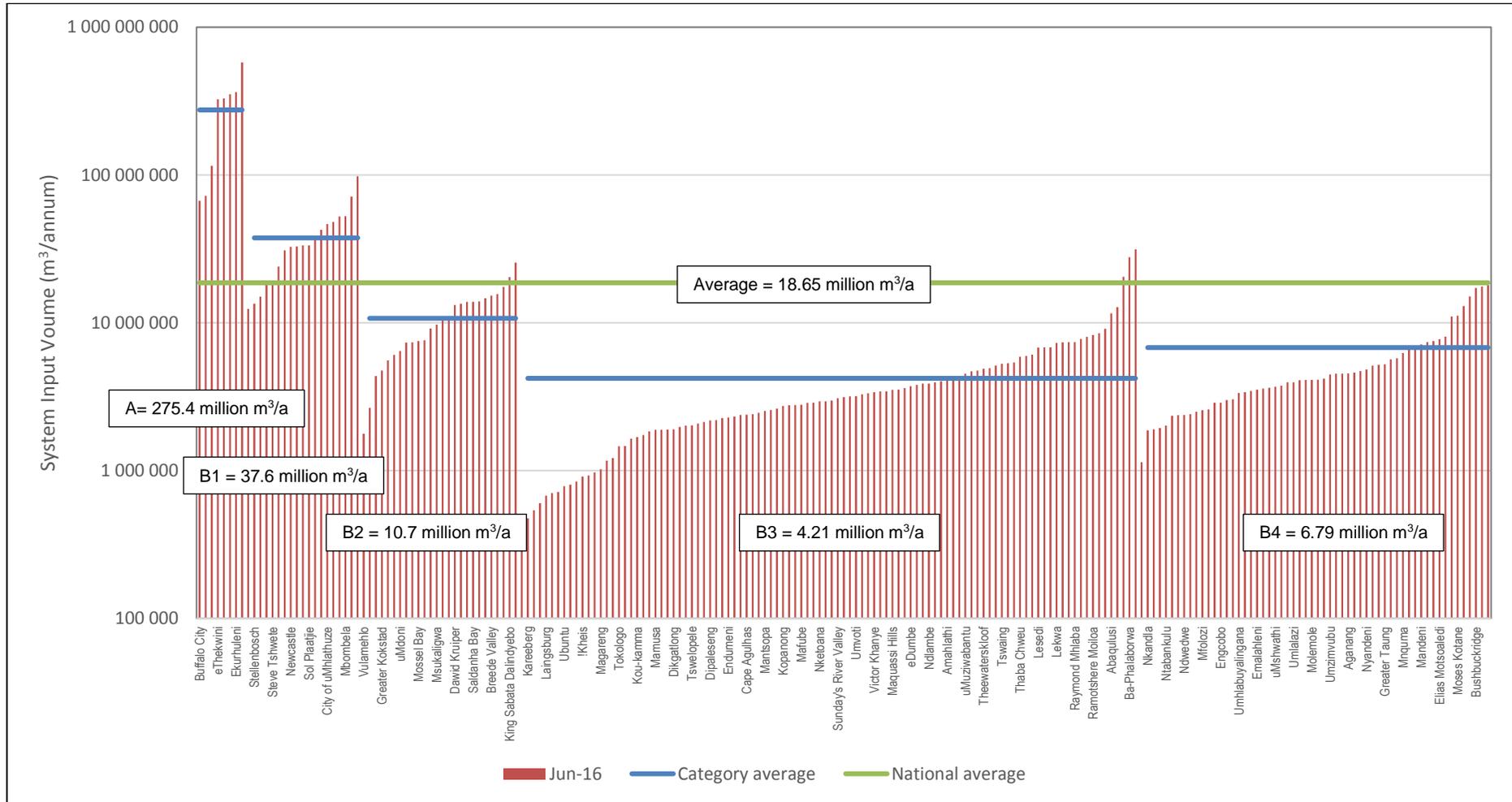


Figure 3.1: 2015/16 estimated system input volume

The average SIV per municipality is 18.7 million m³/a. This figure is highly influenced by the category A and B1 municipalities, which account for 73% of the total SIV. The total estimated SIV for the country is 4020.27 million m³/a.

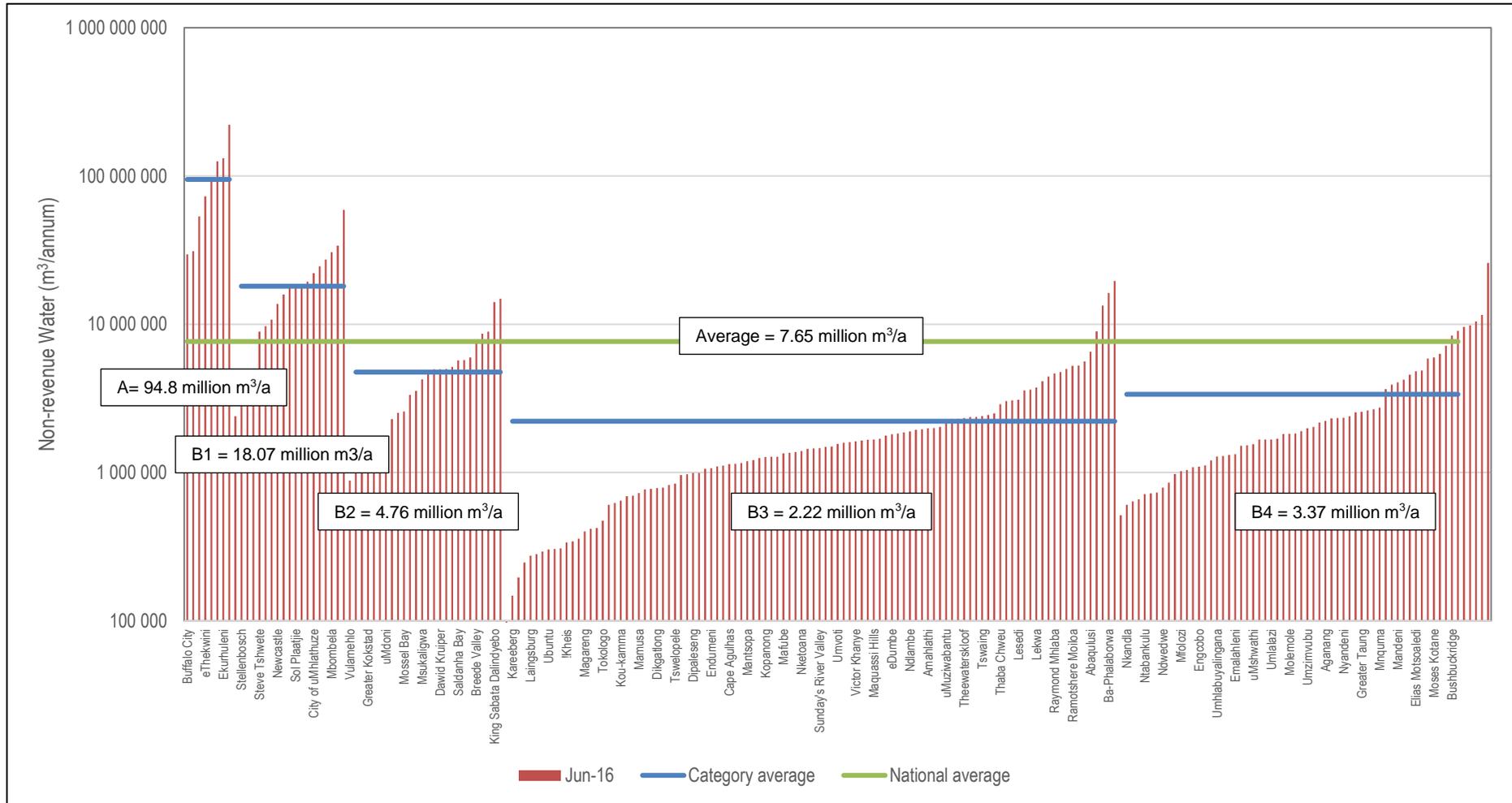


Figure 3.2: Volume non-revenue water

The average volume NRW per municipality is 7.65 million m³/a. This figure is highly influenced by the category A and B1 municipalities, which account for 66% of the total NRW. The potential for savings are the greatest in these municipalities. The total estimated NRW for the country is 1 632.93 million m³/a.

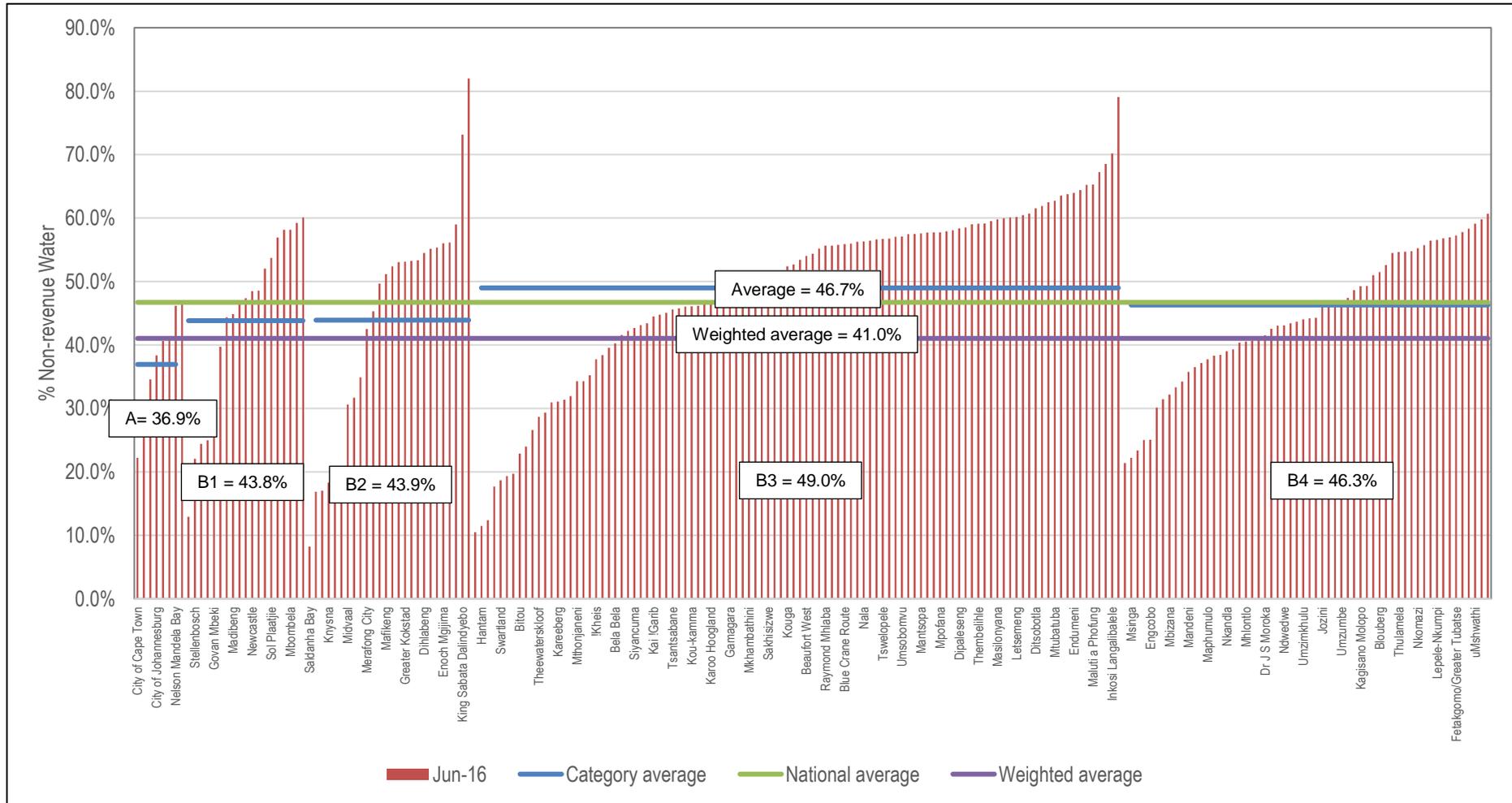


Figure 3.3: 2015/16 Percentage non-revenue water

The percentage NRW is the highest in the category B3 municipalities followed by category B4, B1, B2 and the lowest being the metros. The weighted average compares well with previous studies. The average figure is significantly higher than the weighted average due to the influence of the metros. The NRW for category B4 municipalities is lower than for B3 municipalities due to high number of indigents and equitable share.

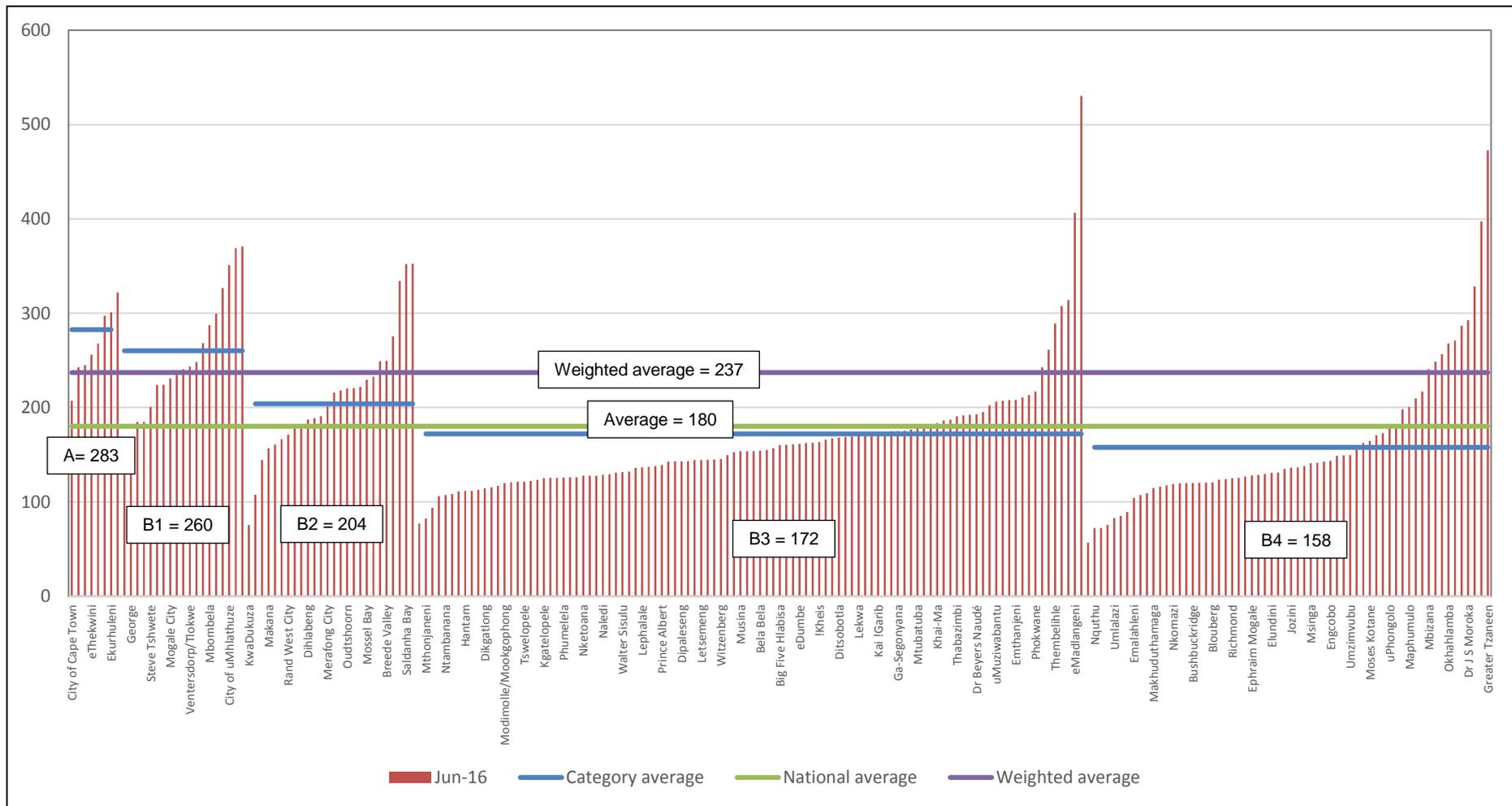


Figure 3.4: 2015/16 liters per capita per day

The liters per capita consumption is the highest in the metros due to the large number of wet industries. Category B3 and B4 municipalities have the lowest per capita consumption and is in line with the level of service and level of development.

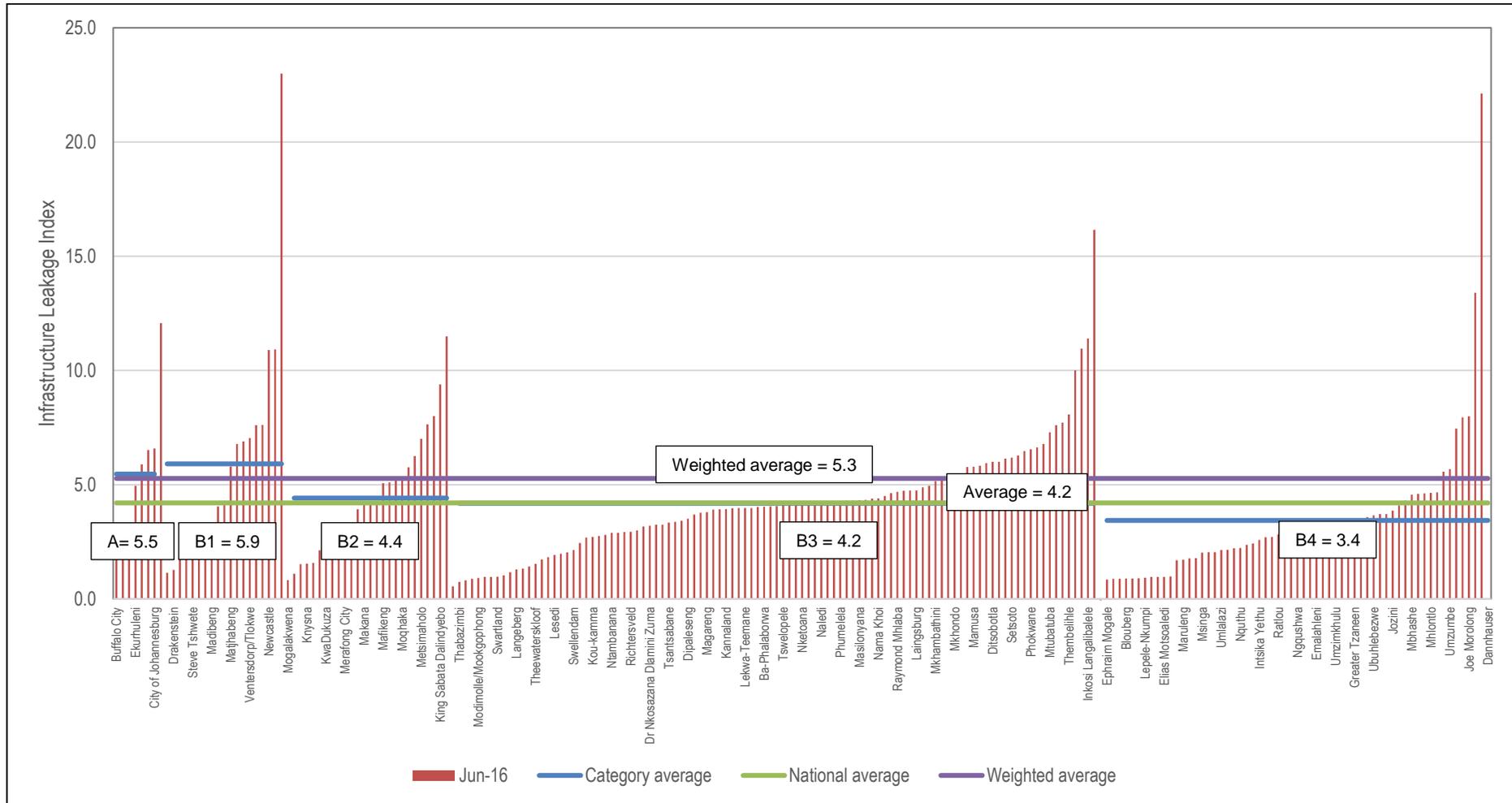


Figure 3.5: 2015/16 Infrastructure Leakage Index

The average ILI is the highest in the category B1 municipalities followed by the metros. The physical leakage is the lowest in the category B4 municipalities due to the relatively low per capita consumption and NRW.

6 CONCLUSIONS

The **Eastern Cape** municipalities have not achieved their 2016 targets and have been tracking the projected water demand without WCWDM. Municipalities in the Eastern Cape are unlikely to achieve their 2017 targets. The estimated 2015/16 water balance, for all municipalities in the Eastern Cape, indicates water losses of 149.61 million m³/a (45.0%) and NRW of 158.65 million m³/a (47.8%). The water balance has a low confidence due to the limited number of data sets and is highly influenced by the Nelson Mandela Bay and Buffalo City metros, which account for 55% of the total demand.

In the **Free State**, Mangaung has been enforcing water restrictions since July 2015 and it exceeded its June 2016 target by 12.2 million m³/a or 16%. Only Mangaung submits information on a regular basis and leakage levels fluctuate considerably. It is difficult to assess if any progress is being made with the reduction of NRW and water losses. The estimated 2015/16 water balance, for all municipalities in the Free State, indicates water losses of 96.91 million m³/a (46.6%) and NRW of 106.91 million m³/a (51.4%). The water balance has a low confidence due to the limited number of data sets. WCWDM must be implemented as a matter of priority to sustain current trends and considering that water restrictions have already been imposed in several Free State municipalities. There is significant scope for improvement in reporting levels, data accuracy and a reduction of system input volume, NRW, water losses and efficiency.

Gauteng has been unable to reduce their demand in the past 9 years, although water use efficiency seems to have been improving in the past 5 years. The estimated 2015/16 water balance, for all municipalities in Gauteng, indicates water losses of 404.07 million m³/a (27.4%) and NRW of 528.84 million m³/a (35.9%). NRW and water loss levels have come down, which is commendable, but WCWDM implementation levels must be elevated to ensure the targets of the Greater Vaal reconciliation strategy are achieved. There is significant scope for improvement in the reduction of system input volume, NRW, water losses and efficiency. Data accuracy and reporting are excellent at metro-level but can improve for some of the smaller municipalities.

KwaZulu Natal has managed to maintain their system input, leakage levels and per capita consumption in the past 5 to 6 years. The estimated 2015/16 water balance, for all KwaZulu-Natal municipalities, indicates water losses of 299.80 million m³/a (43.0%) and NRW of 327.44 million m³/a (46.9%). There is however, significant scope for improvement in the reduction of system input, NRW and water losses in the province and WCWDM implementation levels must be elevated to ensure the targets of the KZN Metropolitan areas reconciliation strategy are achieved, especially with the looming / imposed water restrictions in the province. Data accuracy and reporting are excellent at metro and secondary city level but there is significant scope for improvement in reporting levels and data accuracy for the smaller municipalities.

The **Limpopo** province has been unable to reduce their demand in the past 9 years and water use efficiency is at an all-time high of 209 ℓ/c/d. The estimated 2015/16 water balance, for all municipalities in Limpopo, indicates water losses and NRW of 155.02 million m³/a (55.1%). The water balance has a low confidence due to the limited number of data sets. Leakage levels and NRW are also consistently increasing and WCWDM must be implemented as a matter of priority. There is significant scope for improvement in reporting levels, data accuracy and reduction of system input volume, NRW, water losses and efficiency.

The **Mpumalanga** province has been unable to reduce their demand in the past 8 years with some signs of improvement in 2013, although this requires further investigation. The estimated 2015/16 water balance, for all North West municipalities, indicates water losses and NRW of 105.58 million m³/a (51.1%). The water balance has a low confidence level due to the low number of data sets. NRW and water losses have reduced slightly over the past 8 years despite a significant increase in the system input volume and WCWDM must be implemented as a matter of priority. There is significant scope for improvement in reporting levels, data accuracy and reduction of system input volume, NRW, water losses and efficiency.

The **North West** province has been unable to reduce their demand in the past 9 years, except for 2011, and shows significant growth in the past 2 years. The estimated 2015/16 water balance, for all North West municipalities, indicates water losses and NRW of 105.58 million m³/a (51.1%). NRW have reduced slightly in the past year but water losses are consistently increasing. WCWDM must be implemented as a matter of priority. There is significant scope for improvement in reporting levels, data accuracy and reduction of system input volume, NRW, water losses and efficiency.

Northern Cape has managed to maintain their system input, NRW and per capita consumption in the past 5 to 6 years. The estimated 2015/16 water balance for all Northern Cape municipalities indicates water losses of 42.0 million m³/a (44.6%) and NRW of 44.5 million m³/a (47.3%). The water balance has a medium confidence level and is highly influenced by //Khara Hais (Upington) and Sol Plaatjie (Kimberley) which accounts for approximately 67% of the demand. Increased efforts are required by municipalities to implement WCWDM to ensure targets are achieved and water restrictions are mitigated in the driest province. There is significant scope for improvement in reporting levels, data accuracy, reduction of system input, NRW and water losses in the province.

Municipalities in the **Western Cape** have been doing well to maintain their system input volume for the past 3 to 4 years, while reducing their water losses and per capita consumption. The 2015/16 water balance for the 20 data sets, indicates water losses of 80.48 million m³/a (16.7%) and NRW of 102.7 million m³/a (21.3%). Municipalities must continue their current trends and increase their efforts to implement WCWDM.

Nationally, the system input volume has been consistently increasing since 2006 but the NRW has been improving since 2011 and water losses since 2009. The estimated 2015/16 water balance, for all municipalities, indicate water losses of 1462.01 million m³/a (36.1%) and NRW of 1659.59 million m³/a (41.0%). Per capita consumption has remained almost constant over the past 9 years, which is commendable, but WCWDM efforts must be elevated considering these figures are significantly above international benchmarks of approximately 180 l/c/d and the country is one of the 30 driest in the world. The reduction in NRW is encouraging but the figures are highly influenced by the metros that have made considerable progress to reduce their non-revenue water while there is significant scope for improvement in most of the other municipalities. The reduction in water losses is mainly due to the shift of water losses to unbilled consumption in the water balance.

Only continuous monitoring and analyses will provide a credible benchmark against which the progress made with the implementation of WCWDM may be measured. WCWDM must be implemented as a matter of urgency in all provinces, especially with the looming and reported droughts in the country. There is significant scope for improvement in reporting levels, data accuracy and reduction of system input, NRW, water losses and improved efficiency across the country.

7 RECOMMENDATIONS

The following recommendations are suggested to address the progress made with the implementation of WCWDM in the eight large water distribution systems.

- Maintenance of the reconciliation strategies must continue and be used to monitor the progress made in the implementation of WCWDM. Municipalities must actively participate and report at these meetings and use the outcomes to prioritise resources and budgets.
- Municipalities should increase their efforts to achieve the targets set under the various water reconciliation strategies to ensure water security. Targets need to be reviewed and reported on a regular basis.
- 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 and actively participate, budget through the IDP process and implement the results from the reconciliation strategies.
- Budgets are allocated towards new infrastructure projects through ACIP, MWIG, RBIG, MIG, etc. funding programmes but the management of these funds is fragmented with emphasis on new infrastructure and insufficient focus on WCWDM.
- Ongoing monitoring and reporting of municipal NRW and water loss performance by DWS against determined targets and baselines is critical.
- 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.
- Municipalities should increase their efforts to reduce NRW and the negative impact it has on their ability to generate own income and run a viable water business.
- Municipalities should, through on-going awareness programmes, encourage the consumer to appreciate the value of water and enforce the user pays principle.
- Municipalities should increase payment levels, encourage consumer fixing of leaks, and prosecution of illegal water connections and reduce theft of water.
- Municipal asset management needs to be improved to ensure greater sustainability of water supply services.
- There are close correlation between operations, maintenance, low water losses and NRW. Municipalities should implement proactive operations and maintenance programmes to coincide with WCWDM programmes.
- Closer involvement and collaboration with National Treasury and CoGTA is critical to ensure issues related to funding of WCWDM programmes, metering and billing issues are resolved with municipal finance departments.
- WCWDM should be included in the performance plans of organisations and senior executives to ensure execution and achievement of these plans.
- On-going provision of mentorship to municipalities through the DWS Regional Offices is critical.
- DWS Regional Offices / CMAs must upscale their skills and capacity to provide WCWDM support to municipalities, monitoring and reporting.

- Some Regional Offices appointed a PSP to provide support with the development of reporting templates, meeting with municipalities to confirm targets, analyse the water balance information and provide feedback. The reporting structures in these regions are well established and all municipalities are reporting on a quarterly basis. The initiative was supported by Regulations sending directives to municipalities who did not respond. A similar approach could be followed for all the other provinces to improve communications and water balance reporting.
- The Regulations Relating to Compulsory National Standards and Measures to Conserve Water (R509, 2001) state 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 their leaks. DWS should consider a policy whereby water services institutions are forced to either measure and control or fix leaks on private properties, but government cannot continue to fund new infrastructure projects to supplement leakage as a result of poor operations and maintenance. DWS is already encouraging the fixing of leaks through the War on Leaks programme.
- The national non-revenue water assessment completed in 2011 suggests that 45% of municipalities cannot provide basic information such as monthly consumption figures. One of the key challenges with gathering the information is the poor communication channels with municipalities which includes 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, various questionnaires, RPMS, Green drop, Blue drop etc. Government needs to revisit communication channels with municipalities. Communications should be more formal, avoid duplication and targeted at senior management in the organization. In this regard, the circulars provided by National Treasury provide clear guidelines to municipalities and communications are only with the mayor, municipal manager and CFO.
- The results from the No Drop audit must be used to motivate for funding in the next financial year. The No Drop incentive-based regulation programme should be rolled-out as planned in conjunction with the other Drop programmes to elevate WCWDM in the municipal environment. DWS should also enforce its regulatory mandate to penalise municipalities that do not comply.
- Closer involvement and collaboration with CoGTA and SALGA is critical to address issues relating to human resources' skills and capacity in municipalities, as well as resolving payment for services and unauthorised water use.
- Closer collaboration is required with other national, provincial and local departments that are big water users. These include Departments of Education, Correctional Services, Public Works and Housing to ensure leakages and wastage are brought under control.
- The recommendations of the Second Edition of the National Water Resource Strategy (DWA, June 2013), which calls for greater emphasis on meeting specific targets to reduce water loss, must be implemented. WCWDM measures will have multiple benefits in terms of the postponement of infrastructure augmentation, mitigation against climate change, support to economic growth and ensuring that adequate water is available for equitable allocation.
- The recommendations of South Africa's National Development Plan (Vision for 2030)(NPC, 2013), which calls for clear national and local targets to be achieved by 2017 and 2022, must be implemented.