7

WATER SECURITY

7 WATER SECURITY

7.1 Water availability and demand

Water supply in South Africa is mostly through water supply systems, consisting of a system of dams or standalone (surface water storage). Therefore, Water availability has been estimated at a water supply system (WSS) scale.

Ideally, the water balance is to be made available for each WMA. However, there is no latest available data on the water balances of WMAs. From a strategic planning and/or operation perspective, water balance data is made available for WSS. Key water resource systems are presented in Figure 7.1 below.

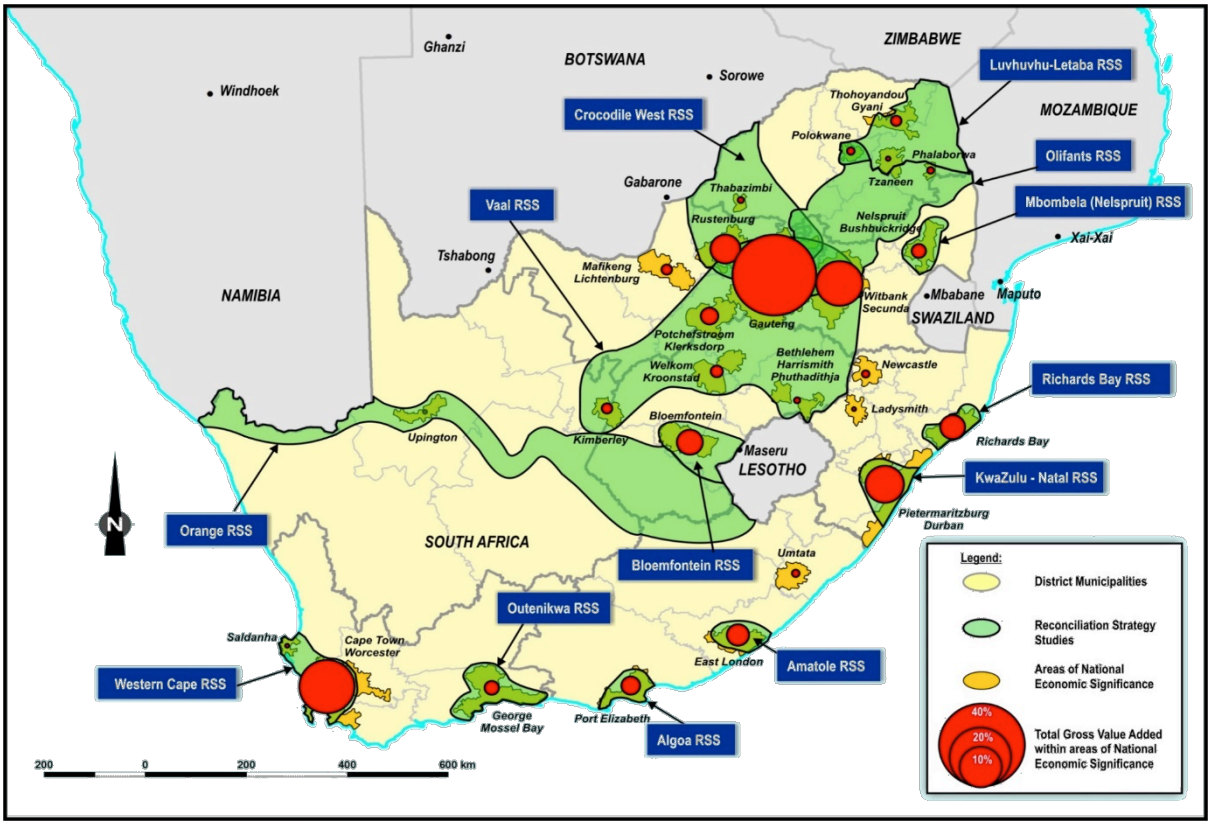


Figure 7.1 Key water resource systems

Based on data from 2019, as given in Table 7-1, large systems where water requirements exceed water available are:

- Quteniqua in WC (-6 M m³/year)
- Amathole in EC (-11 M m³/year)
- Olifants in Limpopo (-33 M m³/year)
- Orange in NC, FS, EC(- 147 M m³/year)
- Mgeni – KZN (- 62 M m³/year)

Nationally the water supply systems are at a deficit of 96 M m³/year (1%), predicted to be 3.4 % by 2040 (see Figure 7.2).

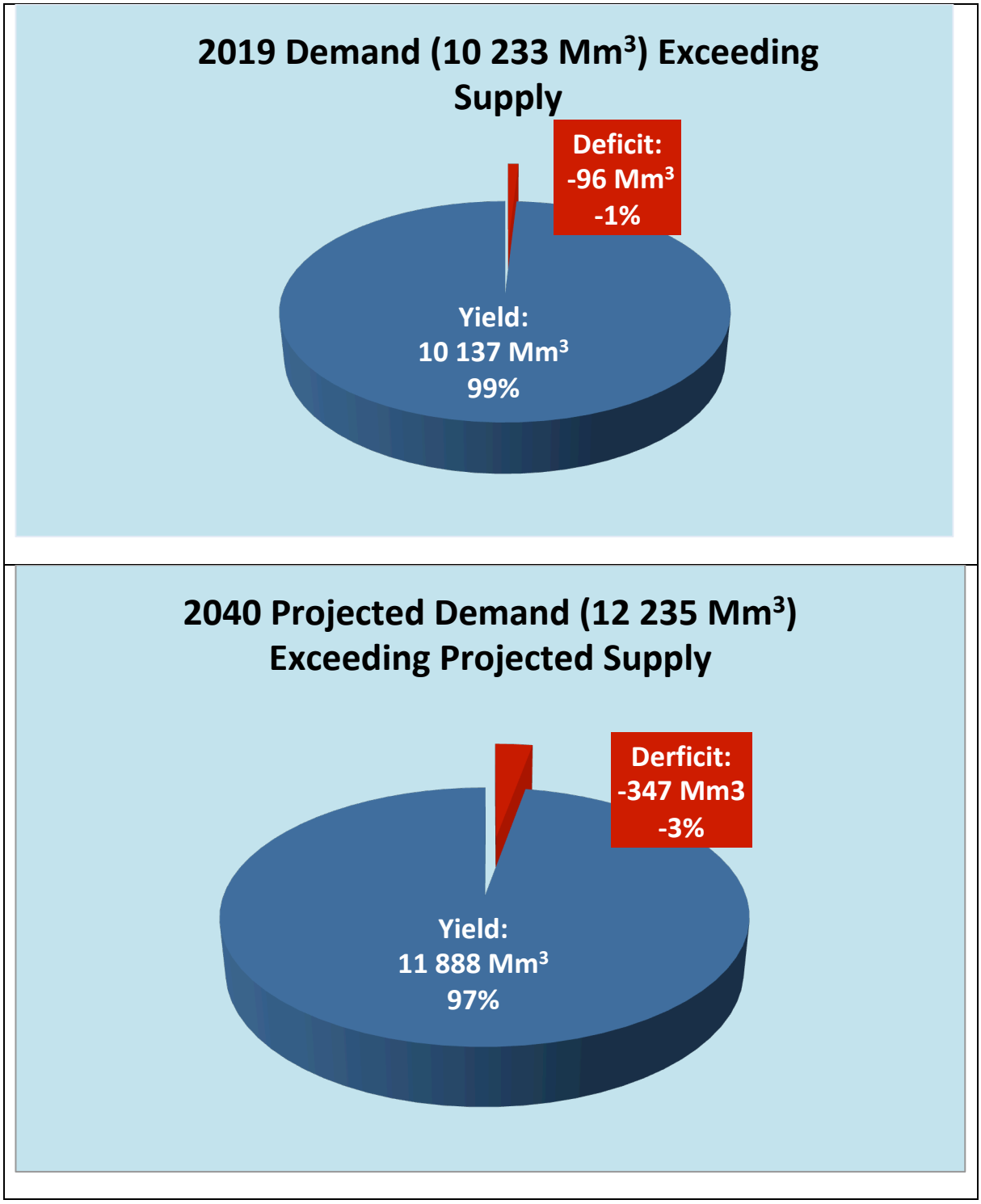


Figure 7.2 Projected demand in comparison to the yield in large water supply systems

Table 7-1 Water availability and requirement in large systems

System	Province	Systems in Mm^3	Current in Mm^3 /Year, the base year 2019			Future in Mm^3 /Year, projected for 2040		
		Total Storage capacity	Availability (integrated system yield)/ scheme yield	Demands (estimated requirements)	Deficit (-) / Surplus (+)	Availability (integrated system yield)/ scheme yield	Demands (estimated requirements)	Deficit (-) / Surplus (+)
Western Cape	WC	895	590	590	0	1 160	1 125	35
Outeniqua	WC	49	62	68	-6	62	90	-28
Algoa	EC	281	195	182	13	225	258	-33
Amathole	EC	241	104	115	-11	124	125	-1
Other Dams in EC	EC	989	36	5	31	36	7	29
Crocodile West	L, NW	495	1 200	1 170	30	1 460	1 365	95
Polokwane	L	254	268	261	7	433	408	25
Luvuvhu/Letaba	L	472	243	215	28	276	277	-1
Olifants	L	1 859	425	458	-33	442	566	-124
Crocodile East	Mp	340	67	62	5	76	76	0
IVRS	Mp, NW, GP, FS	10 566	3 154	3 120	34	3 640	3 600	40
Orange	NC, FS, EC	7 996	2 950	3 097	-147	2 766	3 150	-384
Mgeni and Coasts	KZN	978	499	561	-62	736	705	31

System	Province	Systems in Mm^3	Current in Mm^3 /Year, the base year 2019			Future in Mm^3 /Year, projected for 2040		
		Total Storage capacity	Availability (integrated system yield)/ scheme yield	Demands (estimated requirements)	Deficit (-) / Surplus (+)	Availability (integrated system yield)/ scheme yield	Demands (estimated requirements)	Deficit (-) / Surplus (+)
Richards Bay	KZN	413	239	225	14	290	292	-2
Bloemfontein	FS	84	105	104	1	162	191	-29
TOTAL		**25 912**	**10 137**	**10 233**	**-96**	**11 888**	**12 235**	**-347**

The water use per sector projections is given in Table 7-2 below. The irrigation and Municipal (urban water supply) remain the largest water use sectors. It is expected that relative to other use sectors, by 2040, the municipal and afforestation sectors will see an increase to 36% and 3%, respectively (see Figure 7.3).

Table 7-2 Water use per sector projections

User sector*	**Water requirements (million m³/annum)**				
	2015	**2020**	**2025**	**2030**	**2040**
Municipal (industries, commerce, urban and rural domestic)	4 447	4 900	5 400	5 800	6 600
Agriculture (irrigation and livestock watering)	9 000	9 500	9 600	9 700	9 800
Strategic/Power generation	362	390	410	430	450
Mining and bulk industrial	876	921	968	1 017	1 124
International obligations	178	178	178	178	178
Afforestation	431	432	433	434	434
Total	**15 294**	**16 321**	**16 989**	**17 559**	**18 586**

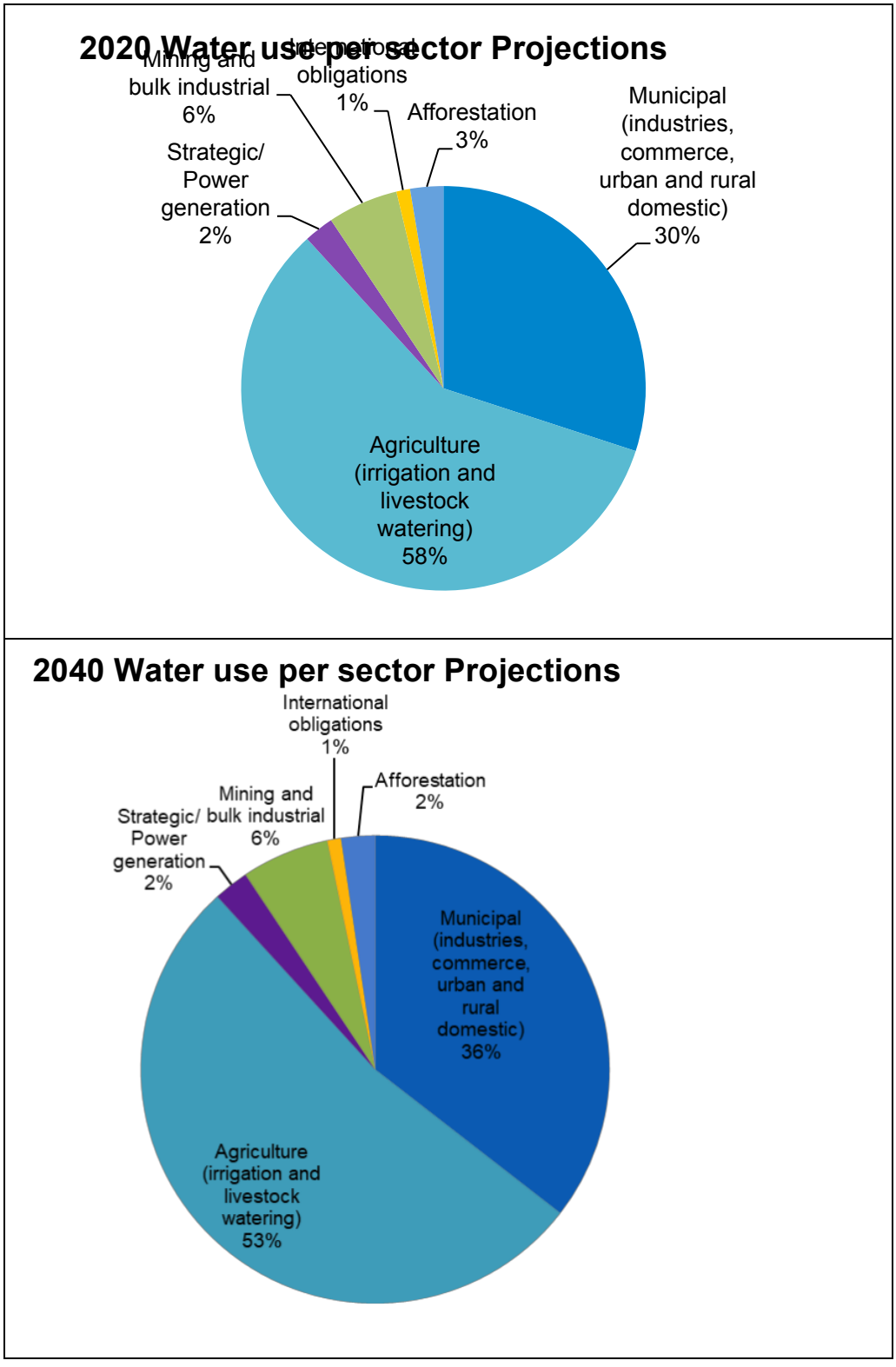


Figure 7.3 Water Use per sector 2020 and 2040 Projections

7.2 Water Reconciliation Strategies

The objective of the reconciliation strategy within a water supply system is to reconcile or find a balance between the current and future water requirements by implementing appropriate intervention measures to increase the available water, conserve water through water conservation and demand management measures, as well as improve the water quality in the river systems.

The Department has recently completed the reconciliation strategies for the Integrated Vaal River System, Mbombela water supply system, Algoa water supply system, and the Richards Bay water supply system. The interventions in these areas have been based on the recommended reconciliation options.

i. The Integrated Vaal River System Reconciliation Strategy

The Vaal Catchment consists of the Upper, Middle, and Lower Vaal River WMAs. Due to numerous inter-basin transfers that link the major Vaal WMA with other WMAs, the reconciliation planning is done in the context of the integrated Vaal River System, which also includes portions of the Komati, Usuthu, Thukela, and Senqu River (located in Lesotho) catchments. Significant water transfers also occur to water users in Olifants and Crocodile (West) River Catchments, of which most are totally dependent on water resources of the Integrated Vaal River System.

The main users of the IVRS water resources are bulk industrial users (Eskom and Sasol), urban users (Rand Water and Sedibeng water), and irrigators (predominantly the Vaalharts Scheme).

The following options are recommended:

- **Water Conservation and Demand Management** - Water loss reduction to reduce water requirement growth.
- **Removal of unlawful irrigation** - Finalize Verification and Validation of lawful water use.
- **Reuse** - Carry out a Regional Reuse investigation. Implement reuse where feasible
- **Lesotho Highlands Water Project Phase 2** - Implement project, finalize completion of Polihali Dam and other associated infrastructure construction.
- **Yield Replacement: Orange River** - Finalise feasibility to determine suitable option (Noordoewer/Vioolsdrift, Verbeeldingskraal). Implement a project to construct the scheme

The status of the implementation of some of the interventions is summarized in Table 7-3.

Table 7-3 Status of implementation of the intervention plans

Intervention	Summary of implementation progress
WCWDM	Limited progress made, some successes of Rand Water Project 1600, Impacts not yet seen on water balance, greater attention required, Municipalities to improve commitment of financial resources
Removal of unlawful Irrigation	Initially some progress made. Successful removal of 80 million m3 of unlawful irrigation. Recent years have seen slowdown of progress. Validation and Verification completion delaying further implementation. Northern Cape continuing with efforts, Free State and Gauteng committed to restarting process. Target to remove additional 75 million m3.
Reuse of treated effluent and other discharges	Short Term AMD solution implemented. Long Term AMD solution requires further investigation. CoT reuse plans slowed down due to budget constraints. Overall Regional reuse feasibility investigation required. Ongoing links to Crocodile (West) Reconciliation Strategy implementation plans.
New Infrastructure construction	Implementation of LHWP Phase 2 delayed till earliest date of April 2027 for delivery. Yield replacement Dam in Orange River Feasibility Study started, still to be completed before best option determined. Earliest data for yield replacement set at 2028.Improved maintenance of existing transfer infrastructure required.

ii. Mbombela Reconciliation Strategy

The major water requirements within the Mbombela Water Supply System are for irrigation, making up 54% of the total Crocodile and Sabie catchment requirements. Sugarcane is the predominant crop in these two catchments. Cross-border flows for the Crocodile and Sabie Rivers have a minimum requirement of 37 million m^3/annum according to the InoMaputo Water Use Agreement to cross the border from South Africa into Mozambique.

The Crocodile system provides water to several users along the stretch of the river and downstream of the main dam for the system - Kwena Dam. The yield of the Crocodile River System is influenced directly by the abstraction volumes and location of the water users within the system. The main water resource infrastructure in the Sabie River is the Inyaka Dam which supplies the Sabie and Sand catchments via the Bushbuckridge Transfer Pipeline.

Options for reconciliation and or intervention measures for the Crocodile System include:

- WCWDM
- Removal of Invasive Alien Plants
- Surrender Irrigation allocations
- Strict restriction rules on low-priority users
- Releases from the Ngodwana Dam

Reconciliation options and or intervention measures for the Sabie System include:

- WCWDM
- Removal of Invasive Alien Plants
- Development of groundwater
- Additional return flows from treated effluent

iii. Algoa Reconciliation Strategy

The Algoa WSS currently comprises three major dams in the west, several smaller dams, a spring situated near NMBM, and an inter-basin transfer scheme from the Orange River via the Fish and Sunday Rivers to the east. Five water user categories included domestic/industrial, Gamtoos irrigation, other irrigation, environmental, and losses.

Urban water use from the Algoa Water Supply System is more than 60% of total use from the system and is expected to increase. Water use within the Kouga Municipality is 10.0 million m3/a (27.3 Mℓ/d), with an estimated bulk water requirement of 13.0 million m3/a (35.5 Mℓ/d). Of this, 5.85 million m3/a was supplied from the Algoa WSS in 2016/17. The Municipality plans to develop a long-term Water Provision Master Plan with reference to the upgrading and rehabilitation of bulk infrastructure. In the future, Groundwater from the Humansdorp area will be used by Kouga LM. There is a possibility of the supply of additional Orange River water to the NMBM, in lieu of more water supplied from the Kromme River sub-system to the Kouga LM and the proposed power plant.

The following interventions are recommended:

- **Further allocation of Orange River water to NMBM**

The concept of the further phasing of the NCLLS (post Phase 4) of transferred Orange River water has been added, termed Phase 5. The assumed yield of the Nooitgedagt Phase 5 Scheme has been assumed to be 18.25 million m3/a (50 Mℓ/d). Conveyance to NMBM could be by either of the two-bulk supply (high-level and low-level) pipelines. Should the capacity of these pipelines be exceeded (assuming that supply cannot be boosted), a further bulk supply pipeline would be required.

- **Groundwater supply**

The yields of the Coega Fault, Moregrove Fault, and Jeffreys Arch aquifers have been revised, while in some areas, the original yield estimates have not been changed. The total long-term yield of the eight potential groundwater interventions has been updated from 29.5 million m3/a to 36.0 million m3/a.

- **Large seawater desalination scheme**

A potential large seawater desalination scheme, with a capacity of 87.6 million m3/a (240 Mℓ/d) has been added as a potential intervention to consider for implementation should the allocation of transferred Orange River water be revoked.

iv. Richards Bay Reconciliation Strategy

Intervention options in the Richards Bay system comprise the implementation of combinations of various reconciliation options over time and can be divided into two main categories, namely:

- Reconciliation options are used to reduce the water requirements; and
- Reconciliation options that will increase the yield available from the existing water resources.

The following interventions are recommended:

- **Reducing water demand by introducing WCWDM** - KCDM have recently (May 2020) started a WCWDM project aiming to reduce water losses in their water supply schemes.
- **Remove alien vegetation** - removing alien vegetation is a standard intervention measure for saving water in all Reconciliation Strategies and is very important in severely water-stressed catchments.
- **Water Reuse** - Indirect effluent reuse, whereby treated effluent could be discharged to Lake Mzingazi for indirect potable and industrial reuse. Also, consider the blending of treated effluent at the Mzingazi WTW or artificial recharge to create a barrier to prevent seawater intrusion. Potential uptake of treated effluent by bulk industrial water users close to the Arboretum macerator. Potential users would need to be identified.
- **Transfers from Neighboring Catchments -** an increase in the Thukela transfer from Middeldrift be compared with other transfer options (Lower Thukela Coastal pipeline and Umfolozi off-channel storage Dam) at a pre-feasibility level, after which a decision can be made as to the preferred option. However, drought hit the catchment shortly after the completion of the Strategy (2015), and the upgraded Thukela transfer was then selected as an emergency scheme. Construction of the upgrade began, which would increase the size of the existing transfer from 1.2 m^3/s to 2.4 m^3/sd.

- **New Dam Construction -** a new dam on the Nseleni River. The proposed dam will be located on the Nseleni River, a tributary of the Mhlathuze River just upstream of the Bhejane township, from where water can be released downstream to Lake Nsezi for abstraction.
- **The raising of Goedertrouw Dam** - the dam can be raised by 2.8 meters which will result in an increase in storage capacity from the existing volume of 301 million m^3 to 336 million m^3. The corresponding increase in yield to the system would be 5.8 million m^3/annum.

7.3 Water Resources Development

Water resource development mainly addresses issues such as socio-economic uplifting and development, ensuring the availability of safe water supplies to communities, and meeting the water requirements for industries and other sectors critical for economic growth. The Department has been involved in the development of water resources infrastructure development to augment water supply and safeguard future water security. Estimated funding of **at least R126 Billion** is required to finance key water resource development projects **in the next ten years.** A schematic illustration of the phases for various projects is presented below.

Furthermore, the list of prioritized water resources development per water supply system is given in Table 7-4.

Resource Development Flow Chart

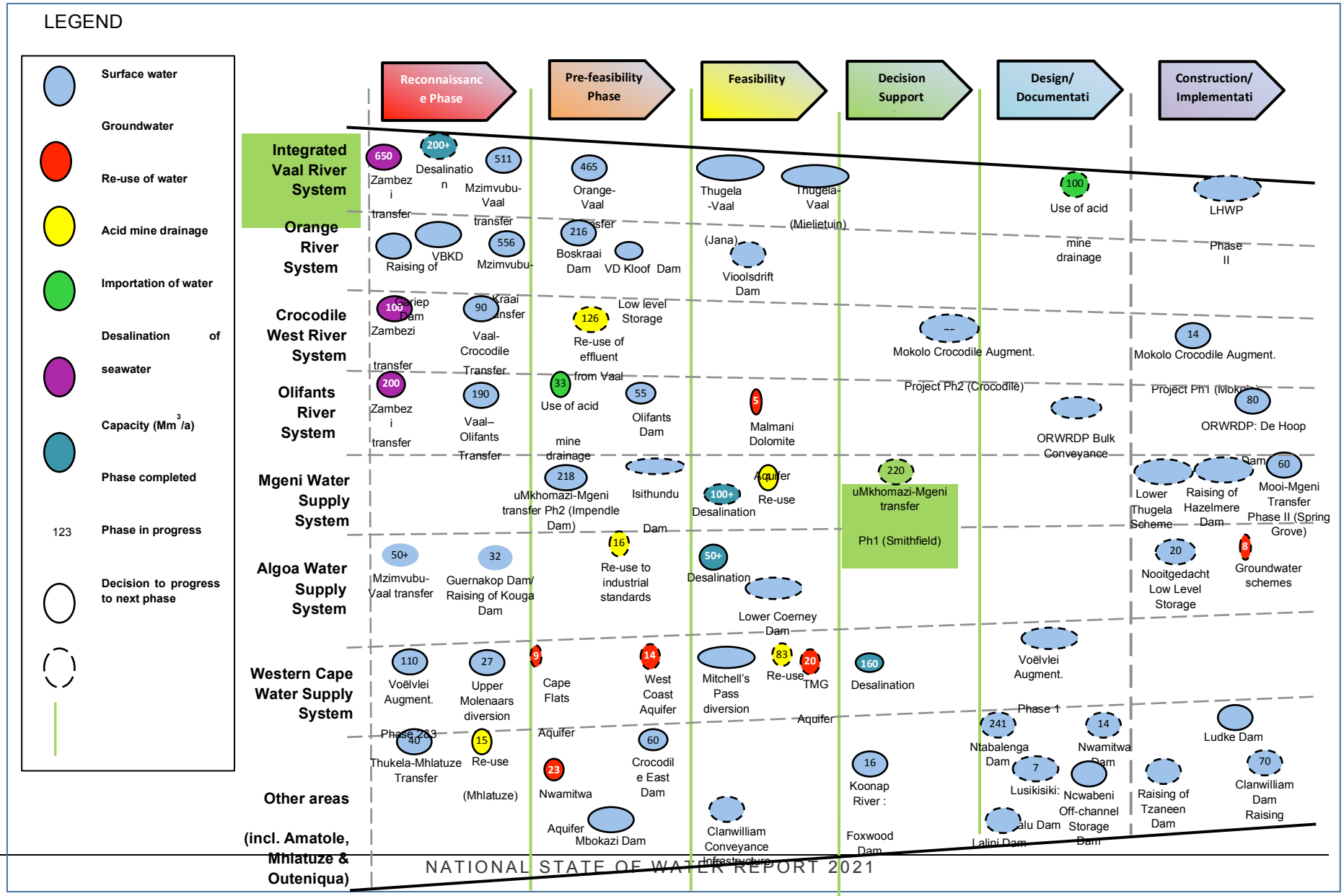


Table 7-4 Current Prioritized Water Resource Development

Water Resource (WR) System	**Current Prioritized Water Resource Development Option and Estimated Date of Water Delivery**		
	2020 - 2030	2031 - 2040	2041 – 2050
Integrated Vaal River System	Phase 2 of Lesotho Highlands Water Project by 2025 (R32.6 Billion)	Use of Acid Mine Drainage	Thukela Water Project (Jana & Millietuin Dam s)
Orange River System	Gariep Pipeline by 2024 (R8 Billion), Vioolsdrift Dam in the Lower Orange (R6 Billion)	Dam at Verbeeldingskraal in the Upper Orange River	
Crocodile West River System	Mokolo Crocoldile (West) Water Augmentation Project (MCWAP) by 2024 (R15 Billion)	Re-Use of Effluent	Re-Use of Effluent
Olifants River System	Olifants Water Resource Development Project (ORWRDP) Phases 2B (R6.6 Billion) , 2D (R1.8 Billion) , 2E (R0.5 Billion) & 2F (R2.3 Billion) Exploitation of the Malmani Dolomitic Groundwater Aquifer	Re-Use of Effluent	Olifants Dam (Possibly Rooipoort Dam)
Mgeni Water Supply System	Phase 1 of uMkhomazi Water Project by 2026 (Dam at Smithfield , transfer tunnel and Associated Works) (R18.5 Billion)	Re-Use of Effluent	Phase 2 of uMkhomazi Dam (Dam at Impendle and Associated Works)
Algoa Water Supply System	Lower Coerny Balancing Dam Ground Water Development Scheme	Re-Use of Effluent	Kouga Dam Augmentation Scheme
Western Cape Water Supply System	Berg River – Voelvlei Augmentation Scheme (BRVAS) by 2021 (R0.9 Billion) Table Mountain Group Aquifer Scheme	Breede-Berg River Augmentation Scheme (Mitchell's Pass Diversion & Raising of Voelvlei Dam)	Raising of Lower Steenbras Dam Desalination of Sea Water

Eastern Cape Water Schemes	Mzimvubu Water Project (R17.9 Billion), Koonap River Development Project (Foxwood Dam) (R3 Billion), Lusikisiki Water Project (Zalu Dam) (R2 Billion)	Groundwater Development	Phase 2 of Mzimvubu Water Project
Letaba Water Supply System	Groot Letaba Water Augmentation Project (GLeWAP) (Nwamitwa Dam (R1.7 Billion) & Raising of Tzaneen)	Groundwater Development	Water Re-Use
Olifants-Doorn Water Scheme	Clanwilliam Dam Raising (R 3.3 Billion) Phase of Conveyance System from the Raised Clanwilliam Dam (R6 Billion)	Phase of Conveyance System from the Raised Clanwilliam Dam	Groundwater Development

7.3.1 Augmentation Projects

Water infrastructure is aging and becoming dysfunctional. Aged infrastructure results in huge water losses and water supply backlogs. Infrastructure renewal lies in the responsibility of the Infrastructure Management Branch within the Department, which is also responsible for the management of Government Water Schemes (GWSs). Table 7-5 reports the progress made on augmentation projects that are being implemented by the Chief Directorate: Infrastructure Development for the period up to the end of September 2021.

7.3.2 Trans-Caledon Tunnel Authority

Trans-Caledon Tunnel Authority (TCTA) is an institution directed to raise funds and implement a portfolio of projects which are at various phases namely, project preparation phase, project implementation phase and close-out phase. Table 7-6 reports on a portfolio of projects including a status update on those projects that are on hold due to funding and other constraints. In addition, TCTA oversees the Operation and Maintenance of several other projects.

Table 7-5 Progress of augmentation projects across the provinces

Province	Project Description	Projects status	Other
Limpopo	Nandoni Dam	Giyani water services project including pipeline from Nandoni Dam on progress	Nandoni water purification upgrade including possible waste-water treatment plant
	Phase 2 of the Olifants River Water Resources Development Project (ORWRDP – 2) involves the development of additional water resource infrastructure consisting of the De Hoop Dam on the Steelpoort River	A BOQ for repairs to the Buffelskloof houses, water supply and sewage network and Tsehla Trust furrow has been compiled and is being finalised	
Western Cape	The project for the Raising of Clanwilliam Dam is aimed to provide additional water to improve the assurance of supply for agriculture, provide for water	The civil design is complete. Most of the construction drawings are complete and have been formally issued to the Contractor. Construction progress is at 21%	

	allocations to resource-poor farmers and to address dam safety aspects. The scope of the work includes the raising of the existing dam wall by 13 metres, the relocation of a section of the N7 directly affected by the raised dam wall and the raising of the secondary provincial roads affected by the Full Supply Level	completion	Upgrade of Greater Brandvlei Dam Scheme
Gauteng	Lesotho Highlands Phase 2	Lesotho Highlands Phase 2 in progress	
KZN	uMkomazi Water Project	Raising of Hazelmere Dam. The project for the Raising of Hazelmere Dam is aimed to augment the water supply to the KZN North Coast by raising the dam wall by 7 metres to increase the yield of the dam for medium term supply. The scope of the work includes the construction of a piano key weir on the spillway, the installation of rock anchors, foundation grouting and other minor works	
Eastern Cape	Cwabeni off-channel storage dam The project involves the construction of a new concrete faced zoned rockfill dam on the Ncwabeni River, with a multi-level intake tower, an abstraction weir on the Umzimkhulu River and a pump station and pipeline to pump water into the off-channel storage dam	Civil and mechanical designs that are independent of the geotechnical investigations and surveys are continuing. Preliminary design is 85% complete, detailed design is 22% complete and tender documentation is 8% complete. The procurement of environmental engineering, geotechnical engineering and surveying services required to advance the design work is being hindered by the lack of funding for the project	

Table 7-6 TCTA Projects Progress end of September 2021

No.	Project Name	Start Date	End Date	Project description	Status
PROJECTS AT PREPARATION PHASE					
1.1	uMkhomazi Water Projects – Phase 1	February 2019	2028	Water requirement projection indicates that the Mgeni System is experiencing a deficit since 2016 and therefore there is a need for new water resources, hence uMWP-1. uMWP-1 consists of Bulk raw water implementation by TCTA and Bulk Potable Water Implementation by Umgeni Water. The Bulk Raw Water portion consists of: • 81m high dam and appurtenant works at Smithfield on the uMkhomazi River near Bulwer. • Conveyance infrastructure (32km 3.5m diameter tunnel and 5km 2.6m diameter raw water pipeline) to the proposed Umgeni Water's Water Treatment Works (WTW) in the uMlaza River valley. Cost at Completion: R 23.243 billion	Design Complete: N/A
PROJECTS AT OPERATIONAL PHASE					
2.1	Berg River Voelvlei Augmentation Scheme (BRVAS)	May 2017	June 2025	The Water Reconciliation Strategy for the Western Cape Water Supply System (WCWSS) indicates that the system is projected to be in deficit soon and should have been augmented by at least 2019/20 to avert a serious shortfall. The urgent need for augmenting the	Design Complete: 0%

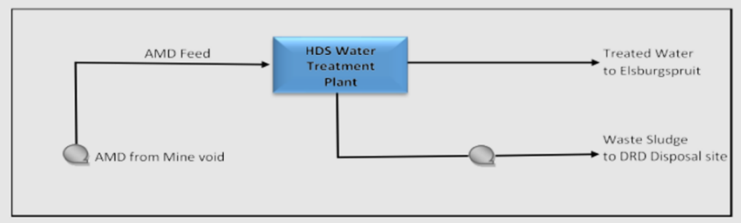
No.	Project Name	Start Date	End Date	Project description	Status
				WCWSS has become evident by the system's inability to cope with the current drought situation. BRVAS is conceptualised to abstract winter flows from the Berg River and pump it to the existing Voëlvlei Dam, increasing the yield by 23 million m^3 per annum and consists of: • abstraction works in the Berg River - diversion weir, sediment traps, 5MW pump station; • canoe chute-fish way; and • a 6.3 km long pipeline to deliver the water to the Voëlvlei Dam Cost at Completion: R 728 million	
2.2	Mzimvubu Water Project (MWP)	2019	2022	Two multi-purpose dams and associated infrastructure, Ntabelanga and Lalini dams, on the Tsitsa river, which is a tributary of the Mzimvubu river, will be developed to provide for potable water supply, irrigation, hydropower, and tourism. Government has classified the project as a Strategic Integrated Project under SIP-3. The project aims to develop the water resources in the Mzimvubu river catchment to provide a stimulus for the regional economy, in terms of domestic water supply, irrigation, hydropower generation and job creation. The project was envisaged to be implemented in 4 stages (2018/19). Stage 1 is Advanced Infrastructure, mainly access road. Stage 2 is the Implementation of Ntabelanga	Design Complete: 0%

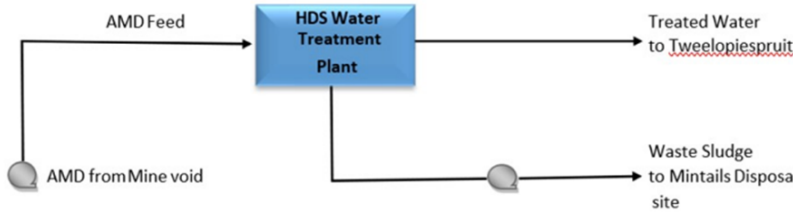
No.	Project Name	Start Date	End Date	Project description	Status
				Dam and Water Treatment Works. Stage 3 involves the bulk distribution system. Stage 4 is the Irrigation and Hydropower components – roads, staff housing. TCTA is only providing Project Management advisory services for implementation of Stage 1. Cost at Completion: R 15 billion construction cost	
2.3	Mokolo and Crocodile River Water Augmentation Project-Phase 2A	April 2019	April 2028	Additional water from MCWAP-2A is required to provide Eskom with a second water source to run their two Waterberg power stations, Medupi and Matimba. This water is to further provide Medupi Power Station with enough water to operate the additional three Flue Gas Desulphurization (FGD) units and Matimba Power station to operate their 6 FGD units, which could not be supplied from the MCWAP-1 pipeline. It will also provide the Lephalale Municipality with water and provide Exxaro with required additional water to increase their mining capacity. The Industrial Development of the Waterberg area is one of the objects of the PICC SIP-01 programme, and the project will also aim to provide water to aid that industrialisation. MCWAP-2A consists of an abstraction weir, a River Management System and implementation of a 160 km water transfer infrastructure with a capacity of 75 million m3/annum with associated ancillary infrastructure. Design Complete: 99% Cost at Completion: R12.36 million	Design Complete: 99%

No.	Project Name	Start Date	End Date	Project description	Status
PROJECTS AT CLOSE OUT PHASE					
3.1	Olifants River Water Resources Development project –Phase 2C	March 2012	2022	The ORWRDP-2 bulk distribution system (BDS) transfers water from the De Hoop and Flag Boshielo dams for municipal and mining needs in the middle Olifants river catchment area, unlocking significant social and economic development. Phase 2C will improve water supply to Jane Furse / Nebo Plateau and for mining activities in the Steelpoort - Burgersfort area. Phase 2C has been implemented by TCTA as per revised Ministerial Directive Construction Complete: 100% Cost at Completion: R2 544 million	Construction Complete: 100%

PROJECTS ON HOLD				
Project		**Directive**	**Strategic Impact**	**Status**
4.1	Olifants River Water Resources Development Project – Phase 2B (ORWRDP-2B)	To source funding and implement commercial portion of Phase 2B. Augment water supply to Mogalakwena	To source funding and implement commercial portion of Phase 2B. Augment water supply to Mogalakwena Municipality	To source funding and implement commercial portion of Phase 2B. Augment water supply to Mogalakwena Municipality by 50 million m^3 per year. DWS signed MOI with Mines for the implementation of the outstanding phases on

No.	Project Name	Start Date	End Date	Project description	Status
		Municipality by 50 million m^3 per year. DWS signed MOI with Mines for the implementation of the outstanding phases on a JV basis with shared responsibility. TCTA awaits DWS guidance on what role TCTA will play within the new institutional framework. TCTA also placed this on agenda with new Minister		by 50 million m^3 per year. DWS signed MOI with Mines for the implementation of the outstanding phases on a JV basis with shared responsibility. TCTA awaits DWS guidance on what role TCTA will play within the new institutional framework. TCTA also placed this on agenda with new Minister	a JV basis with shared responsibility. TCTA awaits DWS guidance on what role TCTA will play within the new institutional framework. TCTA also placed this on agenda with new Minister
4.2	Acid Mine Drainage – Long Term Solution (AMD-LTS)	To fund and implement the AMD Long-term solution.		Desalination of partially treated acid mine drainage water from the Short-term Intervention to a potable or industrial standard.	TCTA Board raised the way forward on the implementation of the Long-Term solution during the meeting with the new Minister, feedback from DWS is awaited.
POTENTIAL PROJECTS					
Project		**Directive**		**Strategic Impact**	**Status**
5.1	Olifants River Water Resources Development Project (ORWRDP - 2D, 2E	Possible directive for TCTA to implement social phases related to Phases		Development of additional water resource infrastructure.	See ORWRDP-2B above

No.	Project Name	Start Date	End Date	Project description	Status
	and 2F) – Phase 2B	2D, 2E and 2F withdrawn.			
5.2	Nwamiwta Dam	Possible directive to TCTA to implement the project.		Implement the project. Increase in water supply for commercial and social use in the Tzaneen area.	Proposal made to DWS awaiting response.
OPERATIONS AND MAINTENECE					
6.1	Acid Mine Drainage Treatment Plants in the Western , Central and Eastern Basins	**Objectives:** To draw down the AMD Central Basin water level to be at or below the level recorded on 31 March2021. To operate and maintain the Central Basin – High Density Sludge (HDS) Water Treatment Plant in a cost effective and environmentally sustainable manner.  Winze 18 Shaft. During the year 1 April 2021 - 31 March 2022 the water level not to exceed 1m below shaft collar to operate and maintain the Western Basin - High Density Sludge (HDS) Water Treatment Plant in a cost effective and environmentally sustainable manner.			

No.	Project Name	Start Date	End Date	Project description	Status
					
6.2	Delivery Tunnel North (DTN) of the Lesotho Highlands Water Project (LHWP)	**Objectives:** • To transfer water as per LHWP Treaty, protocol VI. • To operate and maintain the Delivery Tunnel North transfer scheme in a cost effective and environmentally sustainable manner. Operator: TCTA in house Operation and Maintenance as per Treaty requirements. Target: Annual LHWC delivery schedule compliance, September 2021 plan was 80.0 MCM. Delivery for September 2021 was 80 00 MCM as per Ngoajane meter reading by LHDA on 1st October 2021. TCTA is performing the Operations and Maintenance of the Delivery Tunnel North transfer scheme in-house and form part of the TCTA staff costs.			

7.4 Water use efficiency

Efficient use of water is necessary for South Africa, a semi-arid country that is forecasted to face drier climatic conditions in the future, which will see the demand for water resources exceeding the conventional supply. Systemic water management improvements through technology can aid the monitoring of water use efficiencies, such as ensuring supply systems efficiency, which informs planning, maintenance, and refurbishment.

Water Losses in the Major water supply systems are reported. This is because about 60% of water is allocated to these major supply systems. This section aims to give the status and trends in the improvement within the eight large water supply systems, to potentially reduce system input volume, water losses, and non-revenue water (NRW) and subsequently improve water use efficiency.

South Africa is a semi-arid country that experiences high variability and uncertainty in available surface water resources. Water Conservation / Water Demand Management (WCWDM) is a key strategic intervention to reconcile water requirements with water availability.

7.4.1 Water Losses in Major Water Supply Systems

i. Integrated Vaal River System

The NRW trends are shown in Figure 7.4. NRW deteriorated in the past six months from 38.5% to 40.1% in December 2020. It is concerning to note that the System Input Volume (SIV) and NRW are steadily increasing and are at their highest level in 10 years. Municipalities in the IVRS exceeded their 2020 targets by 106 million m3 /annum and need to reduce their current consumption by 66 million m3 /annum to achieve their 2022 DWS target. The Rand Water consumption needs to be reduced by 140 million m3 /annum or 10% to achieve the Project 1600 target.

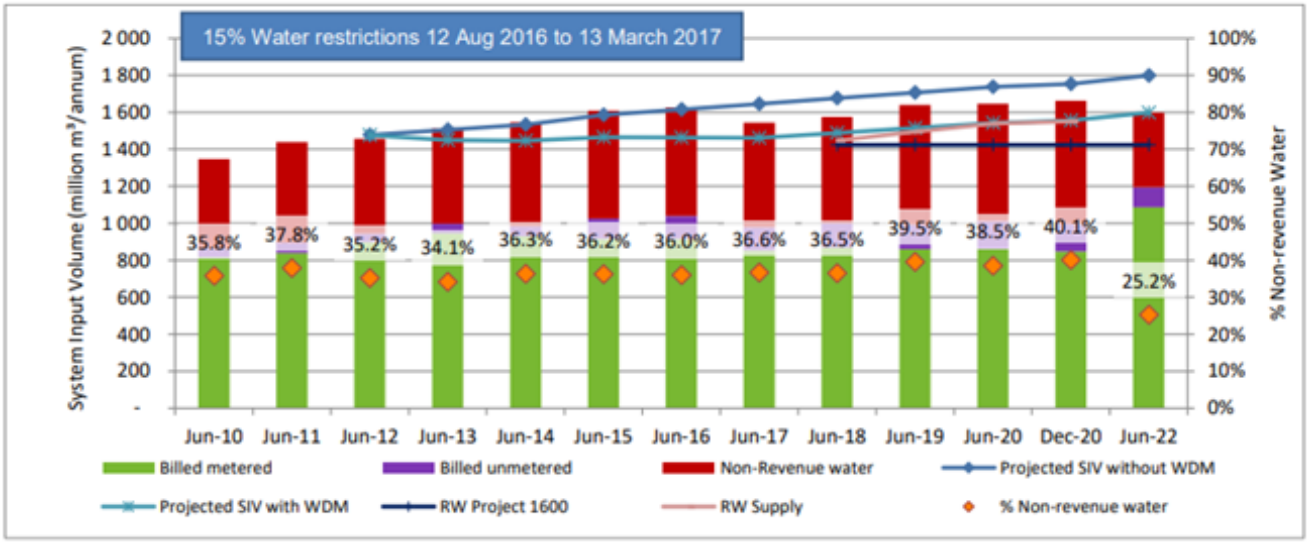


Figure 7.4 IVRS Water Balance Trend for Non-Revenue Water

ii. Crocodile West River Water Supply (CWRWSS)

No accurate assessment could be made of the NRW trend as presented in Figure 7.5, but indications are that municipalities are achieving the 2019 target. NRW is steadily increasing and reaching levels that could jeopardize the sustainability of the municipalities.

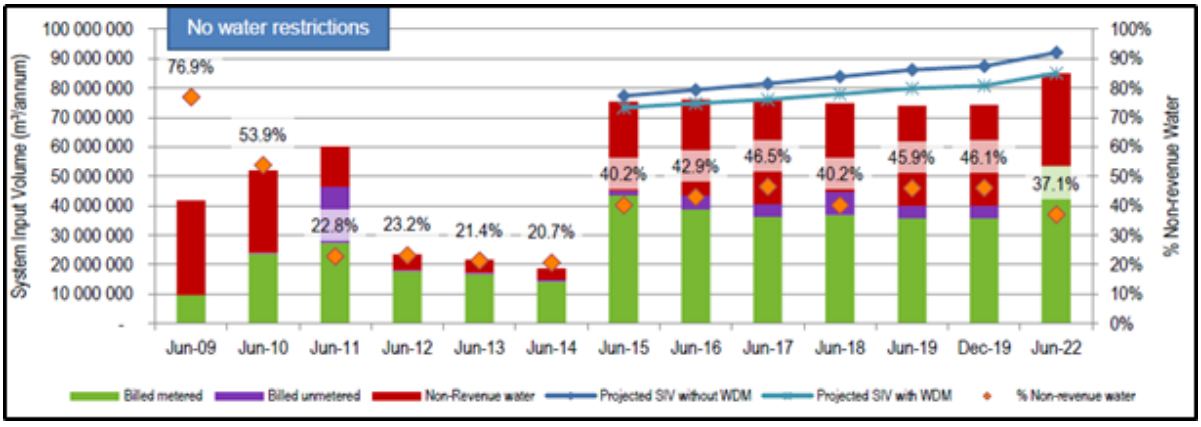


Figure 7.5 CWRWSS Water Balance Trends for Non-Revenue Water

iii. KwaZulu-Natal Coastal Metropolitan Water Supply System (KZNCMWSS)

The NRW and SIV trends for KZNCMWSS are presented in Figure 7.6. The results indicate that NRW is increasing, and municipalities are following the high population with WCWDM projected demand mainly because of water restrictions.

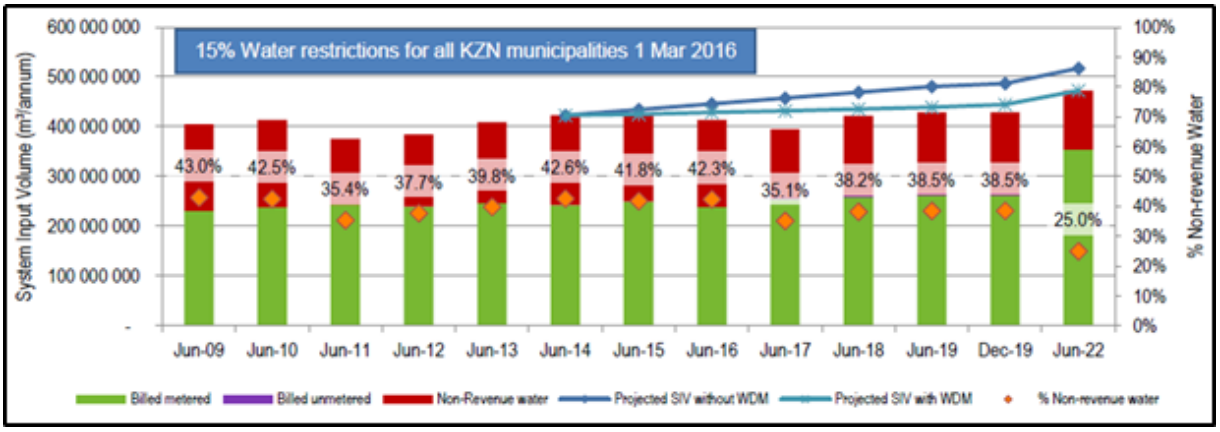


Figure 7.6 KZN Coastal Metropolitan WSS Water Balance Trend for Non-Revenue Water

iv. Western Cape Water Supply System (WCWSS)

The NRW and SIV trends are shown in Figure 7.7. Severe droughts have been experienced in this system since the end of 2014, which is a reason for the lower SIV.

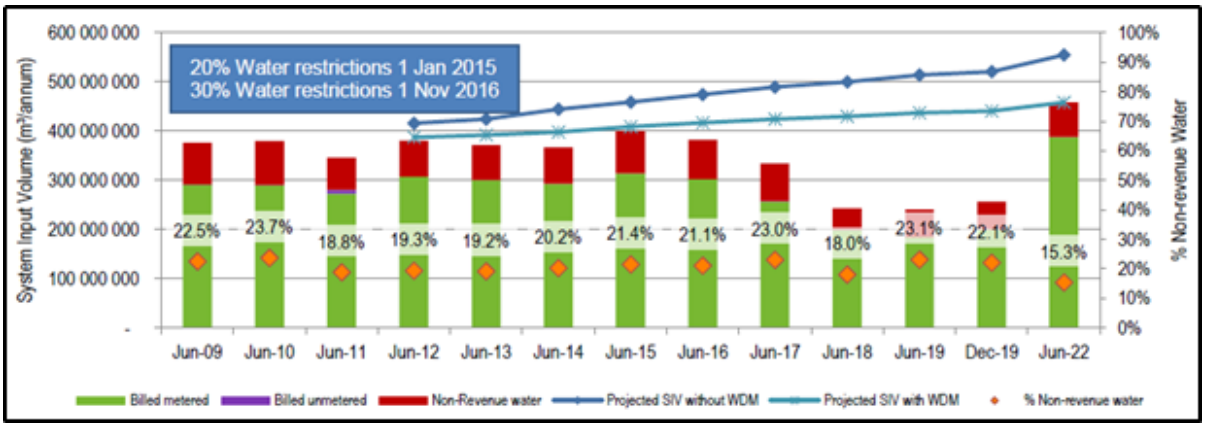


Figure 7.7 Western Cape WSS Water Balance Trend for Non-Revenue Water.

v. Algoa Water Supply System

The Algoa Water Supply System (AWSS) data includes Nelson Mandela Bay, Koukama, Kouga, and Sundays River Valley municipalities and have a medium confidence level. The average NRW is in line with poorly managed systems. The NRW and SIV trends for AWSS are presented in Figure 7.8.

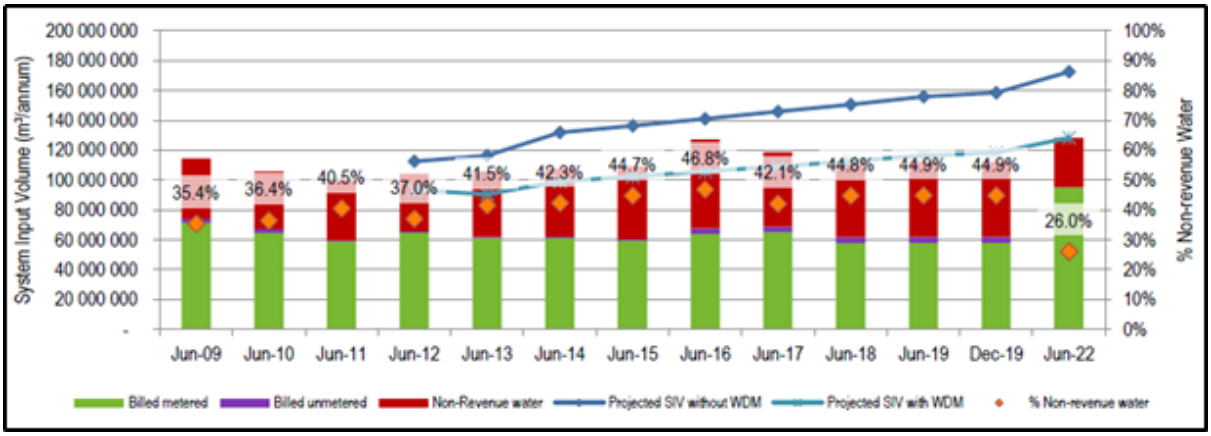


Figure 7.8 Algoa WSS Water Balance Trend for Non-Revenue Water

vi. Amatole Water Supply System

The NRW and SIV trends for Amatole Water Supply System (AmWSS) are shown in Figure 7.9. The data has a medium confidence level.

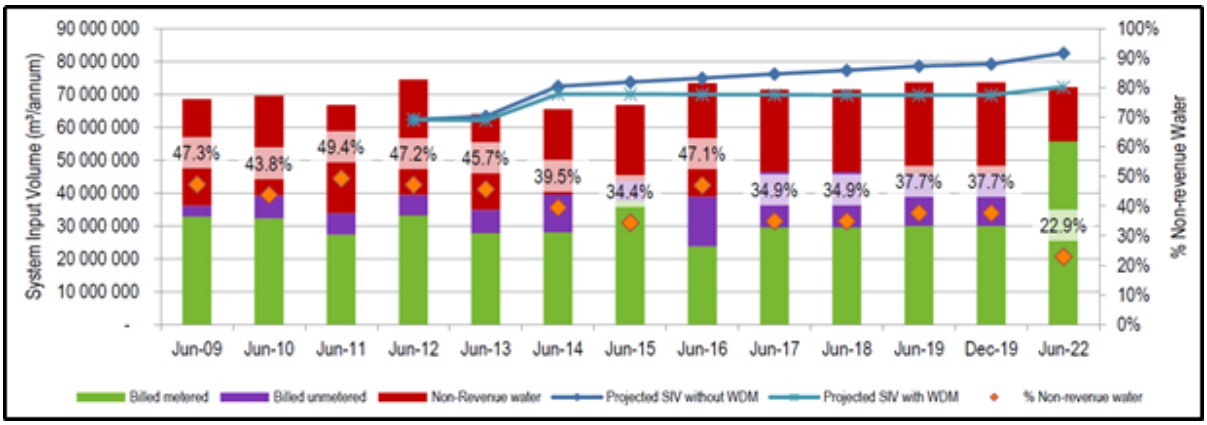


Figure 7.9 AmWSS Water Balance Trends for Non-Revenue Water

vii. Greater Bloemfontein Water Supply System

The Greater Bloemfontein Water Supply System (GBWSS) supplies water to the Mangaung Metro Municipality (MMM) and smaller towns in Naledi, Kopanong, and Mantsopa municipalities.

Figure 7.10 shows the NRW and SIV trends for MMM. The NRW of MMM reduced by almost 20% in the past year and needs further investigation. The MMM should strive to improve its water balance data. MMM has managed to achieve its water restrictions target.

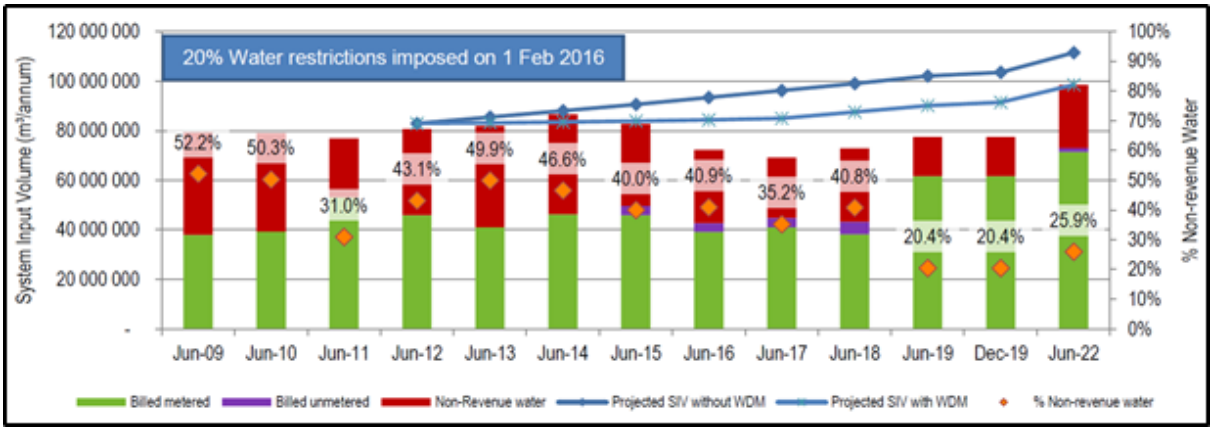


Figure 7.10 MMM Water Balance Trends for Non-Revenue Water

viii. Olifants River Water Supply System

Information regarding the total consumptive water use and losses in the towns within the Olifants River Water Supply System (ORWSS) was based on the limited WCWDM investigation carried out as part of the Olifants WCWDM Study. NRW is stable between 40% and 45%, as presented in Figure 7.11

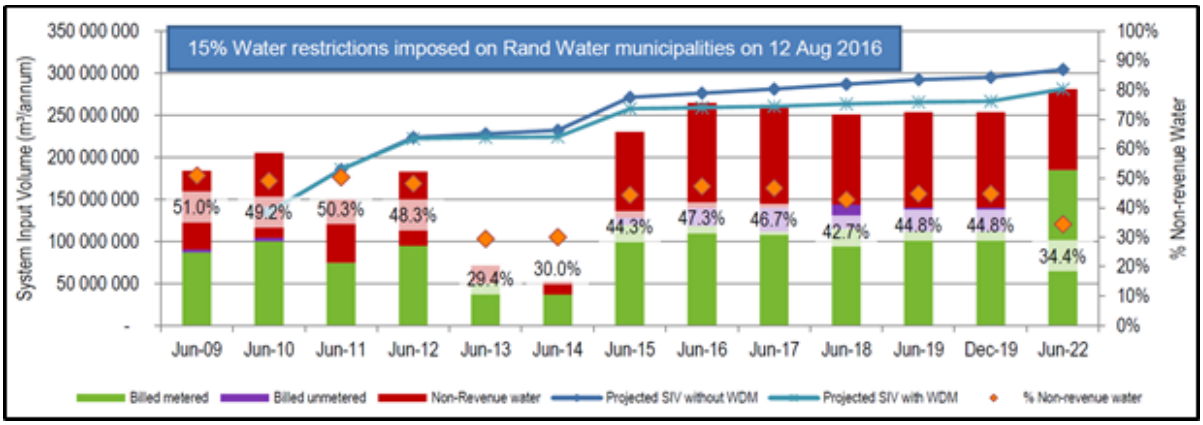


Figure 7.11 ORWSS Water Balance Trends for Non-Revenue Water

7.4.2 Consumption Trends

i. Integrated Vaal River System

The per capita consumption is shown in Figure 7.12 and has been reducing from 2015 because of some WCWDM interventions and imposed water restrictions. The current consumption is still high compared to the national benchmark of 236 ℓ/c/d, but the study area includes the highest number of wet industries in the country. The ℓ/c/d is expected to reduce to 251 ℓ/c/d if the 2022 target is achieved, and further improved efficiencies and water loss reduction could reduce this figure to an expected international benchmark of 180 ℓ/c/d.

Municipalities in the IVRS exceeded their December 2020 target by 106 million m3. Ekurhuleni, Mogale City, Govan Mbeki and Midvaal surpassed their 2019 water demand targets. The city of Johannesburg, City of Tshwane, Emfuleni and Rustenburg, the major contributors to water losses in the IVRS, have not achieved their targets and seem unlikely to do so within the next two years unless significant effort and funds are dedicated to water loss reduction.

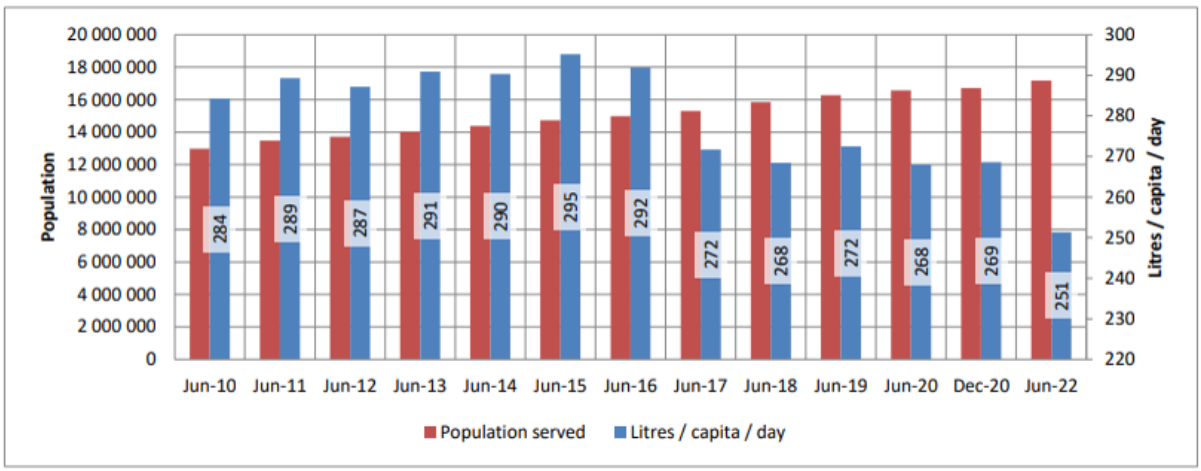


Figure 7.12 IVRS per capita consumption trend

ii. Crocodile West River Water Supply (CWRWSS)

The per capita consumption is presented in Figure 7.13. In December 2019, the consumption was estimated at 170 ℓ/c/d, which is in line with the level of service. The results indicate that progress has been made with the reduction of water losses within these municipalities, although the data had a very low confidence level.

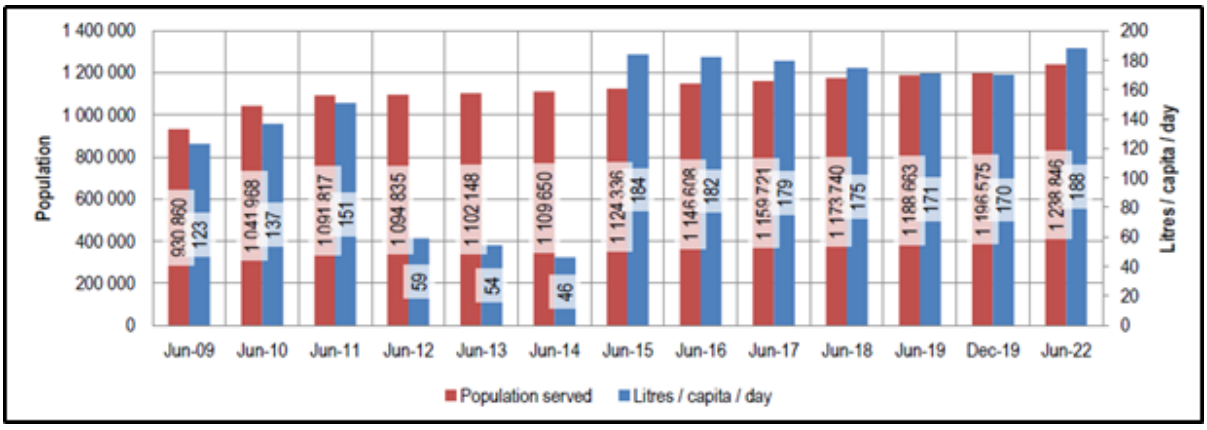


Figure 7.13 CWRWSS per capita consumption trend

iii. KwaZulu-Natal Coastal Metropolitan Water Supply System (KZNCMWSS)

The per capita consumption is presented in Figure 7.14, which has been consistently increasing since 2017, when water restrictions were lifted.

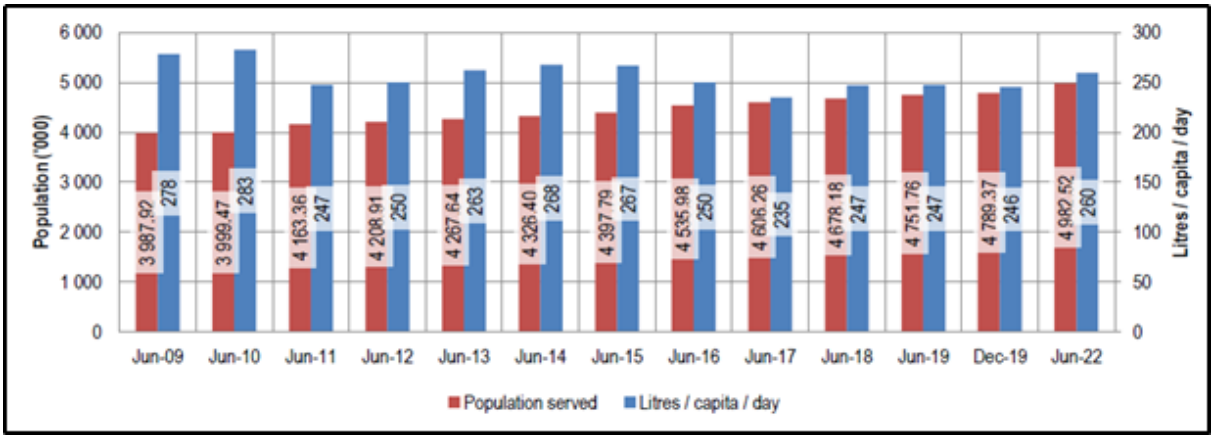


Figure 7.14 KZN Coastal Metro WSS per capita consumption trend

iv. Western Cape Water Supply System (WCWSS)

The per capita consumption is presented in Figure 7.15, which has been consistently decreasing over the past ten years. The average consumption of 127 ℓ/c/d is well below the national benchmark of 236 ℓ/c/d.

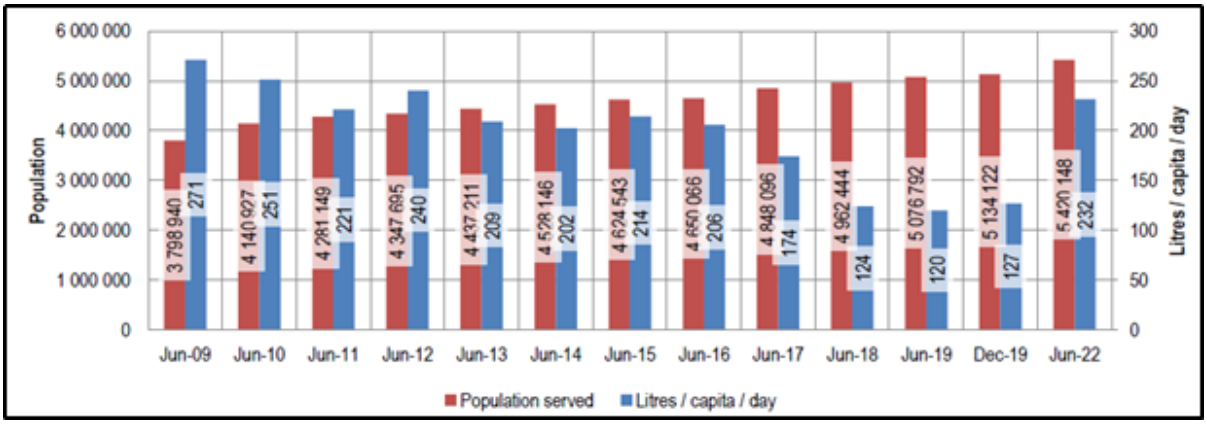


Figure 7.15 Western cape WSS per capita consumption trend

v. Algoa Water Supply System

The results indicate that NRW has been relatively constant over the last six years, at approximately 45%. The AWSS per capita consumption is shown in Figure 7.16, which has been between 199 and 277 ℓ/c/d over the past ten years. The average consumption is expected to reach 226 ℓ/c/d if the 2022 target could be achieved.

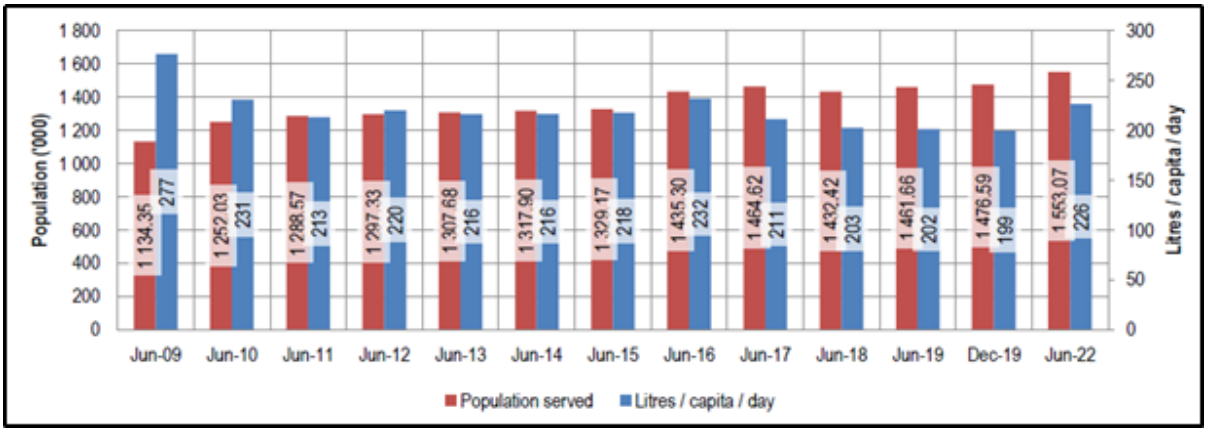


Figure 7.16 Algoa WSS per capita consumption trend

vi. Amatole Water Supply System

The per capita consumption for AmWSS is presented in Figure 7.17. The average per capita consumption has been stable over the past few years.

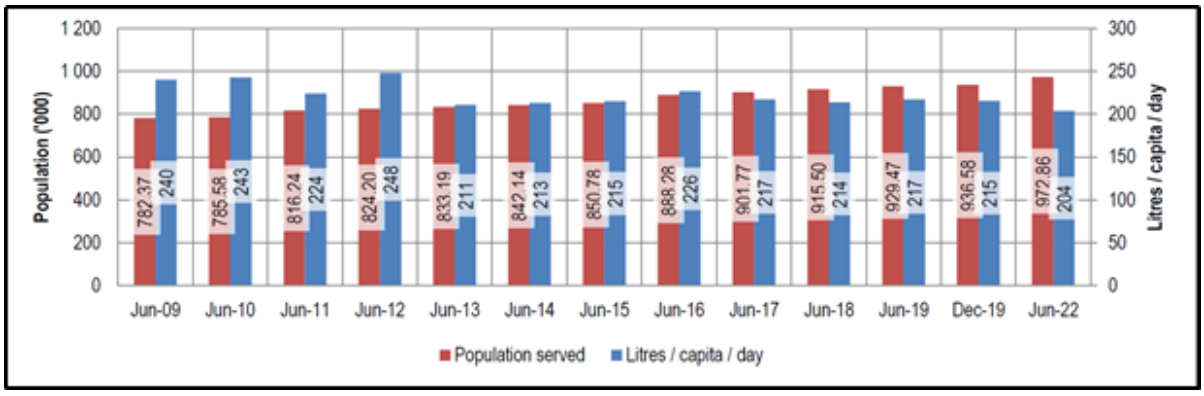


Figure 7.17 AmWSS per capita consumption trend

vii. Greater Bloemfontein Water Supply System

The per capita consumption for MMM is shown in Figure 7.18. The average per capita consumption has been improving over the past few years. However, it can improve considering the level of service. Restrictions of 15% were implemented in MMM during July 2015, which was increased to 20% in July 2016 due to resources being under stress.

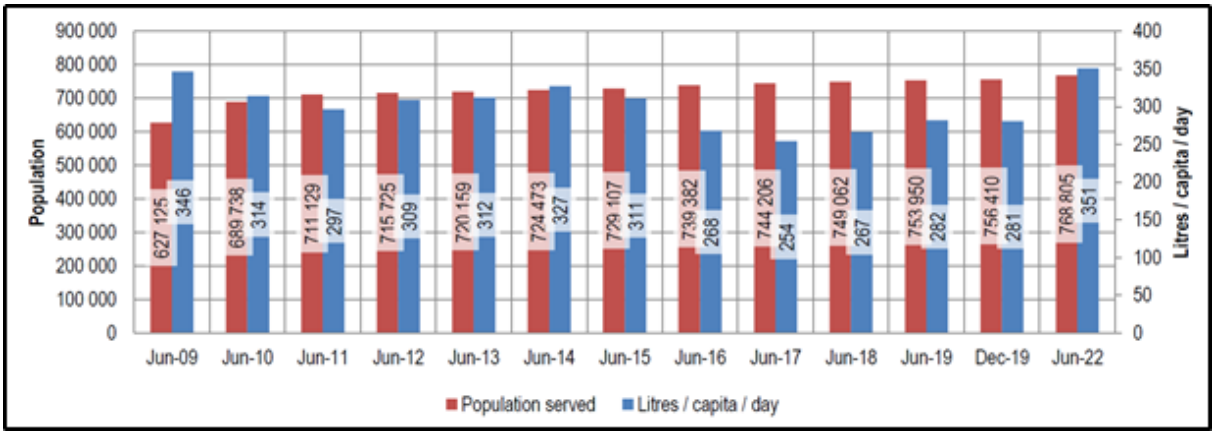


Figure 7.18 MMM per capita consumption trend

viii. Olifants River Water Supply System

The per capita consumption is shown in Figure 7.19. There is a very low confidence level in the unit consumption decrease over the past five years, however. The current estimated average consumption is 184 ℓ/c/d.

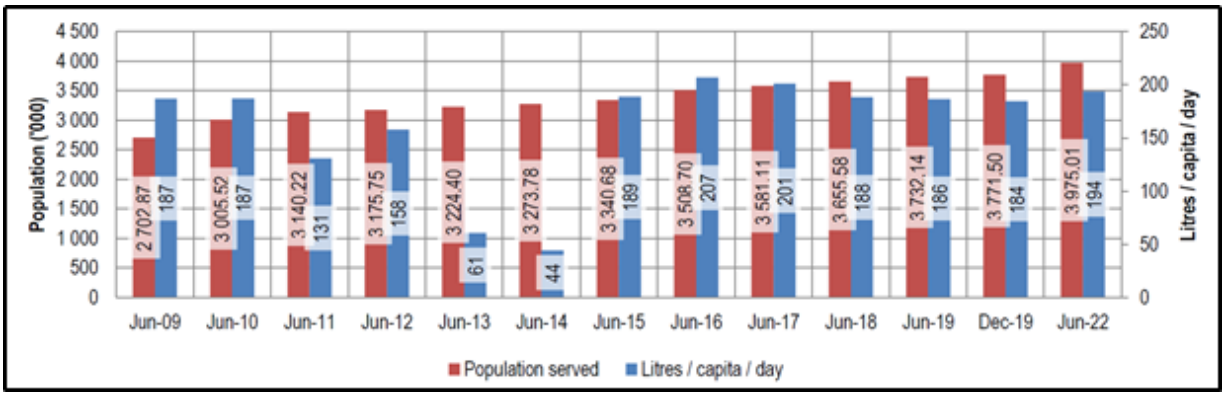


Figure 7.19 ORWSS per capita consumption trend