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 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.

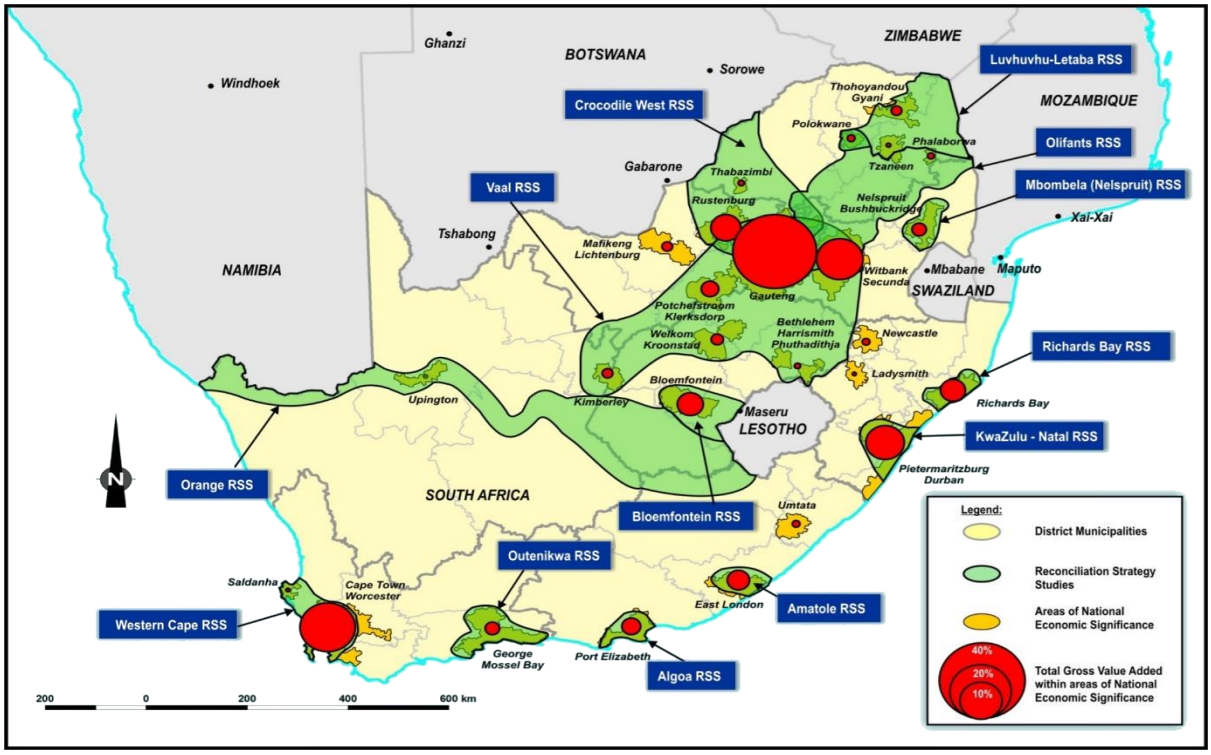


Figure 7.1 Key water resource systems

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

- Outeniqua 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)
- Umgeni – 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).

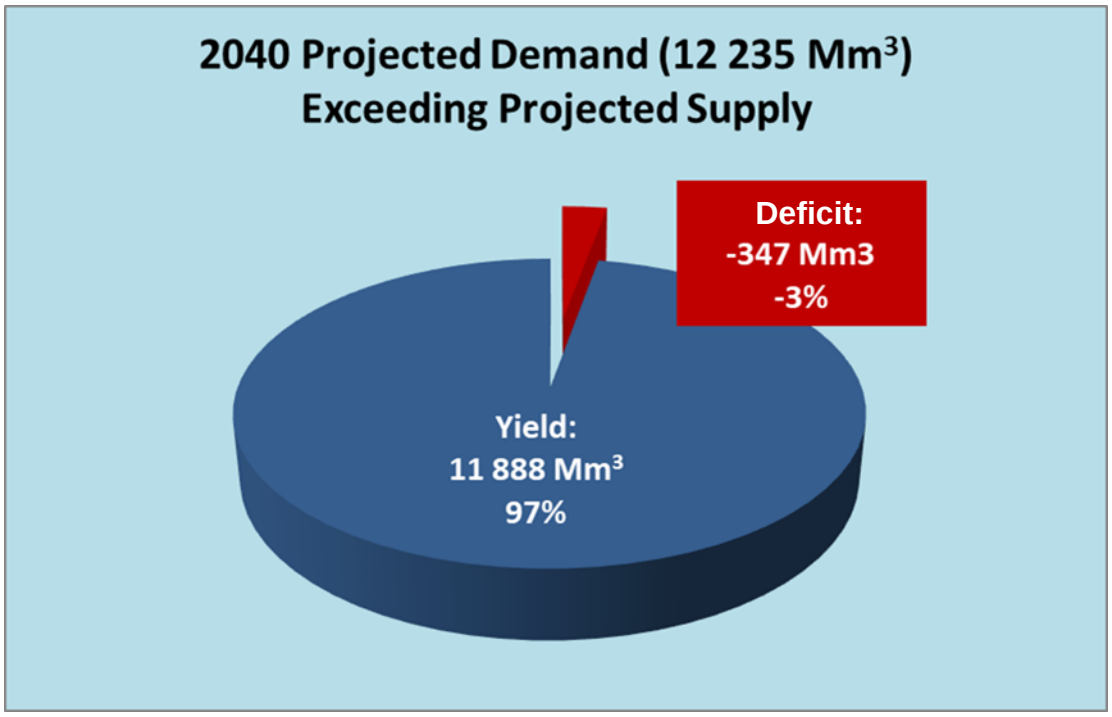


Figure 7.2 Projected demand in comparison to the yield in large water supply systems

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	208	361	-153	208	387	-179
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
Umgeni and Coasts	KZN	978	499	561	-62	736	705	31
Richards Bay	KZN	413	239	225	14	290	292	-2
Bloemfontein	FS	84	105	104	1	162	191	-29
TOTAL		**25 912**	**10 278**	**10 532**	**-254**	**12 020**	**12 546**	**-526**

The water use per sector projections is given in Table 7-2 below. 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 of 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**

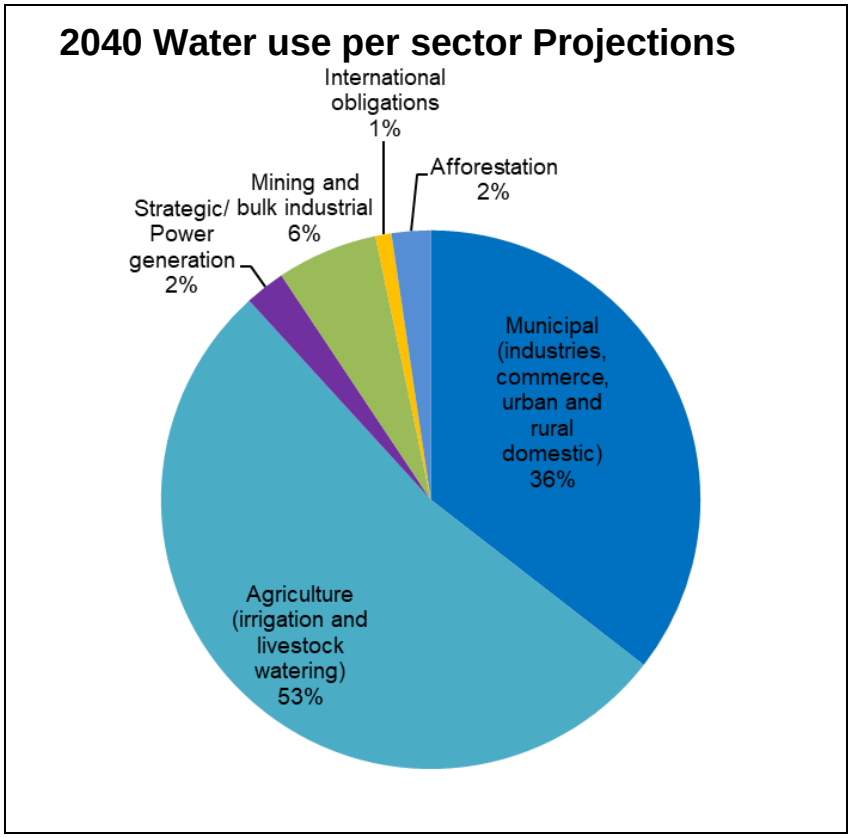


Figure 7.3 Water Use per sector 2040 Projections

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 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 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** - Finalise 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, finalise completion of Polihali Dam and other associated infrastructure construction.
- **Yield Replacement: Orange River** - Finalise feasibility to determine a suitable option (Noordoewer/Vioolsdrift, Verbeeldingskraal). Implement a project to construct the scheme.

The status of the implementation of some of the interventions is summarised 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 was made—successfully removing 80 million m3 of unlawful irrigation. Recent years have seen a 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 is required. Ongoing links to Crocodile (West) Reconciliation Strategy implementation plans.
New Infrastructure construction	Implementation of LHWP Phase 2 has been delayed till the earliest date of April 2027 for delivery. Yield replacement Dam in Orange River Feasibility Study started, but still to be completed before the best option is determined. Earliest

Intervention	Summary of implementation progress
	data for yield replacement is set at 2028. Improved maintenance of existing transfer infrastructure is 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 the total use of 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 to upgrade and rehabilitate 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, instead of more water 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 will increase the yield available from the existing water resources.

The following interventions are recommended:

- **Reducing water demand by introducing WCWDM** – King Cetshwayo DM 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 the 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 prioritised water resource development per water supply system is given in Table 7-4.

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 Dams)
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 Crocodile (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)
Umgeni 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 the Chief Directorate is implementing: Infrastructure Development for the period up to the end of September 2022.

Table 7-5 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 the 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 Tshehla 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 allocations to resource-poor farmers and to address dam safety aspects. The scope of the work includes the	The civil design is complete. Most of the construction drawings are complete and have been formally issued to the Contractor. Construction progress is at 12% completion	

	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		Upgrade of Greater Brandvlei Dam Scheme
Gauteng	Lesotho Highlands Phase 2	Lesotho Highlands Phase 2 is 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	To date, 73 anchors have been installed and stressed. Progress on the dam wall construction is at 97%completion. Work on the intake tower and the left and right flank training wall is complete, and work on the NOC screed and training wall is in progress. The appointment of a private contractor for the construction of the permanent houses is in progress	
Eastern Cape	Ncwabeni 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 independent of geotechnical investigations and surveys are continuing. The preliminary design is 85% complete, the detailed design is 25% 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	

The project summary in Table 7-5 presents and overview the various TCTA projects at various stages and the status of the projects. Climate change, increasing population growth, and urbanisation continue to exert pressure on the timely delivery of traditional water infrastructure projects to meet the needs of our time. Figure 7.4 presents illustrations of some of the TCTA augmentation projects at various locations across South Africa.

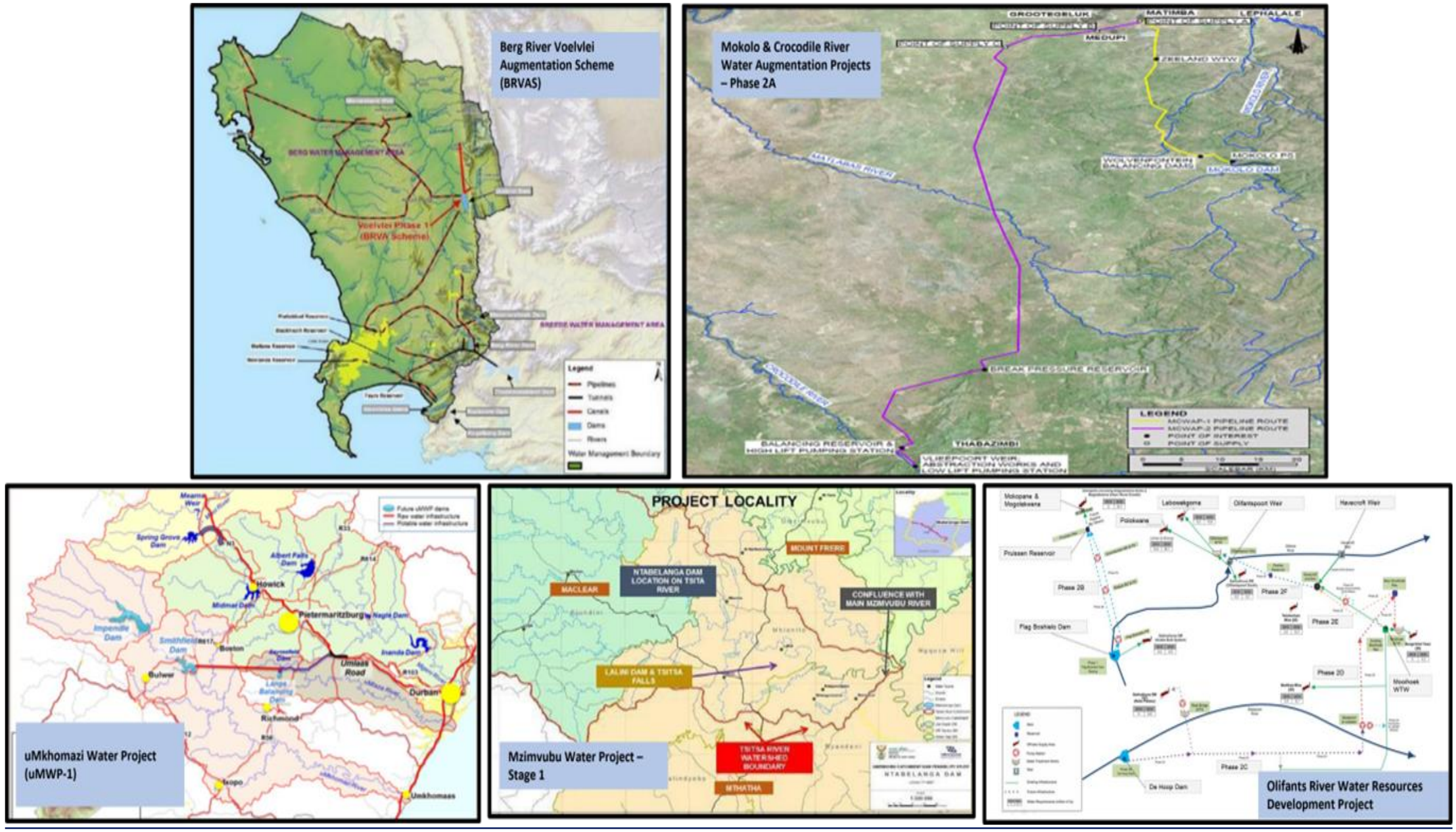


Figure 7.4 Illustration of some of the TCTA augumentation projects (modified from DWS 2022 report)

Table 7-6 TCTA Projects Progress end of September 2022

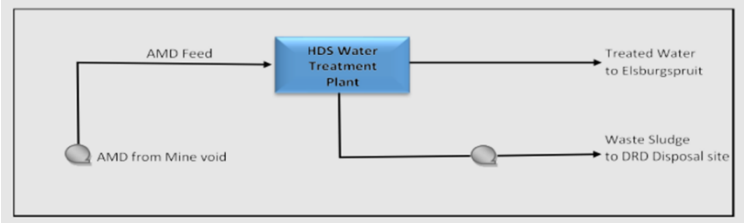
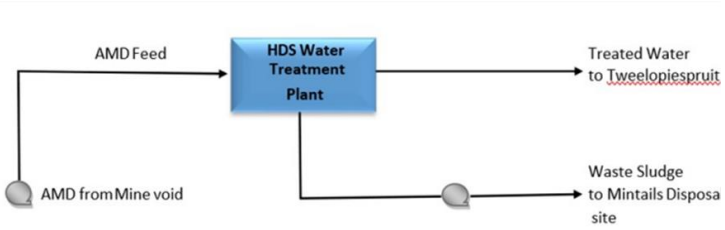
No.	Project Name	Start Date	End Date	Project description	Status
PROJECTS AT PREPARATION PHASE					
1.1	uMkhomazi Water Projects – Phase 1	February 2019	2031	Water requirement projection indicates that the Umgeni System is experiencing a deficit since 2016 and therefore there is a need for new water resources, 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 uMlazi River valley. Cost at Completion: R 23.243 billion Percentage Actual Spend to Date: 0%	Design Complete: N/A
1.2	Berg River Voelvlei Augmentation Scheme (BRVAS)	May 2017	February 2028	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 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	Design Complete: 100% (conceptual design)

				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 Revised Cost at Completion: R 1 746 242 452 Percentage Actual Spend to Date: 3%	
1.3	Mokolo and Crocodile River Water Augmentation Project- Phase 2A (MCWAP-2A)	April 2019	April 2030	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 Desulphurisation (FGD) units and Matimba Power station to operate their 6 FGD units could not be supplied from the MCWAP-1 pipeline. It will also provide the Lephalale Local Municipality with water and provide Exxaro with the required additional water to increase its 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%

ADVISORY SERVICES					
2.1	Mzimvubu Water Project (MWP): Stage 1	2019	2025	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 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 Percentage Actual Spend to Date: 29% of construction cost.	Design Complete: 0%
PROJECTS AT CLOSE OUT PHASE					
3.1	Olifants River Water Resources Development project –Phase 2C	March 2012	2020	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.	Construction Status: 100% Complete

				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	
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 Local 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.		Augment water supply to Mogalakwena Local 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 the Minister.
4.2	Acid Mine Drainage – Long Term Solution (AMD-LTS)			Desalination of partially treated acid mine drainage	TCTA Board raised the way forward on the implementation of the Long-Term solution

		To fund and implement the AMD Long-term solution.	water from the Short-term Intervention to a potable or industrial standard.	during the meeting with the Minister, feedback from DWS is awaited.
POTENTIAL PROJECTS				
Project		**Directive**	**Strategic Impact**	**Status**
5.1	Olifants River Water Resources Development Project (ORWRDP - 2D, 2E and 2F) – Phase 2B	Possible directive for TCTA to implement social phases related to Phases 2D, 2E and 2F withdrawn.	Development of additional water resource infrastructure.	See ORWRDP-2B above
5.2	Nwamitwa Dam	Possible directive to TCTA to implement the project.	Increase in water supply for commercial and social use in the Tzaneen area.	Proposal made to DWS and 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 March 2021. 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. 
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: As from 1 January 2021, Nafasi Water (Pty) Ltd was appointed to operate the plant for duration of 60 months.

7.4 Water Use Efficiency

7.4.1 Legislation addressing water use efficiency

The National Water Act, 36 of 1998 (NWA), provides the legal framework for the effective and sustainable management of the country's water resources. The Act requires that the nation's water resources are used efficiently and equitably in a sustainable manner for the benefit of all South Africans. Moreover, Section 22 of the NWA states that a person who uses water may not waste that water.

The Water Services Act, 108 of 1997 (WSA) aims to promote water conservation in the provision of water services. It requires Water Service Authorities (WSAs) to outline measures to conserve water resources and places the duty to conserve water on water services institutions. The Water Services Act states in Section 73 that the Minister may prescribe measures to conserve water. The Act and its Regulations enable the implementation of Water Conservation and Water Demand Management (WC/WDM) specifically for the municipal sector by encouraging the sector to develop By-Laws, WC/WDM plans, Water Services Development Plans (WSDP), etc.

The Directorate: Water Use Efficiency (D: WUE) is responsible for facilitating the national scale development and promotion of water conservation and water demand management aimed at efficiently using the nation's limited water resources.

7.4.2 Why is addressing water use efficiency a concern?

South Africa is the 30th driest country in the world, and many parts of the country are approaching a scenario where the demand outstrips the supply. That is, most of the freshwater resources are fully utilised. A high level of water stress can negatively affect economic development, increasing competition and potential conflict among users, which calls for effective supply and demand management policies and an increase in water-use efficiency. Therefore, Water Use Efficiency is critical in ensuring the sustainability of the freshwater resources.

7.4.3 Stakeholders involved in addressing water use efficiency

Governments are increasingly collaborating with other stakeholders, including the private sector, to ensure that Water Governance is genuinely inclusive. The fundamental components of good water governance include effective, flexible, and accountable state institutions that can respond to change, along with openness and transparency. Citizens and communities should also be able to voice their opinions and be involved in decision-making. Policy processes must involve participation and multistakeholder engagement.

● *South African Local Government Association (SALGA):* Ensures the provision of services to communities in a non-exploitative manner. SALGA promotes a safe and healthy environment in local government, promotes social and economic

development, and encourages the involvement of communities and community organisations in matters of local government. SALGA provides support to Water Services Authorities (WSAs) to ensure the implementation and reporting of Water Use Efficiency.

● *Sector Bodies such as Business Unity South Africa (BUSA), Minerals Council South Africa, and Agricultural Sector bodies*: Provide support to their members to ensure the implementation and reporting of WUE information.

● *Water Services Authorities (WSAs*): Implementation of WUE programmes and report progress to the Department.

● *Industry, Mining, and Power Generation Sector*: Implementation of WUE programmes and report progress to DWS.

● *Civil Society*: Advocating the importance of saving water within their communities.

● *Water Research Commission (WRC*): Provide Research and Development of tools relating to WUE.

7.4.4 South African Citizens' Role in Managing Water Use Efficiency

All South African Citizens need to be mindful of the amount of water they are consuming in their households and use water sparingly. Figure 7.5 presents the water numbers every South African should be familiar with to aid in water use efficiency and behavioral change. Each household can formulate its water-savvy practices and be guided by water-wise tips communicated by the Department. An enormous amount of water is wasted daily due to household water leaks and excessive water use behaviour. SA Citizens need to ensure leaking pipes in their yards and toilets are fixed quickly. Communities need to support their Water Services Authorities by reporting leaking and burst pipes and hold the authorities accountable to the by-laws. Water users should also be aware of their responsibility and take ownership of the water services and resource management in their area of residence.

Figure 7.5 Water use efficiency campaign- 50 litres of water per day

7.5 Consumption Trends

i. Integrated Vaal River System

The per capita consumption is shown in Figure 7.6 and has been reducing since 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 country's largest number of wet industries. 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 m^3. 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.

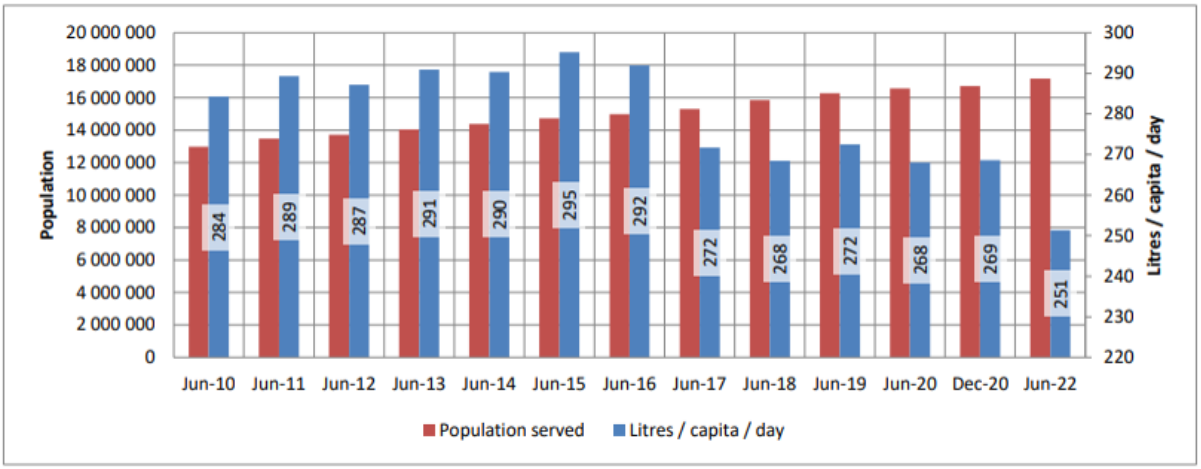


Figure 7.6 IVRS per capita consumption trend

ii. Crocodile West River Water Supply (CWRWSS)

The per capita consumption is presented in Figure 7.7. 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.

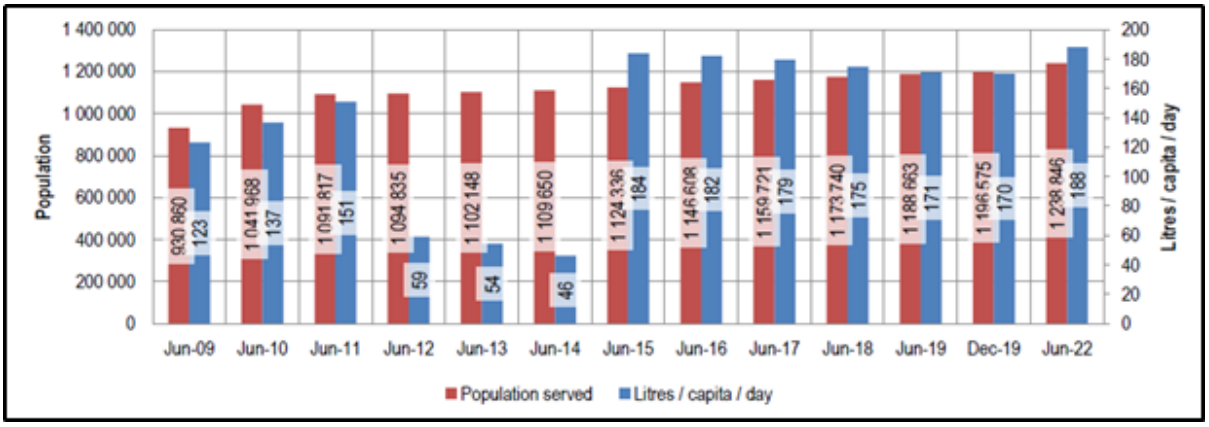


Figure 7.7 CWRWSS per capita consumption trend

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

The per capita consumption is presented in Figure 7.8, which has been consistently increasing since 2017 when water restrictions were lifted.

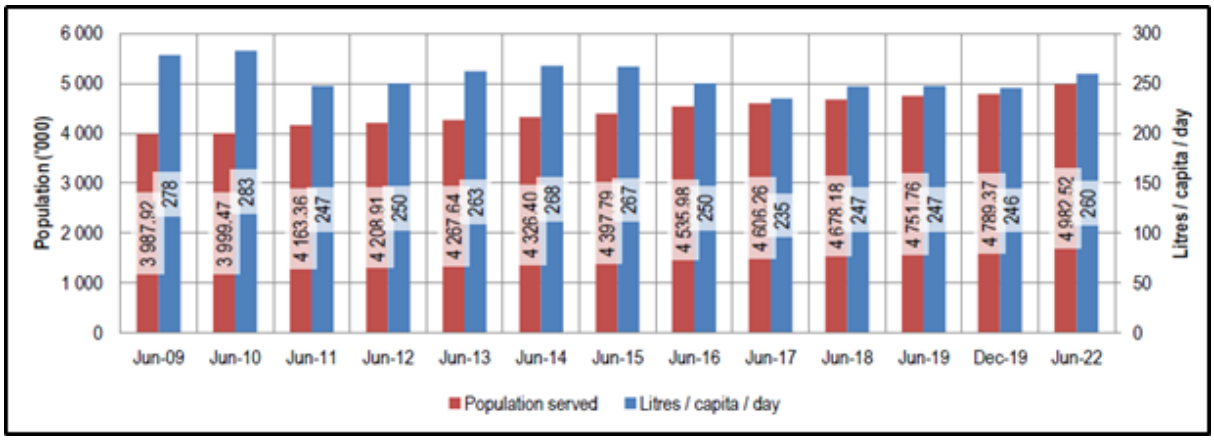


Figure 7.8 Coastal Metro WSS per capita consumption trend

iv. Western Cape Water Supply System (WCWSS)

The per capita consumption is presented in Figure , 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.

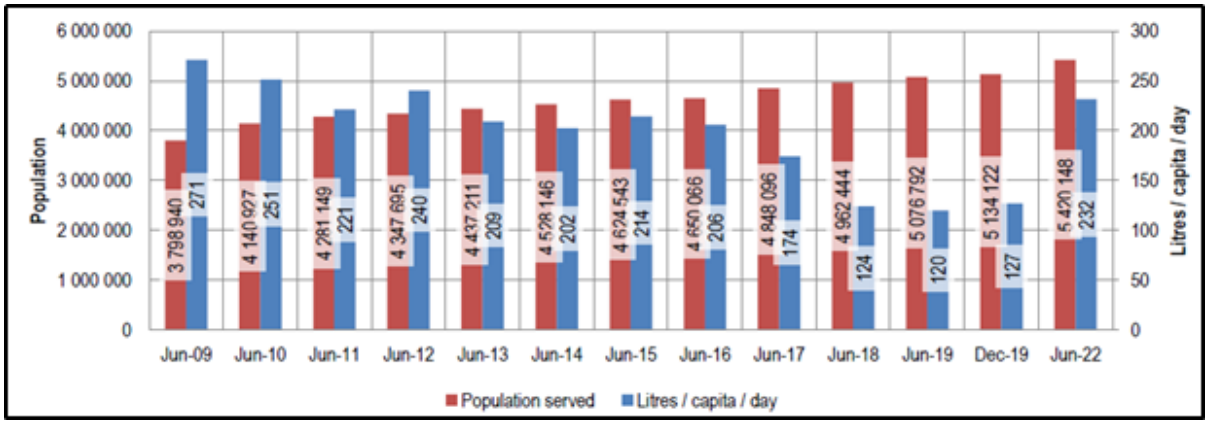


Figure 7.9 Western Cape WSS per capita consumption trend

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 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 can be achieved.

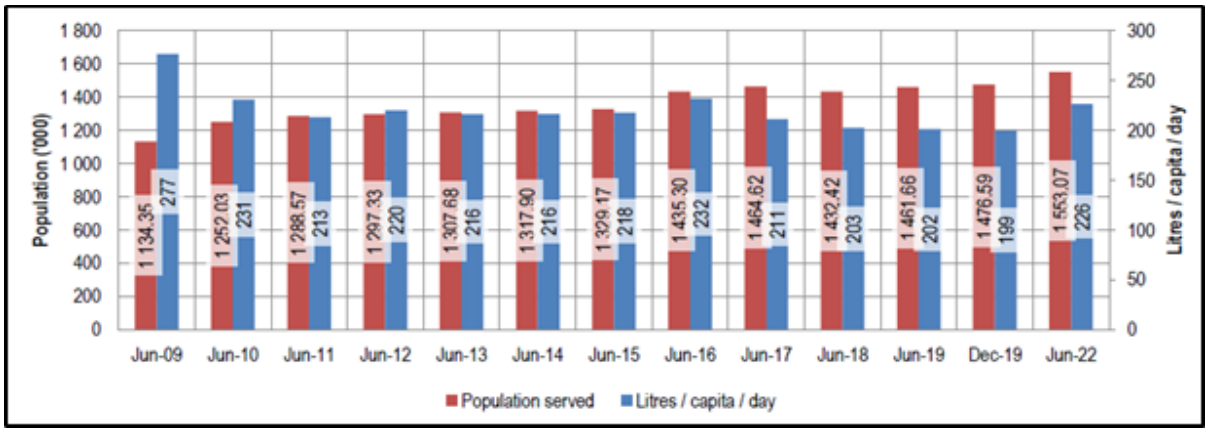


Figure 7.10 Algoa WSS per capita consumption trend

vi. Amatole Water Supply System

The per capita consumption for AmWSS is presented in Figure 7.11. The average per capita consumption has been stable over the past few years.

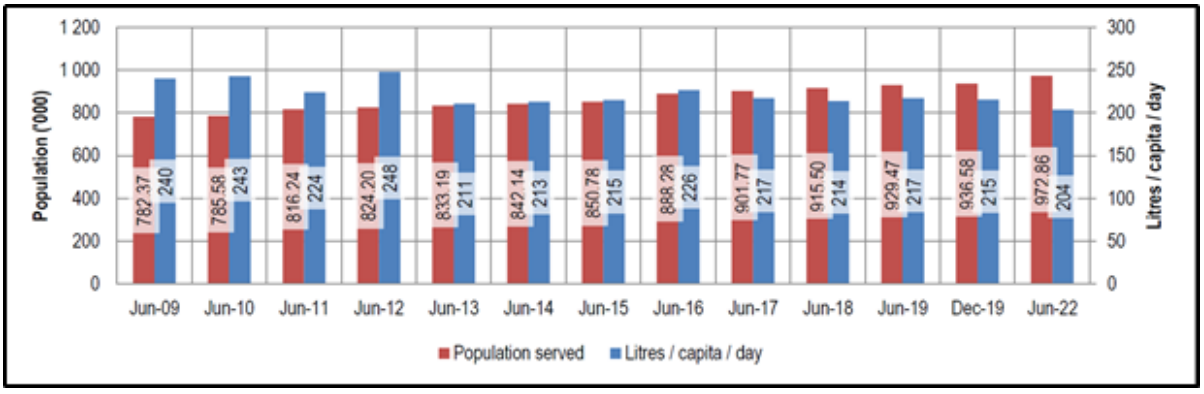


Figure 7.11 AmWSS per capita consumption trend

vii. Greater Bloemfontein Water Supply System

The per capita consumption for MMM is shown in Figure 7.12. 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.

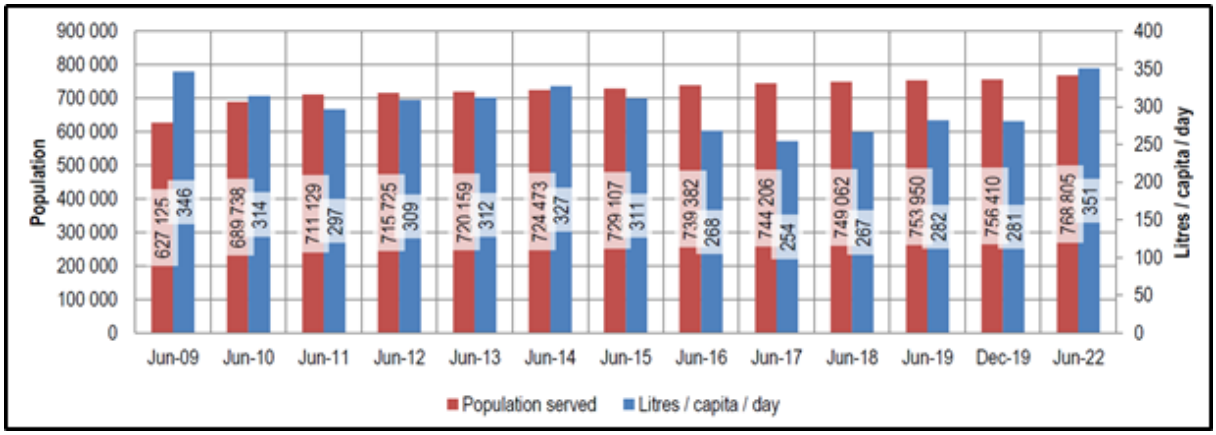


Figure 7.12 MMM per capita consumption trend

viii. Olifants River Water Supply System

The per capita consumption is shown in Figure 7.13. However, there is a very low confidence level in the unit consumption decrease over the past five years. The current estimated average consumption is 184 ℓ/c/d.

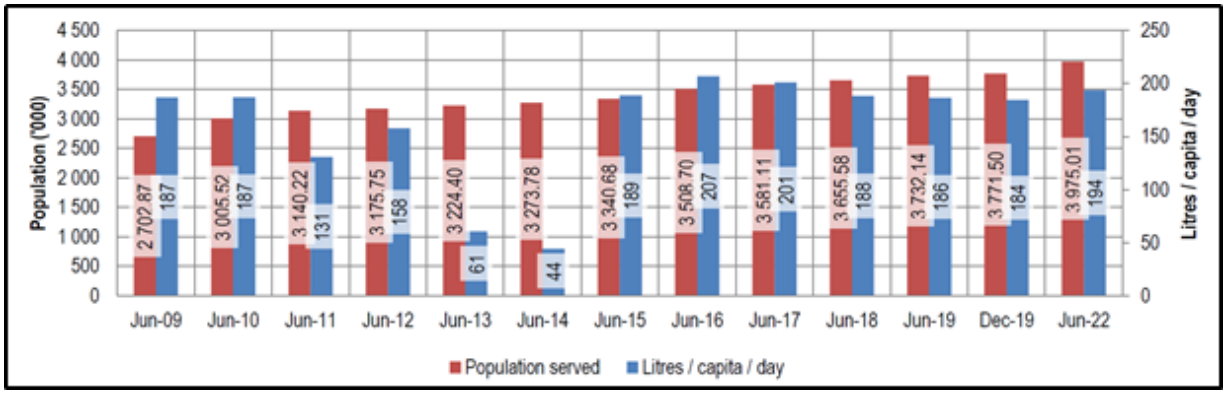


Figure 7.13 ORWSS per capita consumption trend