7

WATER SECURITY

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7.1 Introduction and Background

South Africa is a water-scarce country with an average rainfall of 450 mm, which is half the world average. Also compounding the water scarcity is the country's high evaporation rate, from 2000 to >2600 mm/a. Water scarcity is the ratio of human water consumption to available water supply in a given area. It is a tangible reality that can be measured regularly across regions and over time. The two fundamental drivers of water scarcity are physical and/or economic. Physical water scarcity occurs when there are inadequate natural water resources to meet demand. The demand is usually population-driven, where rapid population growth places high pressure on the amount of water available, leading to per capita water shortages. Climate-driven water scarcity occurs when insufficient precipitation and high evaporation create low available stream run-off, reducing water availability. In South Africa, climate-driven water scarcity is intensified by global climate change, climate variability and recurrent droughts. South Africa is the 30th driest country in the world.

South Africa has areas like Gauteng and Western Cape, which are more prone to severe physical water scarcity, where high population densities converge with low freshwater availability. Gauteng, with nearly 16 million residents, is the leading centre for both international migrants and domestic migrants. Gauteng is projected to reach 20 million residents by 2050, a growth not matched by an adequate increase in dam storage capacity. Western Cape, with 7.6 million residents, is the second major immigration attraction centre in South Africa. Western Cape is projected to reach 8.5 million residents by 2050, a growth not matched by an adequate increase in dam storage capacity.

The South African water sector has established extensive infrastructure to transfer water between catchments to address supply deficits, particularly around the economic hubs. However, over 98% of South Africa's available water resources are already allocated. There are also limited opportunities to increase future water requirements with conventional surface water resources; hence, more intervention is required on the demand side to address the projected supply deficit of 17% by 2030. South Africa is also known for water wastefulness. South Africans consume about 218 litres of water per capita per day (l/c/d), 26% above the world average of 173 l/c/d. Gauteng leads with water consumption at 266 l/c/d, followed by Northern Cape at 247 l/c/d.

The water scarcity situation in South Africa is not limited to physical drivers. It is also a consequence of economic factors. Economic water scarcity is caused by inadequate investment in water distribution infrastructure, technology, and human resources. It is induced by political power, policies, and/or socioeconomic relations. According to the

2023 DWS No Drop Benchmarking Report, non-revenue water accounts for 47.4%, while avoidable water losses are estimated at 40.8%. Geospatial disparities, inherited from apartheid history, are evident. Rural communities, small towns, and rural provinces remain inadequately serviced.

7.2 Water Use Efficiency

In the water sector, the term ‘water use efficiency’ is generally understood as a dimensionless ratio between water use and water withdrawal. Water Use Efficiency is about using water without waste. In the DWS, Water Use Efficiency goes hand in hand with Water Conservation and Water Demand Management (WC/WDM). **Water Conservation** is the minimisation of water loss or waste, the care and protection of water resources, plus the efficient and effective use of water. **Water Demand Management** is the adaptation and implementation of a strategy by a water institution or consumer to influence the water demand and usage to meet key objectives such as economic growth & development, social development & equity, environmental protection, sustainable water supply and services, etc. WC/WDM is thus concerned with reducing water usage & wastage and safeguarding the quality & quantity of water resources. WC/WDM is a fundamental step in promoting water use efficiency across all sectors in the country. The potential benefits of WC/WDM include the following:

- Improved water security is where there is a reliable water supply that meets reasonable demand.
- Financially sustainable water utilities emanating from efficient billing and cost recovery.
- Improved water infrastructure operation and maintenance, drastically preventing excessive leakages and improving service delivery.
- Reduced synthetic wetlands which breed mosquitoes and other health hazards to communities.
- Reduced timeframes and cost-effective approaches which allow for delayed construction of augmentation schemes such as large dams.
- Improved water production technology.
- Improved relations between government and citizens

The Agricultural sector, particularly irrigated agriculture, is the country's largest consumer of water, accounting for over 61% of the country’s annual water usage. Agriculture plays a critical role in ensuring national food security and supporting a rural economy where there is considerable poverty. However, despite the sector's importance for food security and economic stability, its reliance on water-intensive irrigation systems, outdated irrigation practices and general water use inefficiencies place immense pressure on the country’s limited water resources. The levels of WUE vary considerably across the country, and some of the inefficiencies can be linked largely to conveyance losses (in canals and pipelines) and poor in-field practices. The

NWRS3 indicates that the average water loss across irrigation schemes is around 30%. The agriculture sector must adopt more conservative water management strategies to ensure productivity and sustainability.

The municipal water use sector is estimated at around 27% nationally, providing water to households, businesses, and public services. The role of this sector in economic development is significant, driven by the country's large metropolitan centres, which are supported by the large water supply systems. However, the challenges facing this sector are the increasing levels of water losses and Non-Revenue Water (NRW). The current status of NRW, at 47%, is of national concern, indicating that almost half of the potable water transported through the distribution system to customers does not generate revenue, thus causing billions of rands in revenue loss for municipalities. Furthermore, the water that does make it is mostly wasted. At 218 l/c/d, the national water consumption is 26% higher than the international benchmark usage of 173 l/c/d. Factors such as inadequate metering and billing inefficiencies, unauthorised water use, ageing infrastructure, insufficient maintenance, and poor water management practices are key contributors to the growing NRW issue. This is an urgent national matter that needs to be addressed to improve water supply efficiency, ensuring that more potable water reaches consumers and is conserved upon arrival.

Water use within the industry, mining, and power generation (IMP) sector is highly variable, with this sector collectively using around 7% of all water in the country. Despite their smaller water use share, these sectors typically provide between 10-15% of the Gross Domestic Product (GDP). The IMP sector is extremely diverse and equally unique in that businesses in these sectors can supply their own water through abstractions from the resource. Water is typically used within production processes for scrubbing, washing, cleaning, dust suppression, and cooling. Some IMP companies have implemented innovative technologies such as water recycling, desalination, and closed-looped systems to reduce freshwater consumption and enhance water use efficiency. The IMP sector has implemented various initiatives to enhance WUE. Similarly, power plants, more especially those relying on coal, are adopting more efficient cooling technologies to reduce water use intensity. WUE is essential in balancing economic development with sustainable water management of the country's limited water resources.

7.2.1 Legislation and Policy

Water is at the core of human survival, peace, and prosperity. The highest legislative mandate for efficient and effective distribution of water resources comes from the Constitution of the Republic of South Africa Act (No. 108 of 1996), Section 27 (1)(b), which states that everyone has a right to access sufficient food and water. The National Water Act, 36 of 1998 (NWA) provides the legal framework for the promotion of efficient, equitable, and sustainable management of the country's water resources. The NWA recognises that water is a scarce and precious resource that belongs to all the people of South Africa, and that the goal of water resource management is to achieve the sustainable use of water for the benefit of all South Africans. The guiding principles are to develop, protect, use, conserve, manage, and control water resources, ultimately promoting the integrated management of water resources sustainably and efficiently.

The Water Services Act 108 of 1997 provides the additional legal framework for the provision of water supply and sanitation services to end users such as households, businesses, and industries, within municipalities, promoting water conservation in the provision of water services. It compels water service authorities (WSAs) to outline measures to conserve water resources and places the duty to conserve water on water service institutions. The Water Services Act and its Regulations enable the implementation of WC/WDM specifically for the municipal sector by encouraging the sector to develop By-Laws, WC/WDM plans, Water Services Development Plans, etc. The key provisions and aspects of ensuring WC/WDM are Section 11 (1): the duty to provide sustainable access to water services; Section 11 (2) (e): the duty to conserve water resources; and Sections 12 and 13: the duty to prepare a WSDP which contains, amongst others, details of existing and proposed water conservation, recycling, and environmental protection measures. The Regulations relating to Compulsory National Standards and Measures to Conserve Water (GNR.509 of 8 June 2001) under the Water Services Act protect consumers and Water Service Authorities and ensure the application of sound water management principles.

The National Water and Sanitation Master Plan (NWSMP) 2018 acknowledges that South Africa is facing a water crisis caused by insufficient water infrastructure maintenance and investment, recurrent droughts driven by climatic variation, inequalities in access to water and sanitation, environmental degradation and resource pollution, and a lack of skilled water engineers. This crisis has already impacted economic growth and some South Africans' well-being. The NWSMP also recognises that building a water-secure future will require proactive infrastructure management, effective water infrastructure operations and maintenance, and ultimately reduced water demand. Management of NRW is central to the achievement of these objectives.

The NWRS-3’s purpose is to ensure that national water resources are protected, used, developed, conserved, managed, and controlled efficiently and sustainably. The NWRS-3 acknowledges that South Africa is a water-stressed country, facing several water challenges and concerns, including water security, environmental degradation, water pollution, and inefficient water use. It outlines the importance of WC/WDM and NRW management. The WC/WDM and NRW management are priority programmes for reaching the 15 % water demand reduction target.

Considering the urgency to protect our water resources and the adverse effects of climate change, the NWRS-2 (2013) concurs that WC/WDM should be a priority, and measures should be taken to reconcile demand and supply to provide for the national goals of a better life for all through economic growth and job creation. The new NWRS-

3 provides core principles as set out in the National WC/WDM strategy essential to the realisation of WC/WDM.

The NDP presents a vision for South Africa in 2030 to eliminate poverty and reduce inequality while recognising that access to water and sanitation services is fundamental to this vision. In terms of water, the NDP envisages that by 2030:

- All main urban and industrial centres will have reliable water supply to meet their needs while ensuring efficient agricultural water use for rural communities.
- Natural water sources will be protected to prevent excessive extraction and pollution.
- Water will be recognised as a foundation for activities such as tourism and recreation, reinforcing the importance of its protection.
- Where rivers are shared with other countries, South Africa will honor its obligations.
- All South Africans will have affordable, reliable access to safe water and dignified sanitation.
- Water demand will be reduced by 15% below baseline levels in urban areas.

The National Water and Sanitation Master Plan (NWSMP) (2018) recognises that building a water-secure future requires proactive water infrastructure management, effective water infrastructure operations, and maintenance, coupled with reduced water demand.

7.2.2 Water Conservation and Water Demand Management Strategy for The Water Services Sector (2023)

This WC/WDM Strategy for Water Services Sector 2023 is an updated version of the 2004 version of the WC/WDM Strategy for Water Services Sector. National WC/WDM Strategy, which provides the overarching framework for the various sub-sector WC/WDM Strategies for Agriculture, Industry, Mining and Power Generation, and Water Services. Even though there are new technologies and innovations; the strategies, techniques, and approaches recommended in the 2023 WC/WDM strategy to achieve more effective and efficient use of water are well known and have been known for decades. Despite this, research work undertaken in recent years provides evidence that in South Africa non-revenue water (NRW), for example, has not improved, but deteriorated. As for many of the other challenges in South Africa, the solutions are known, but implementation is the obstacle.

The National WC/WDM strategy presents the overarching framework for the strategies. Four goals have been identified to effectively implement WC/WDM across the various sector value chains (Figure 7.1). The are ten objectives supporting these goals, which link the key pillars of WC/WDM (legislative, social, technical and financial), as they cut across multiple goals.

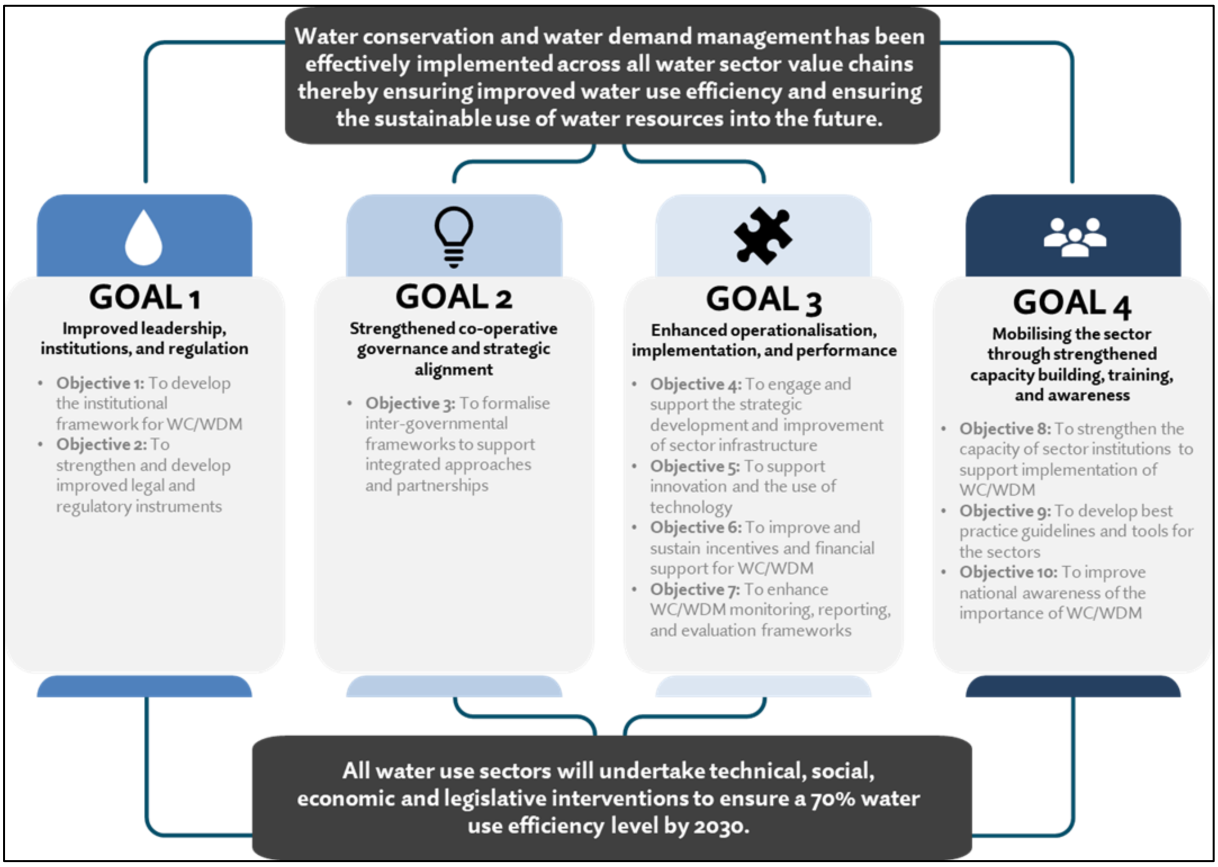


Figure 7.1: WC/WDM Strategy Framework

Implementation plans have been developed for each subsector to guide the implementation of the subsector strategies. The plans provide for interventions that will compel the active participation of national and provincial government departments, municipalities, the private sector, and civil society.

7.2.3 WC/WDM in the Water Services Sector

The status of WC/WDM at the large municipal water supply systems is a concern and a threat to national water security. The DWS monitors and analyses the progress made with the implementation of WC/WDM and targets for the large water supply systems by collecting International Water Association (IWA) water balances from the municipalities.

- *The National Water Balance*

NRW management is central to achieving these objectives, based on the principle that measurement and monitoring of water resources is the foundation of sound decision-making, allocation of resources, and effective WC/WDM implementation. South Africa has a 20-year benchmarking history, starting with the adaptation of the International

Water Association's methodology for calculating and understanding NRW and water losses in 2002, in the development of a pragmatic approach to benchmark water losses in potable water distribution systems in South Africa. The first comprehensive national benchmark study was published in 2012 in The State of Non-Revenue Water in South Africa (2012). Since 2012, several detailed assessments and updates have been undertaken, including the No Drop Assessment in 2015. The last national water loss benchmarking study was published in the No Drop Watch Report 2023.

Based on the 2023 No Drop Watch Report, the National Water Balance indicates a System Inputs Volume (SIV) of 4.39 billion m³/a, 40.8% water loss, and 47.4% Non-Revenue Water (NRW) (Figure 7.2: 2023 National Water Balance (Figure 7.2). NRW and water losses have increased by a notable 5.9% and 4.3%, respectively, since June 2016. Between 2016 and 2019, these fluctuations were less than 1%. The highest increase was in 2020/2021, attributed to the increased water demands and the impact of the COVID-19 pandemic.

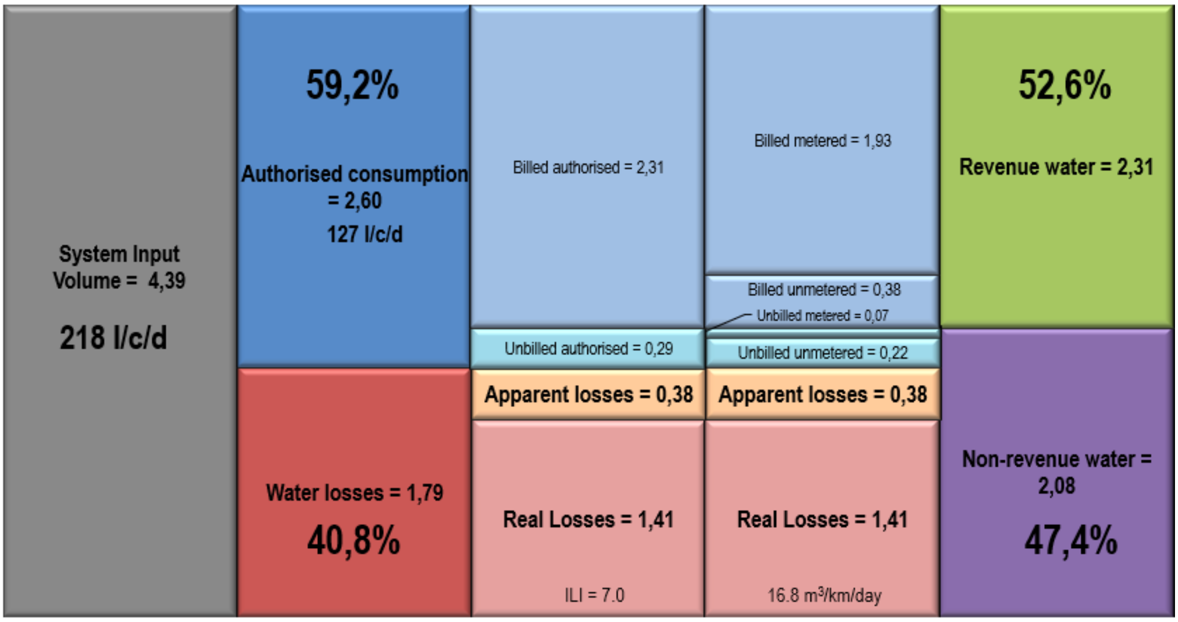


Figure 7.2: 2023 National Water Balance

The DWS will be conducting the No Drop Progress Assessment Tool (PAT) in the 2025/26 financial year, which is a concise and focused benchmarking exercise that extracts some of the key risk areas that would, individually and collectively, give a snapshot view of the status of the WSI's WC/WDM business. The No Drop PAT report is expected in December 2025.

7.2.4 WC/WDM in the Agriculture Sector

DWS requested the WRC to help develop a new framework for reporting water use efficiency in agriculture. This framework, now known as the Irri-Drop Report, aims to generate more information on the extent of agricultural water losses at irrigation schemes across the country. The framework borrows cues from similar reports such as the Green-Drop, Blue-Drop, and, more recently, the No-Drop reports. The Irri-Drop framework aims to provide a tool for assessing irrigation schemes in terms of water conveyance efficiency and the readiness of this sector to deal with water losses transparently. Extending the Irri-Drop Report concept to cover on-farm water delivery networks was recommended.

The state of irrigation water losses and measures to improve water use efficiency on selected irrigation schemes (WRC report no. 2970/1/23), was based on academic data analysis from the Vaalharts and Loskop irrigation schemes, the two biggest irrigation schemes in South Africa. The Vaalharts scheme, on the boundary of North West and Northern Cape provinces, is reported to have over 1 176 km network of canals and storm drains over 29,000 hectares. Most of the water is fed to crops using centre-pivot irrigation systems. The scheme is gradually transitioning from traditional methods, such as overhead sprinklers and flooding, to micro-sprayer and drip systems.

The second biggest public irrigation scheme, Loskop, is fed by the Loskop Dam at the boundary of Limpopo and Mpumalanga provinces. The reservoir irrigates nearly 19,000 hectares using a 495 km long network of concrete-lined canals. Furthermore, Dr Macdex Mutema, a senior researcher at the Agricultural Research Council and lead author of the study, acknowledges that upgrading irrigation infrastructure can be very costly, and hence, a need to redirect funding to projects that can yield the best water-saving benefits. Dr Macdex Mutema amplified the urgent need to address the data gaps for better accounting of water deliveries to farmers. Equally important is the establishment of more gauging stations at strategic positions of the canal networks because the most cost-effective way to minimise water losses from canal networks is to isolate and remediate the problem areas. Hence, identifying appropriate gauging stations on the main canal, secondary, tertiary, and community canals and equipping these gauging stations with accurate measurement devices were highly recommended. A good working data collection system and competent personnel are also required to handle the data collected. Other measures for improving the efficiency of canals are improvements in operations and infrastructure maintenance. This should include proper maintenance plans and sealing the gaps between the concrete slabs that make up the canal walls and beds to reduce leakage.

Major irrigation schemes submit water use efficiency accounting reports monthly. The average water loss of the applicable schemes is about 30% (see Table 7-1).

Table 7-1: Water Losses in Major Irrigation Schemes, 2024

Irrigation Scheme	Water Released ($x10^3m^3$)/a	Volume used ($x10^3m^3$)/a	Volume Losses ($x10^3m^3$)/a	Water losses (%)
Vaalharts WUA	413 440	325 487	87 953	23%
Vanderkloof WUA	635 433	581 554	53 878	16%
Kakamas WUA	475 772	393 783	81 990	17%
Boegoeberg WUA	42 449	18 995	23 454	39%
Orange Vaal WUA	4 150 507	3 558 228	592 279	14%
Sandvet WUA	116 149	88 357	27 792	22%
Orange Riet WUA	369 884	234 159	99 096	26%
LORWUA	112 048	84 688	27 360	24%
Gamtoos IB	70 583	60 230	10 353	15%
Impala WUA	232 207	150 372	81 835	35%
Loskop IB	303 041	265 904	37 136	12%
Hartbeespoort IB	126 266	233 456	100 746	43%
Crocodile West IB	532 236	452 401	79 835	15%
Marico Bosveld GWS	14 631	10 049	4 581	31%
Nzhelele GWS	21 024	18 669	2 355	11%

7.2.5 WC/WDM in the Industry, Mining, and Power Generation Sector

The efficiency of water usage by different IMP sub-sectors has not yet been systematically determined. However, data from a study commissioned by DWS in partnership with the Minerals Council of South Africa in 2012 does provide some indicative water use efficiency benchmarks for common minerals mined in South Africa. Through this partnership, a suite of supporting tools to guide the mining sector's implementation of WC/WDM has been developed. These include the commodity-based national water use efficiency benchmarks that have been developed for coal, gold, platinum, and "other" commodities.

In terms of power generation, Eskom power plants have diverse technical parameters and use a combination of cooling technologies bound to provide different water usage profiles. Eskom employs three types of cooling systems at its power plants. The most common and older type is wet cooling, but there are also direct and indirect dry cooling systems.

DWS has developed a methodology to guide the implementation of WC/WDM within the mining sector, and processes are underway to develop supporting tools for the industrial sector. All these, along with a range of technical interventions developed in association with sector partners like WRC, NCPC-SA, and CSIR, aimed at improving water usage, water treatment, and re-use options in the industrial sector, further illustrate room for improvement. Industries are encouraged to recycle and reuse water.

However, compliance varies, with some sectors (e.g. mining) showing better adherence to water conservation regulations than others. Water Use Licences (WUL) and regulations remain the key instruments for enforcing the implementation of WC/WDM. Specific WC/WDM conditions requiring the development of WC/WDM plans have been incorporated into the WUL.

7.2.6 Education and Awareness Campaigns

Appropriate social awareness and education programmes are imperative for WC/WDM's success and sustainability. Raising awareness about WC/WDM issues to the relevant stakeholders improves general knowledge and helps facilitate changes in behaviour through the education of stakeholders; knowledge about the subject increases.

7.3 Demographics

The Department of Water and Sanitation started a verification process for service delivery for all settlements in South Africa in 2011. Twenty-seven thousand nine hundred six communities were identified as part of the process. Spatial Polygons delineating the spatial extent of every settlement as well as demography data and service levels for every settlement, were verified and populated in a DWS reference geodatabase.

The dataset was aligned with Census 2011 results. The alignment was done at the local municipal level, the lowest level common area where data could be compared. Population figures per settlement were used as a ratio of the summed local municipality population. This ratio was applied to the Census 2011 data to disaggregate data from the municipal level into the identified settlement areas. Using the census-aligned community dataset as a baseline, annual adjustments are made to population, households, and service levels per settlement.

Annual population and household growth are calculated based on annual growth figures sourced from StatsSA as well as interprovincial migration figures in annual StatsSA midyear documents.

A realignment was again done at the local municipality level when the Census 2022 results were released. Financial delegations on Municipal Infrastructure Grant (MIG), Regional Bulk Infrastructure Grant (RBIG), and Water Service Infrastructure Grant (WSIG) projects are published annually. A specific percentage of these allocations are earmarked for the Water Services delivery project. Using these allocations in conjunction with unit cost figures calculated at the local municipality level by the Civil Engineering Sector as part of a cost model developed for Water Services, a figure is calculated for households potentially being served, e.g. [MIG Allocation] *0.2/ [Unit Cost per household] = [Households Served].

The served figure is subtracted from the existing water backlog in the specific local municipality, and the newly calculated backlog figure is then split into the settlements for that local municipality based on the ratio derived from the population per settlement. Figures are annually calculated per settlement per service level. Only settlements with existing water backlogs can be served per Local Municipality. Using the difference between the backlog figures for the year (n) vs year (n+1) a served figure is derived. These potential services people are split between the settlements in the area.

The analysis of the demographics for South Africa as per the last update for the year 2024 is given in Table 7-2. The Eastern Cape, one of South Africa's nine provinces that presents a diverse demographic profile characterised by a mix of urban and rural households, is home to approximately 1.87 million households, supporting a total population of over 7.35 million people. This results in a household density of 3.93, indicating the average number of individuals per household.

Table 7-2: District Municipality Provincial Household Density (DWS, 2024).

Region	Time Frame	Total Households	Total Population	Household Density	Urban Households	Rural Households
Eastern Cape	April 2024	1871169	7352691	3.93	849909	1021260
Free State	April 2024	849197	2999613	353	771617	77580
Gauteng	April 2024	5599783	15627688	2,79	5051024	548759
KwaZulu-Natal	April 2024	2912226	12818479	4,4	1599987	1312239
Limpopo	April 2024	1897352	6822375	3,6	377004	1520348
Mpumalanga	April 2024	1491045	5361261	3,6	742190	748855
North West	April 2024	1154367	3852976	3,34	527790	626577
Northern Cape	April 2024	339528	1398650	4,12	253561	85967
Western Cape	April 2024	2397488	7743151	3,23	2215896	181592
Provincial	April 2024	18512155	63976884	3,46	12388978	6123177

The demographic distribution reveals a significant rural presence, with 1.1 million households (about 54.6%) situated in rural areas, compared to (45.4%) households in urban settings. This rural-urban split highlights the province's unique blend of urban development and rural landscapes, each contributing to the overall socio-economic composition of the region.

The Free State province, located in the heart of South Africa, presents a unique demographic profile. The province is home to approximately 849 thousand households, supporting a total population of nearly 3 million people. This results in a household density of 3.53, indicating the average number of individuals per household.

The demographic distribution in Free State shows a significant urban presence, with 772 thousand households (about 90.9%) situated in urban areas, compared to (9.1%) households in rural settings. This urban-rural split highlights the province's predominantly urban character, with a smaller proportion of its population residing in rural areas.

Gauteng, the economic powerhouse of South Africa, showcases a dynamic and densely populated demographic profile. The province is home to approximately 5.6 million households, supporting a total population of over 15.6 million people. This results in a household density of 2.79, indicating the average number of individuals per household. The demographic distribution in Gauteng is predominantly urban, with 5.1 million households (about 90.2%) situated in urban areas, compared to (9.8%) households in rural settings. This urban dominance reflects Gauteng's status as a major urban centre, encompassing key cities such as Johannesburg and Pretoria, which are hubs of economic activity, cultural diversity, and infrastructural development.

KwaZulu-Natal, a province known for its rich cultural heritage and diverse landscapes, presents a complex demographic profile. The province is home to approximately 2,9 million households, supporting a total population of over 12.8 million people. This results in a household density of 4.40, indicating the average number of individuals per household. The demographic distribution in KwaZulu-Natal shows a balanced mix of urban and rural households, with (about 55%) of households situated in urban areas, compared to (45%) households in rural settings. This urban-rural split highlights the province's unique blend of bustling urban centres and extensive rural areas, each contributing to the overall socio-economic fabric of the region.

Limpopo, a province in the northern part of South Africa, presents a distinctive demographic profile. The province is home to approximately 1.9 million households, supporting a total population of over 6.8 million people. This results in a household density of 3.60, indicating the average number of individuals per household. The demographic distribution in Limpopo shows a significant rural presence, with 1.5 million households (about 80.1%) situated in rural areas, compared to (19.9%) households in urban settings. This rural dominance highlights the province's extensive agricultural landscapes and rural communities, which play a crucial role in its socio-economic structure.

Mpumalanga, a province known for its scenic landscapes and rich natural resources, presents a diverse demographic profile. The province is home to approximately 1.5 million households, supporting a total population of over 5.36 million people. This results in a household density of 3.60, indicating the average number of individuals per household. The demographic distribution in Mpumalanga shows a balanced mix of urban and rural households, with (about 49.8%) of households situated in urban areas, compared to (50.2%) households in rural settings. This near-equal urban-rural split highlights the province's unique blend of urban development and rural communities, each contributing to the overall socio-economic of the region.

North West, a province in the north-central part of South Africa, presents a distinctive demographic profile. The province is home to approximately 1.2 million households, supporting a total population of over 3.85 million people. This results in a household density of 3.34, indicating the average number of individuals per household. The demographic distribution in the North West shows a significant rural presence, with (about 54.3%) households situated in rural areas, compared to (45.7%) households in urban settings. This rural dominance highlights the province's extensive agricultural landscapes and rural communities, which are crucial to its socio-economic structure.

Northern Cape, the largest and most sparsely populated province in South Africa, presents a unique demographic profile. The province is home to approximately 340 thousand households, supporting a total population of nearly 1.4 million people. This results in a household density of 4.12, indicating the average number of individuals per household. The demographic distribution in the Northern Cape shows a significant urban presence, with 254 thousand households (about 74.7%) situated in urban areas, compared to (25.3%) households in rural settings. This urban dominance reflects the province's concentration of population in key urban centres despite its vast geographical area.

Western Cape, a province renowned for its scenic beauty and vibrant cities, presents a diverse demographic profile. The province is home to approximately 2.4 million households, supporting a total population of over 7.74 million people. This results in a household density of 3.23, indicating the average number of individuals per household.

The demographic distribution in the Western Cape shows a significant urban presence, with 2.2 million households (about 92.4%) situated in urban areas, compared to 181,592 households (7.6%) in rural settings. This urban dominance reflects the province's concentration of population in key urban centres such as Cape Town, which are hubs of economic activity, cultural diversity, and infrastructural development.

Overall, in April 2024, the total population reached 64 million, as depicted in Figure 7.3 below.

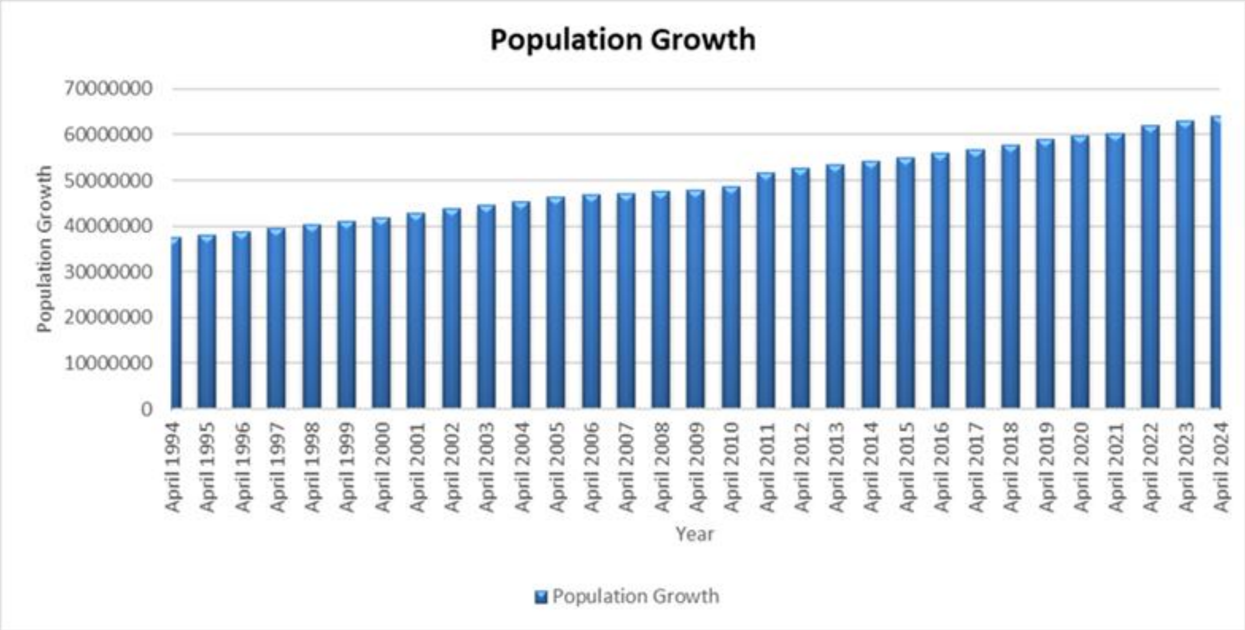


Figure 7.3: Population Growth Projections

The population growth rate is 1.5%, while the household growth rate is slightly higher at 1.9%. There is a total population of 64 million. Of this population, 62% are urban residents, approximately 39 million. In contrast, 38% of the population, or about 25 million people, lived in rural areas, as shown in Figure 7.4.

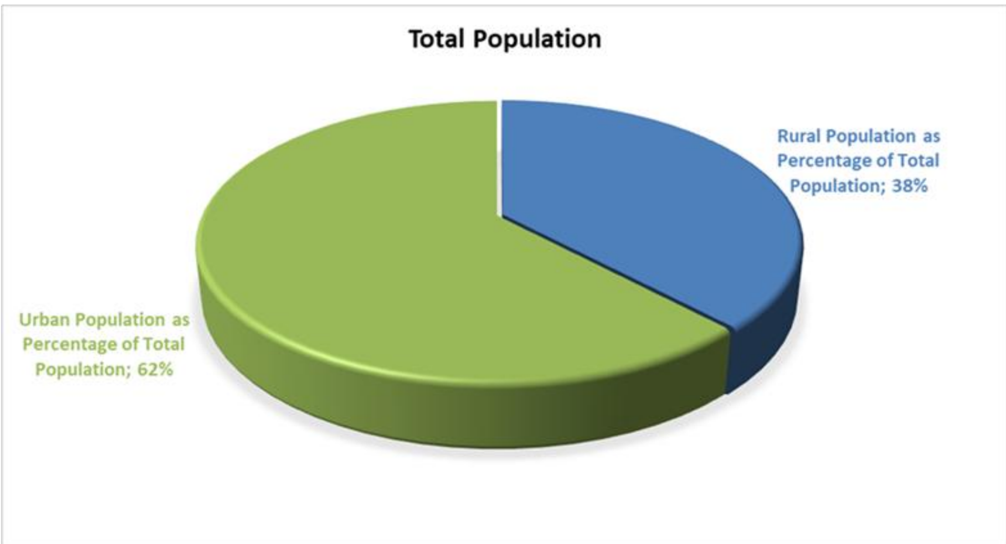


Figure 7.4: Rural and Urban Population as a Percentage of Total Population

The Provincial region had a total population of 28 thousand; of this population, 19% were urban residents, amounting to approximately 5 thousand people. In contrast, 81% of the population, or about 23 thousand people (Figure 7.5), lived in rural areas.

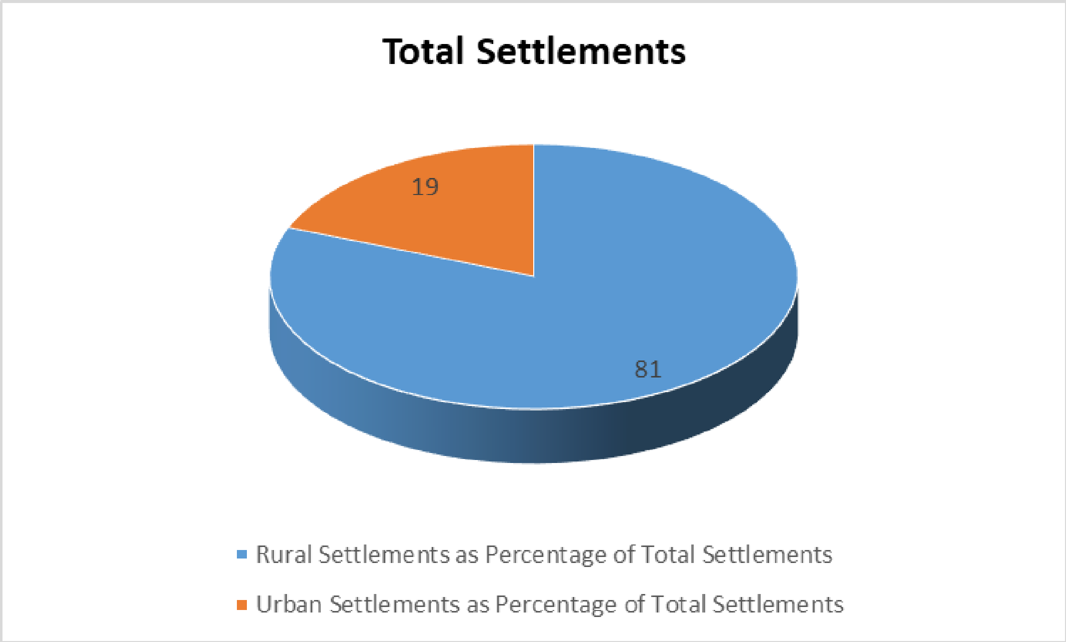


Figure 7.5: Rural and Urban Settlement as a Percentage of Settlements

In the Provincial region, the distribution of households shows a significant urban majority. As of April 2024, 67% of the households are urban, amounting to approximately 12.39 million households. In contrast, 33% of the households are rural, which translates to around 6.12 million households (Figure 7.6Figure 7.6). This distribution shows the concentration of the population in urban areas, reflecting urbanisation trends and the development of infrastructure and services.

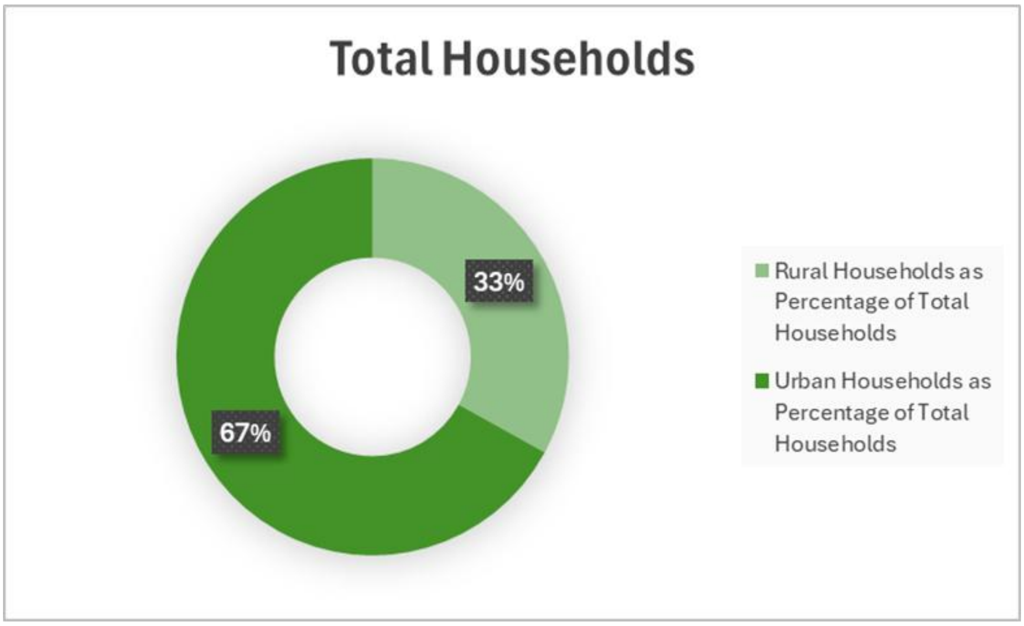


Figure 7.6: Rural and Urban Households as a percentage of Total Household

7.4 Access to Water and Sanitation

Table 7-3 gives District Municipal Provincial Water and Above Reconstruction and Development Program (RDP) Households. In the Eastern Cape, there are a total of 1.9 million households. Among these, a notable 81.02% of households have access to water infrastructure. Furthermore, a substantial (78.68%) of households meet or exceed the Rural Development Program (RDP) standards for water infrastructure. However, the situation with reliable water supply is less favourable, with only 58.18% of households enjoying consistent and dependable access to water. This disparity suggests that while access to basic water services is widespread, many households still struggle with the reliability of their water supply.

Gauteng boasts a total of 5,56 million households, demonstrating impressive statistics regarding water access. An overwhelming (99.08%) of households benefit from water infrastructure, showcasing the province's commitment to meeting the needs of its residents. Moreover, an impressive (97.38%) of households have access to water infrastructure that meets or exceeds RDP standards. In terms of reliability, (78.02%) of households have a consistent water supply, reflecting both high access levels and a relatively dependable water provision system.

With 850 thousand households, the Free State presents a favourable depiction for water access, as nearly all 98.78% of households have access to water infrastructure. Additionally, (94.7%) of households meet or exceed RDP standards for water services. However, the reliability of this water supply leaves room for improvement; only (56.2%) of households have a constant and reliable source of water. This highlights a gap between access to water services and the reliability of those services.

In KwaZulu-Natal, there are 2,9 million households, of which (90.7%) have access to water infrastructure. Furthermore, the majority (85.6%) of households meet or exceed the RDP standards for water service provision. However, while these figures are encouraging, only (60.4%) of households experience a reliable water supply. This suggests that despite good access to water infrastructure, many residents still face challenges regarding the consistency of their water services.

Limpopo is home to 1,9 million households. Among these, (85.2%) of households have access to water infrastructure, while (69.54%) meet or exceed RDP standards. The reliability of these water resources, however, the information suggests a different narrative, with only (58.81%) of households enjoying a dependable water supply. This indicates a notable discrepancy between basic access and reliable water provision in the province.

In Mpumalanga, there are 1.5 million households. A commendable (90.36%) of households have access to water infrastructure, with (83.56%) complying with RDP standards. Despite these promising figures, the reliability of the water supply remains a concern, with (54.53%) of households experiencing consistent access to water. This highlights an ongoing challenge to ensure that a significant number of households with access also benefit from reliable water services.

The North West province consists of 1.2 million households, with (95.45%) households having access to water infrastructure. Additionally, (83.58%) of households meet or exceed the RDP standards for water services. However, only (57.03%) households benefit from a reliable water supply. The data stresses the need to bridge the gap between having basic access to water and ensuring its reliability for the residents of the North-West.

The Western Cape has a total of 340 thousand households. Within this province, (96.96%) of households have access to water infrastructure, and (90.13%) meet or surpass RDP standards. However, only (54.62%) of households have a reliable water supply, indicating that while infrastructure access is strong, many residents still face challenges in securing consistent water service.

On a broader scale, across all provinces, there are a total of 18,5 million households. Remarkably, (93.55%) of households have access to water infrastructure, and (88.58%) households meet or exceed RDP. Nevertheless, regarding reliable water supply, only (68.09%) of households can depend on a consistent water service, refer to Figure 7.7.

This reveals a significant trend: while a large majority of households across various provinces have access to essential water infrastructure, there are pronounced gaps in the reliability of this resource (Table 7-3). Provinces like Gauteng and the Western Cape exhibit both high access and reliability rates. In contrast, provinces such as Mpumalanga and Limpopo face greater challenges in ensuring that all households have access to water infrastructure and benefit from reliable water supply systems. This underlines the pressing need for improvements in water infrastructure to secure consistent and dependable water services for all households across the provinces.

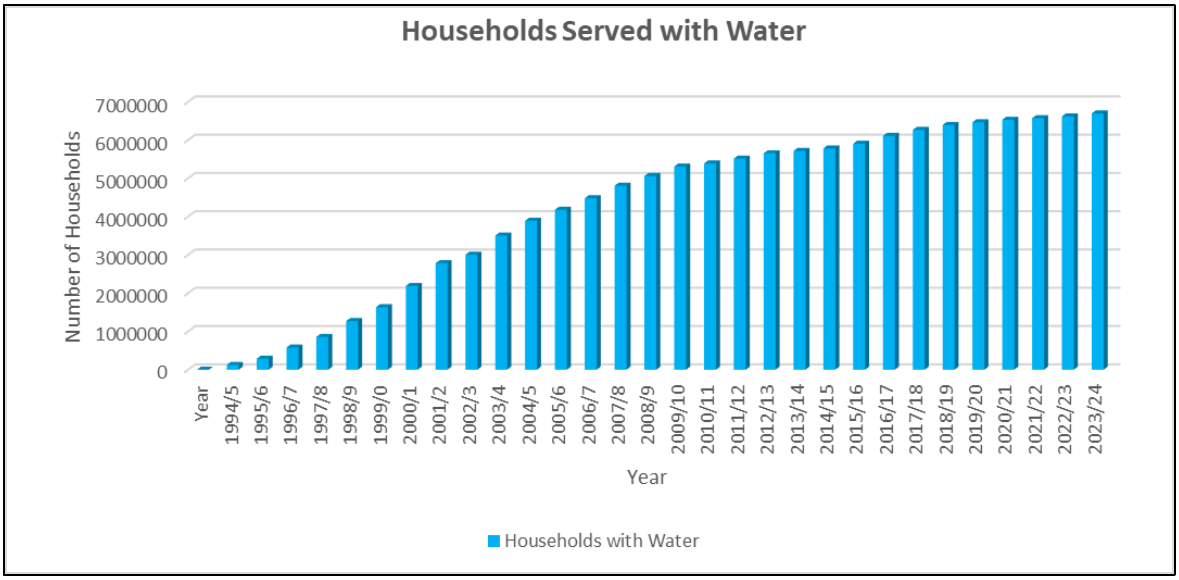


Figure 7.7: Households Served with Water

Table 7-3: District Municipal Provincial Water at and above RDP Households (DWS,2024)

Region	Time Frame	Total Households	Access to Water Infrastructure Households	Access to Water Infrastructure Households %	Total At and Above RDP Water Infrastructure Households	Total At and Above RDP Water Infrastructure Households %	Reliable Water Households	Reliable Water Households %
Eastern Cape	April 2024	1871169	1516033	81,02	1472321	78,68	1088670	58,18
Free State	April 2024	849197	838807	98,78	804230	94,7	477233	56,2
Gauteng	April 2024	5599783	5548485	99,08	5453309	97,38	4369073	78,02
KwaZulu-Natal	April 2024	2912226	2641461	90,7	2492924	85,6	1758844	60,4
Limpopo	April 2024	1897352	1616479	85,2	1319445	69,54	1115896	58,81
Mpumalanga	April 2024	1491045	1347376	90,36	1245946	83,56	813047	54,53
North West	April 2024	1154367	1101809	95,45	964876	83,58	658349	57,03
Northern Cape	April 2024	339528	329208	96,96	306007	90,13	185464	54,62
Western Cape	April 2024	2397488	2378608	99,21	2338180	97,53	2137636	89,16
Provincial	April 2024	18512155	17318266	93,55	16397238	88,58	12604212	68,09

7.5 Raw water use charges for the 2024/2025 financial year

Water tariffs are fees that public utilities charge for supplying and treating water and wastewater services. These fees cover water treatment, storage, transportation, and wastewater management costs. The amount and structure of water tariffs can differ between water management areas and types of users, such as residential, commercial, and industrial customers. The main goals of water tariffs are to ensure financial sustainability, improve efficiency, provide fair access to services, and support water conservation and environmental health.

Raw water tariffs are fees for using untreated water from natural sources like rivers, lakes, and aquifers. Government agencies or water management authorities usually set these tariffs to cover the costs of managing water resources, maintaining infrastructure, and protecting the environment. Raw water tariffs help manage how water is charged for use (Figure 7.8). They usually include a fixed charge and a charge based on the amount of water abstracted.

These tariffs encourage people to use water wisely, protect water resources, and keep water management systems financially stable. Several key factors are important when setting raw water tariffs. First is cost recovery, which ensures that expenses for managing water resources and maintaining infrastructure are covered. Economic efficiency encourages responsible water use. Tariffs also reflect the environmental impact of taking water to encourage conservation. Social equity ensures that tariffs are fair and include protections for vulnerable groups, while Transparency and accountability are also necessary for clear processes and consulting with stakeholders to ensure all parties understand how tariffs are set and used.

Figure 7.9 shows that the involvement of various stakeholders in establishing and managing water tariffs is essential for effective water resource management and sustainability. The Department of Water and Sanitation (DWS) is responsible for regulating water tariffs by establishing comprehensive norms and standards that aim to promote sustainable water usage and equitable access. This regulatory framework is designed to ensure that water resources are utilized efficiently while safeguarding the interests of all users. The Trans-Caledon Tunnel Authority (TCTA) is key in this process, as it not only finances but also oversees the implementation of bulk water infrastructure projects across the country by ensuring that cost recovery mechanisms are integrated into the tariff structure.

In addition to governmental bodies, banks and investors are crucial for providing the necessary funding for water infrastructure projects. They help bridge the significant investment gap often faced in the water sector, enabling the development and maintenance of essential water services and infrastructure. The impact of water tariffs extends directly to the water sector and end users. These tariffs must be carefully calibrated to balance several competing priorities: ensuring sufficient cost recovery to fund infrastructure and maintenance, maintaining affordability for consumers—especially vulnerable populations—and promoting water conservation practices.

Monitoring bodies such as the South African Reserve Bank (SARB) play an important role by overseeing administered prices, including water tariffs, to mitigate economic inflationary pressures. This monitoring helps ensure that any tariff increases do not disproportionately affect consumers, while ensuring that the water services remain sustainable.

The National Treasury is responsible for overseeing the broader financial framework in which these tariffs operate. It ensures that the tariffs are established efficiently and transparently, allowing for public scrutiny and fostering trust among stakeholders. Furthermore, the South African Local Government Association (SALGA) is actively involved in advocating for fair tariff adjustments. It represents the interests of municipalities during tariff discussions, ensuring that local governments have a voice in the process and that the tariffs set are fair and reflective of local needs.

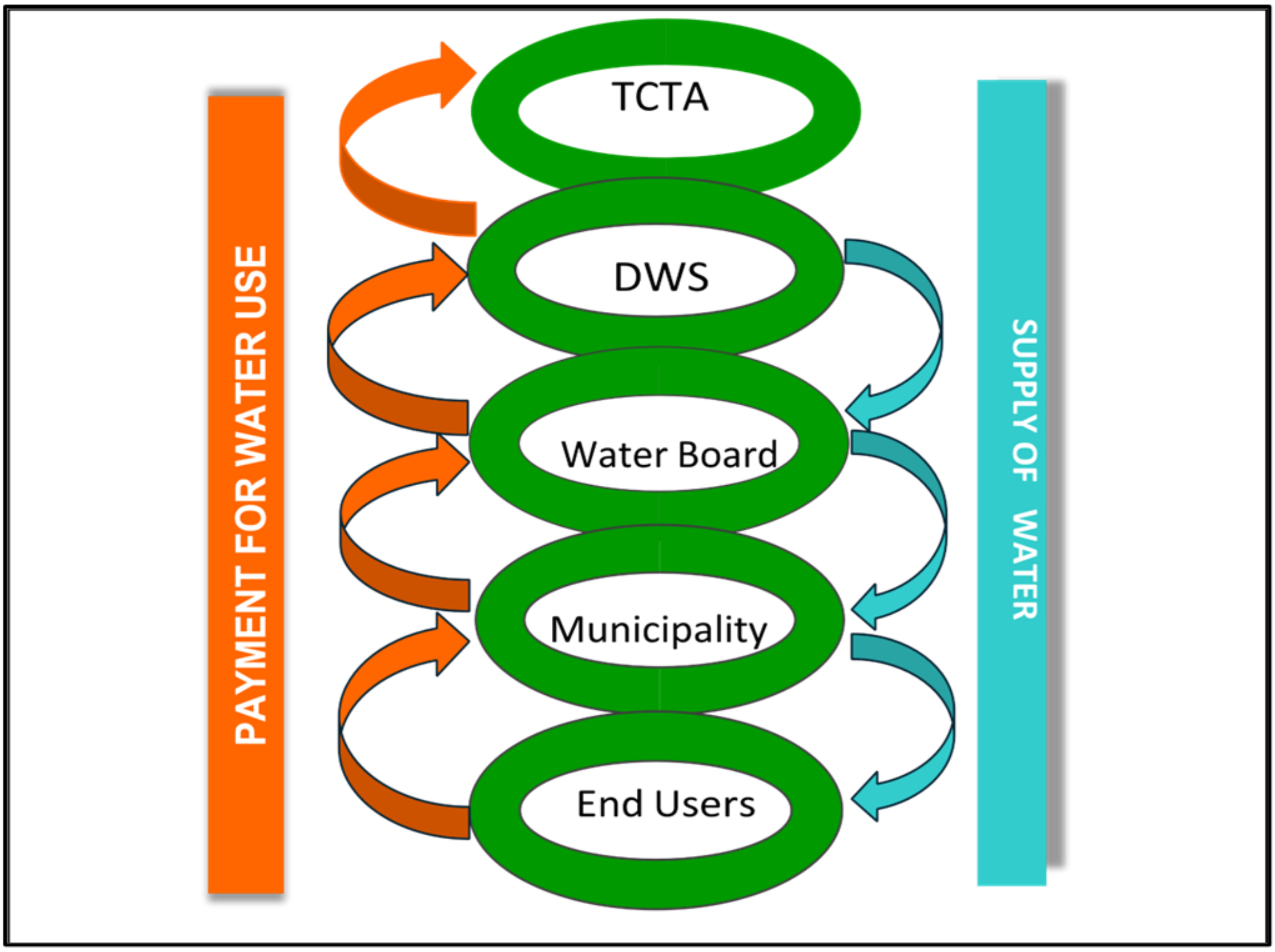


Figure 7.8: Water Supply Chain

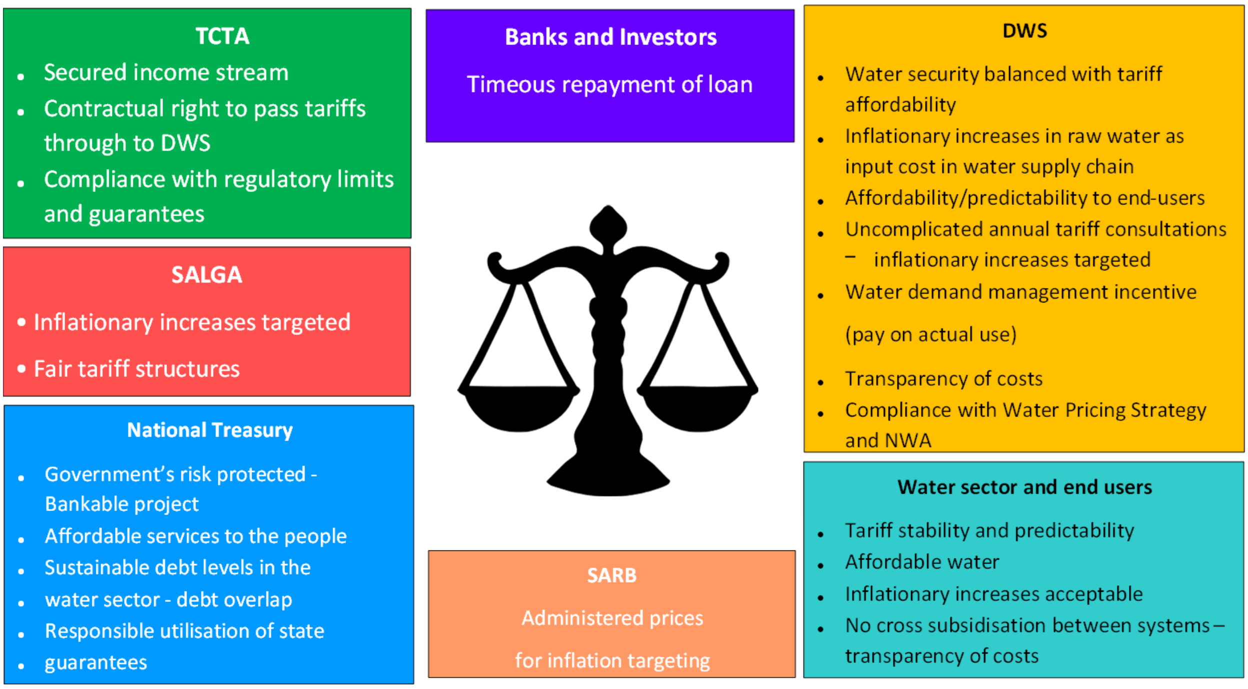


Figure 7.9: Balanced Tarrif Objective Source (TCTA, 2024)

7.5.1 Water Resource Management Charges

Considering the issue of affordability and financial stability of the institution, the increased range for the Water Resource Management Charges was approved as given in Table 7-4. The analysis of water tariffs for the Limpopo-North West Water Management Area (WMA) between the fiscal years 2023/24 and 2024/25 reveals a positive trend of consistent increases across all categories. The domestic and industrial (D&I) tariff has risen from 4.80 c/m³ in 2023/24 to 5.21 c/m³ in 2024/25, reflecting an 8.6% increase. Likewise, irrigation (IRR) tariffs have grown from 3.37 c/m³ to 3.65 c/m³, and forestry tariffs have advanced from 2.65 c/m³ to 2.87 c/m³, both also demonstrating an 8.6% rise.

Table 7-4: 2024/2-25 Approved Water Resource Management Charges

	APPROVED TARIFFS 2024/25 FY		
WMA	**Domestic and Industry c/m^3**	**Irrigation c/m^3**	**Forestry c/m^3**
Limpopo North West	5.21	3.65	2.87
Pongola Mzimkhulu	3.39	2.50	2.19
Olifants	4.78	3.54	2.68
Inkomati Usuthu	5.07	2.57	1.99
Berg Olifants	6.36	3.06	2.99
Breede Gouritz	5.85	3.26	1.67
Mzimvubu Tsitsikamma	4.38	3.33	2.94
Orange	1.89	1.15	0.00
Vaal	3.11	2.64	2.64

In the Pongola-Mzimkhulu Water Management Area (WMA), the assessment of water tariffs between the fiscal years 2023/24 and 2024/25 highlights some significant observations. The tariff for domestic and industrial (D&I) use has remained stable at 3.39 c/m³, indicating a solid pricing strategy that supports consistency for consumers. In contrast, the irrigation (IRR) tariffs have increased from 2.30 c/m³ in 2023/24 to 2.50 c/m³ in 2024/25, reflecting an 8.6% rise. Forestry tariffs have also risen from 2.01 c/m³ to 2.19 c/m³, maintaining the same 8.6% increase.

For the Olifants Water Management Area (WMA), the review of water tariffs shows a consistent and constructive increase across all categories. The domestic and industrial (D&I) tariff has risen from 4.41 c/m³ in 2023/24 to 4.78 c/m³ in 2024/25, indicating an 8.6% increase that aligns with overall growth objectives. Furthermore, irrigation (IRR) tariffs have progressed from 3.26 c/m³ to 3.54 c/m³, while forestry tariffs have increased from 2.47 c/m³ to 2.68 c/m³, both showing an 8.6% rise. The analysis of water tariffs for the Inkomati-Usuthu Water Management Area (WMA) reveals a positive trend, with consistent increases across all categories. For domestic and industrial (D&I) use, the tariff rose from 4.67 c/m³ in 2023/24 to 5.07 c/m³ in 2024/25, representing an 8.6% increase. Likewise, irrigation (IRR) tariffs have moved from 2.37 c/m³ to 2.57 c/m³, and forestry tariffs have increased from 1.83 c/m³ to 1.99 c/m³, both reflecting an 8.6% rise.

Similarly, in the Berg-Olifants Water Management Area (WMA), the comparison of tariffs demonstrates a constructive increase across all categories. The domestic and industrial (D&I) tariff increased from 5.86 c/m³ in 2023/24 to 6.36 c/m³ in 2024/25, highlighting an 8.6% growth. In addition, irrigation (IRR) tariffs have grown from 2.82 c/m³ to 3.06 c/m³, and forestry tariffs have risen from 2.76 c/m³ to 3.00 c/m³, again showing an 8.6% increase.

The upward trend in water tariffs is also noteworthy in the Breede-Gouritz Water Management Area (WMA). The tariff for domestic and industrial (D&I) use has grown from 5.51 c/m³ in 2023/24 to 5.85 c/m³ in 2024/25, indicating a 6.2% increase. Additionally, irrigation (IRR) tariffs have increased from 3.00 c/m³ to 3.26 c/m³, and forestry tariffs from 1.54 c/m³ to 1.67 c/m³, with both categories demonstrating an 8.6% increase.

The tariffs for the Mzimvubu to Tsitsikama Water Management Area (WMA) between the fiscal years 2023/24 and 2024/25 show a consistent increase across all categories. For domestic and industrial (D&I) use, the tariff increased from 4.04 c/m³ in 2023/24 to 4.38 c/m³ in 2024/25, reflecting an 8.6% rise. Similarly, irrigation (IRR) tariffs rose from 3.07 c/m³ to 3.33 c/m³, and forestry tariffs increased from 2.71 c/m³ to 2.94 c/m³, both also showing an 8.6% increase.

The analysis of water tariffs for the Orange Water Management Area (WMA) reveals positive developments across all categories. For domestic and industrial (D&I) use, the tariff increased from 1.74 c/m³ in 2023/24 to 1.89 c/m³ in 2024/25, reflecting a constructive 8.6% rise. Similarly, irrigation (IRR) tariffs increased from 1.06 c/m³ to 1.15 c/m³, demonstrating an 8.6% growth. No forestry tariffs were recorded for this WMA.

The evaluation of water tariffs for the Vaal Water Management Area (WMA) during the same fiscal year highlights consistent improvements across all categories. For domestic and industrial (D&I) usage, the tariff rose from 2.87 c/m³ in 2023/24 to 3.11 c/m³ in 2024/25, marking an encouraging 8.6% increase. Furthermore, irrigation (IRR) tariffs increased from 2.43 c/m³ to 2.64 c/m³, while forestry tariffs remained steady at 2.43 c/m³.

The WRMC for waste-related activities was determined according to the principle of apportionment, wherein the total cost of the CMA was allocated to the waste activities based on the registered waste volumes refer to Table 7-5.

Table 7-5: 2024/25 Approved WRMC for Waste Related Activities

WASTE DISCHARGE TARIFFS	
APPROVED 2024/25 FY	
Domestic and Industry Sector	
WMA	**Approved 2024/2025 Tariffs C/M³**
Berg Olifants	4.36
Breede Gouritz	5.67
Inkomati Usuthu	5.07
Limpopo North West	3.91
Mzimvubu Tsitsikamma	3.04
Olifants	3.55
Orange	2.20
Pongola Mzimkhulu	3.46
Vaal	2.93

7.5.2 Water Resource Infrastructure Charges

Water Resource Infrastructure charges play a role in ensuring the effective management of water supply systems. These charges are designed to cover the essential cost involved in planning, designing, constructing, operating, maintaining, refurbishing, and enhancing government water schemes. The infrastructure charges are categorized into four key elements 1) Depreciation 2) Return of Assets; 3) Operations and Maintenance (O&M) and 4) Capital Unit Charge (CUC).

The water resources infrastructure charges for all other systems/ schemes and water user categories are represented in Table 7-6 are approved as follows:

Vaal River System: The total weighted average capital tariff for augmentation schemes has seen an increase, rising from R3.45/m³ to R3.725/m³, while the marginal tariff moved up from R5.55/m³ to R5.997/m.

The Berg Water Capital Charge has remained stable, indicating effective management of this component, while the Third-Party Capital Charge has increased significantly from R7.10/m³ to R7.627/m³.

Table 7-6: The water resources infrastructure charges

PROJECTS	2024/25 FY Approved tariffs R/m3	
Vaal River System (VRS)	Capital Unit charge (CUC)	**2.805**
	Bulk Operation and Royalty Charge (BO&RC)	**0.920**
	Total Weighted Average Augmentation Schemes Capital Tariff	**3.725**
	Marginal Tariff	**5.997**
Berg Water Project (BWP)	Berg Water Capital Charge	**0.191**
	Third Party Capital Charge	**7.627**
Vaal River Eastern Sub System Augmentation Project (VRESAP)	Eskom VRESAP- User Tariff	**1.861**
	Sasol VRESAP User Tariff	**3.701**
	VRESAP marginal tariff	**5.542**
Komati Water Scheme Augmentation Project (KWSAP)		
	KWSAP user tariff	**3.184**
	KWSAP marginal tariff	**7.260**
Mokolo and Crocodile River (West) Water Augmentation Project Phase 1 (MCWAP)		
	MCWAP- 1 User Tariff	**4.53**
	MCWAP-Marginal Tariff	**6.95**
Mooi- Mgeni Transfer Scheme 2 (MMTS-2)		
	MMTS -2 Capital Tariff (zero rated and not discontinued)	**0.000**
	MMTS -2 Incremental Tariff	**4.879**
uMkhomazi Water Project-Phase 1 (uMWP-1)	uMWP-1 Capital Tariff	**2.139**

The Vaal River Eastern Subsystem Augmentation Project (VRESAP): Eskom's user tariff increased from R1.75/m³ to R1.861/m³, and Sasol's user tariff rose from R3.50/m³ to R3.701/m³. Furthermore, the marginal tariff rose from R5.25/m³ to R5.542/m³, ensuring that these critical services remain sustainable as costs evolve.

Komati Water Scheme Augmentation Project (KWSAP) -The user tariff has risen from R3.00/m³ to R3.184/m³, reflecting the need for continuous investment in water supply systems. The marginal tariff also saw an increase from R7.00/m³ to R7.260/m³.Mokolo and Crocodile River (West) Water Augmentation Project Phase 1 (MCWAP): The user tariff increased from R4.25/m³ to R4.53/m³, and the marginal tariff rose from R6.75/m³ to R6.95/m³. Mooi-Mgeni Transfer Scheme 2 (MMTS-2): The incremental tariff increased from R4.50/m³ to R4.879/m³.

uMkhomazi Water Project-Phase 1 (uMWP-1): The capital tariff rose from R2.00/m³ to R2.139/m³.

7.6 Water Infrastructure

Infrastructure development is critical for driving socio-economic progress in South Africa, and the Department of Water and Sanitation (DWS) is essential in this important initiative. The DWS is tasked with the sustainable management of the nation's water resources, including ensuring the availability of clean and safe water for all citizens and providing efficient and reliable sanitation services. This mandate is crucial for safeguarding public health, promoting environmental sustainability, enabling economic activities that contribute to the nation's growth, and improving every South African's overall quality of life.

The Department has developed strategic initiatives to address the water sector's multifaceted challenges, notably the National Water and Sanitation Master Plan. This comprehensive plan outlines actionable strategies to tackle issues such as water scarcity, inadequate sanitation facilities, and infrastructure upgrades. It strongly emphasises enhancing water security by diversifying water supply sources, optimizing water use, and protecting vital ecosystems.

Additionally, the initiatives focus on expanding access to clean water and improving sanitation infrastructure, particularly in underserved urban areas and rural communities where access to these essential services is often limited. By prioritizing investments in modern infrastructure, such as water treatment plants and sanitation facilities, along with the adoption of innovative technologies, the DWS aims to create a more resilient water sector. This sector will meet the current needs of a growing population and adapt to the dynamic economic landscape and climate challenges. Through these efforts, the DWS is committed to fostering a sustainable, equitable, and efficient water and sanitation system that supports community development, enhances public health, and drives economic growth across South Africa (DWS, 2024). The augmentation projects that were taken as part of the initiatives are depicted in Figure 7.10.

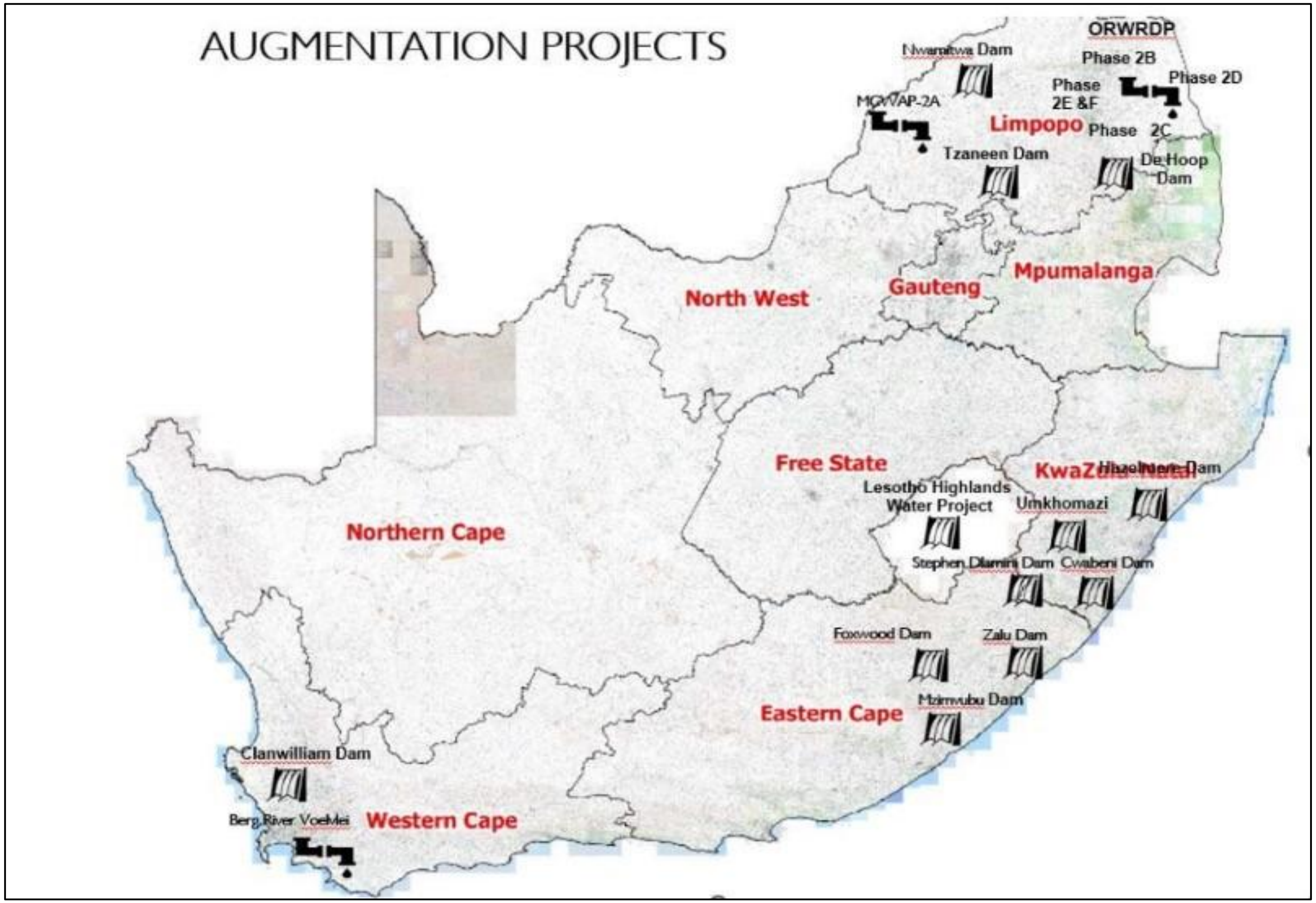


Figure 7.10: Water Resource Development Projects Underway

7.7 Projects At Close Out Phase

7.7.1 Hazlemere Dam

The project to raise Hazelmere Dam aims to enhance the water supply to the KZN North Coast by increasing the dam wall height by 7 meters. This will improve the dam's yield for medium-term water supply. The scope of work includes constructing a piano key weir on the spillway, installing rock anchors, performing foundation grouting, and undertaking other minor works.

7.7.2 De Hoop Dam

Phase 2 of the ORWRDP (ORWRDP-2) focuses on the development of additional water resource infrastructure, particularly the De Hoop Dam on the Steelpoort River. Phase 2A encompasses the construction of the De Hoop Dam and its associated works.

7.1. Projects at construction Phase

7.7.3 Raising of Tzaneen Dam

This project focuses on constructing a large storage dam with a gross capacity of approximately 187 million cubic meters on the Great Letaba River, downstream from the confluence with the Nwanedzi River. The aim is to accommodate the ecological water reserve as well as domestic and irrigation water requirements. The Raising of Tzaneen Dam project is designed to enhance the region's water supply by increasing the height of the dam wall by 3 meters to improve the dam's yield and address water shortages. The work includes demolishing the top of the existing spillway, constructing a labyrinth spillway, and performing other minor related works, along with the realignment of affected national and provincial roads.

7.7.4 Raising of Clanwilliam Dam

The Raising of Clanwilliam Dam project aims to increase the reliability of water supply for agricultural purposes. It also intends to allocate water to resource-poor farmers and address safety concerns associated with the dam. The project involves raising the existing dam wall by 13 meters, relocating a section of the N7 highway that is directly affected by the elevated dam wall, and raising secondary provincial roads impacted by the Full Supply Level (FSL) within the dam basin. Currently, the project is 19% complete and is expected to be finished by 2028.

7.7.5 Mzimvubu Water Project (MWP) Stages 1 & 2

The Ntabelanga and Lalini dams and their associated infrastructure represent an exciting opportunity for development on the Tsitsa River, a vital tributary of the Mzimvubu River. This multi-purpose project is designed to enhance potable water supply, promote irrigation, generate hydropower, and foster tourism. Recognized as a Strategic Integrated Project under SIP-19, it underscores the government's commitment to sustainable development.

The project is positioned to significantly impact the regional economy by effectively utilizing the water resources in the Mzimvubu River catchment. Its focus areas, including domestic water supply, irrigation, hydropower generation, and job creation, aim to uplift local communities and stimulate growth.

The implementation of this project is planned in four strategic stages, starting in 2018/19:

Stage 1: includes the development of Advanced Infrastructure, with a key emphasis on building access roads (Figure 7.11)

Stage 2: Implementation of the Ntabelanga Dam, which will serve as a foundation for the project.

Stage 3: Establishment of the bulk distribution system to ensure efficient water delivery.

Stage 4: Integration of irrigation and hydropower components, which will also include the construction of roads and staff housing

Figure 7.11: Mzimvubu Site. Source (DWS, 2024)

7.8 Projects in the Design Phase

7.8.1 Groot Letaba River Development Project (GLeWAP): Raising of Tzaneen Dam

The project involves the construction of a large storage dam with a gross storage capacity of approximately 187 million m^3 on the Great Letaba River downstream of the confluence of the

Nwanedzi River to provide for the ecological water reserve and domestic and irrigation water requirements. The scope of the work includes the construction of the Nwamitwa Dam and the realignment of affected National and provincial roads

7.8.2 Olifants Management Model

The Olifants Management Model (OMM) involves the further developments of the bulk water distribution system from the De Hoop Dam consisting of a pipeline from Flag Boshielo dam to Sekuruwe WTW in Mogalakwena (ORWRDP 2B & 2B+), a pipeline from Clapham pump station to the Olifantspoort weir (ORWRDP 2F) and the refurbishment of existing LWUA Infrastructure (ORWRDP 2H).

Additional work includes the southern extension of the existing LWUA pipeline, and the potable water supply system to communities adjacent to the bulk supply system

7.8.3 Lusikisiki Regional Water Supply Scheme: Zalu Dam

The Zalu Dam project involves constructing a storage dam with a yield of 6.85 million cubic meters per year (m^3/a) on the Xura River at the Zalu site, located approximately 10 km northwest of the town of Lusikisiki. Additionally, it includes the development of water distribution infrastructure to supply water for domestic use and irrigation to the town of Lusikisiki and surrounding villages

7.8.4 Algoa Water Supply System: Coerney Dam

The project entails the construction of a new earth-fill embankment dam, with a capacity of 4.69 million cubic meters, located to the east of the existing Scheepersvlakte Dam. This new dam will provide additional balancing storage for water transfers to the Nooitgedagt Water Treatment Works, serving the Nelson Mandela Bay Municipality. The project is currently 11% complete.

7.8.5 Foxwood Dam

The project entails the construction of a new composite concrete gravity and earth embankment dam on the Koonap River, located upstream of Adelaide. This dam will enhance the water supply for Adelaide and ensure a reliable bulk water source for new irrigation development aimed at resource-poor farmers. The proposed dam will have a gross capacity of approximately 55 million cubic meters and will feature a dam wall with a maximum height of 48 meters above the foundation level. Currently, the project is at 0% completion.

7.8.6 Raising of Gcuwa Weir

The Raising of Gcuwa Weir project aims to augment the water supply in the Butterworth area by raising the Full Supply Level of the Gcuwa Weir by 1.5 meters, which will increase its storage capacity by 0.7 million cubic meters to address water shortages. The scope of work includes raising the existing spillway to 549.5 meters above sea level (masl), strengthening the existing earth-fill embankment, raising the NOC by 1.2 meters, and making other modifications to existing works. The project is scheduled to start in 2021 and end in May 2030, with a completion percentage currently at 0%.

7.8.7 Olifants River Water Resources Development Project (Phase 2A)

De Hoop Dam: This operational project, De Hoop Dam, involves repairs to 38 houses and the water reticulation and sewage network at the Buffelskloof

7.9 Projects at the Implementation Phase by TCTA

7.9.1 Berg River Voelvlei Augmentation Scheme (BRVAS)

The Water Reconciliation Strategy for the Western Cape Water Supply System (WCWSS) highlighted a concerning projection indicating that the system was facing an impending water deficit. It required substantial augmentation efforts by the year 2019/20 to prevent a significant shortfall in water supply. This urgency became particularly apparent during the severe drought conditions experienced in 2018-2019 when the WCWSS demonstrated an inability to meet the region's water demands.

To address this critical situation, the proposed project aims to abstract and transfer excess winter flows from the Berg River (see Figure 7.12). This initiative will involve pumping the water to the existing Voëlvlei Dam, increasing the dam’s yield by an estimated 23 million cubic meters per annum.

The project comprises several key components, including the construction of a diversion weir in the Berg River to manage water flow and a pump station that will facilitate the extraction of water from the river. A significant feature of the project is the installation of a 6.3 km long rising main pipeline designed to transport the abstracted water efficiently to the Voëlvlei Dam. This pipeline will ensure a reliable water flow, particularly during winter when excess flows are available.

In addition to the main components, ancillary works will also be undertaken. These include the construction of access roads to facilitate transportation and maintenance, a canoe-chute fishway to ensure safe passage for aquatic life, temporary river diversion works to minimize environmental impact during construction, and an electrical supply system aimed at powering the pumps necessary for the water transfer operation.

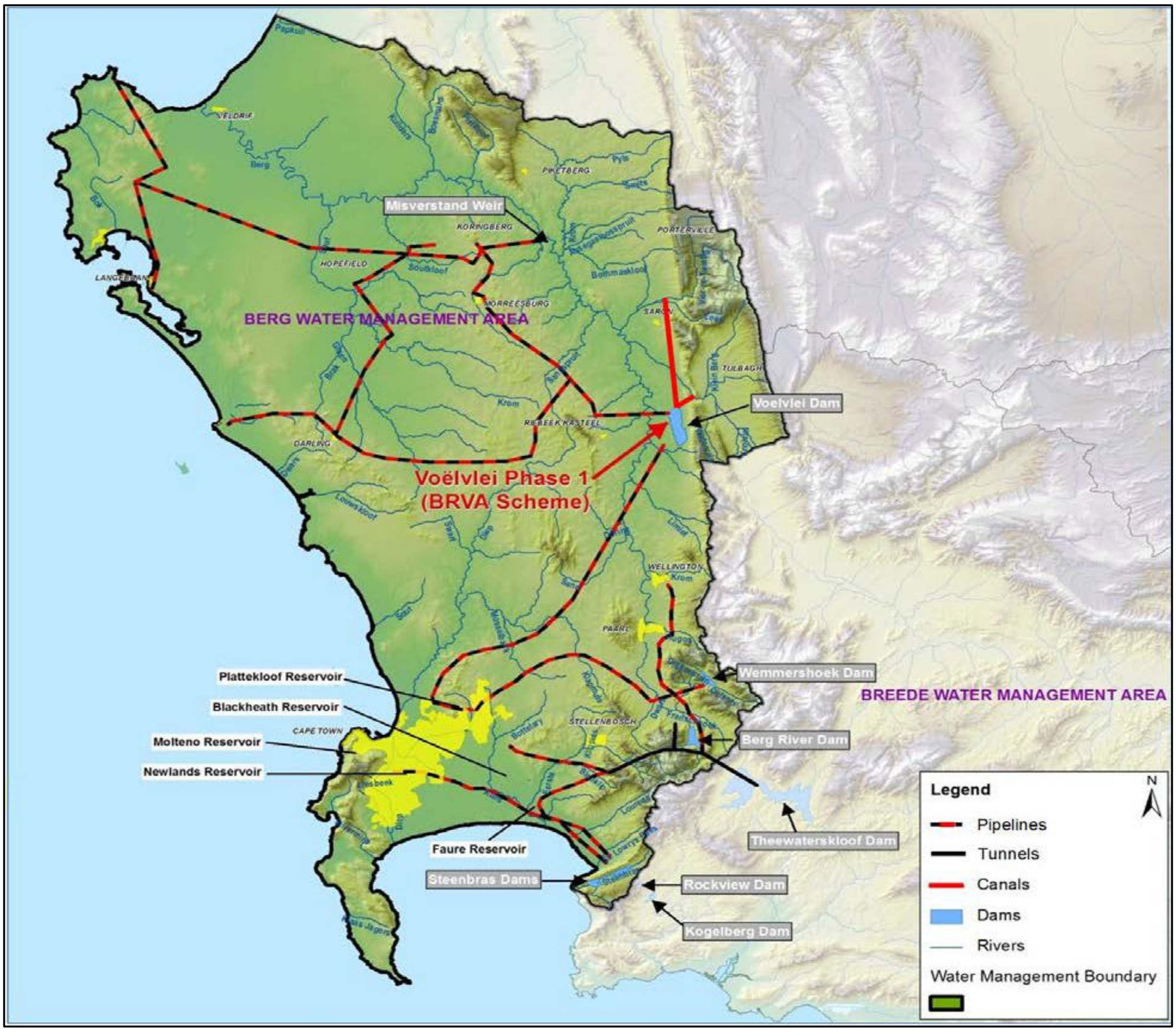


Figure 7.12: Location of the Berg River Vloevlei Project

7.9.2 Mokolo and Crocodile River Water Augmentation Project -2A (MCWAP)

The development of the Waterberg area is a pivotal component of the PICC SIP-01 program, aimed at strengthening the region's industrial growth and sustainability. This project is designed to address the escalating water demands faced by the Lephalale Municipality, which is experiencing significant population growth. This initiative will support local communities and enhance Exxaro's operational efficiency by ensuring a reliable water supply and providing them with the necessary resources for their mining activities.

In addition, the MCWAP-2A project (Figure 7.13) is integral to supplying Eskom with a secondary water source essential for the functioning of its two primary power stations in the Waterberg region—Medupi and Matimba. This additional source will facilitate an adequate water supply for Medupi Power Station, enabling it to operate three extra Flue Gas Desulfurization (FGD) units that are crucial for reducing emissions. For the Matimba Power

Station, the additional water will ensure the smooth operation of its 6 FGD units, which cannot currently receive water from the existing MCWAP-1 pipeline due to capacity constraints.

The MCWAP-2A project consists of several key infrastructure components designed to support its operational objectives:

- Abstraction Weir
- River Management System
- Water Transfer Infrastructure
- Pump Station
- Operational Control Centre

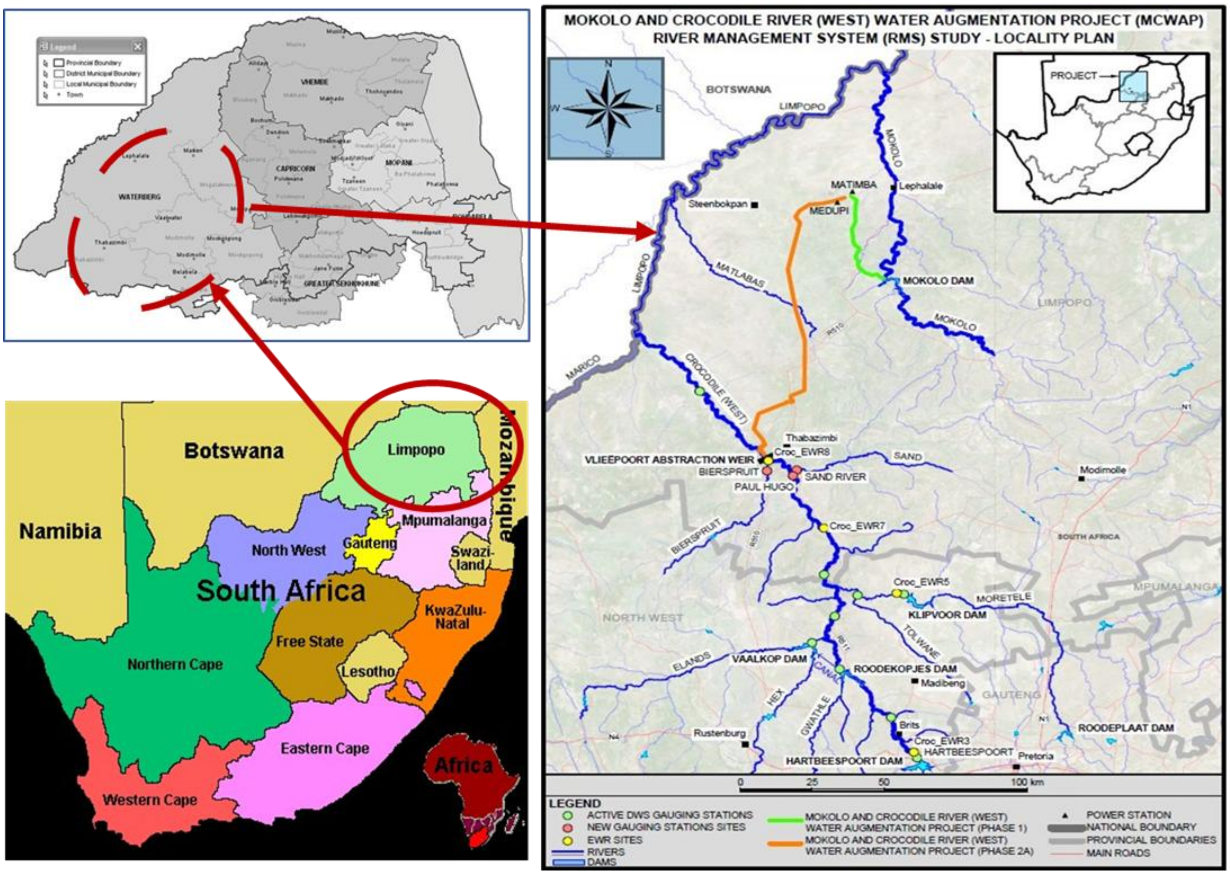


Figure 7.13: Mokolo and Crocodile River Augmentation Project- Phase 2A (MCWAP -2A)

7.9.3 uMkhomazi Water Project (uMWP-1)

The projections for water requirements indicate that the Mgeni System has been facing a deficit since 2016. To address this challenge, the Umgeni Water Project 1 (uMWP-1) (refer to (Figure 7.14) has been proposed to enhance the water resources.

The project will incorporate both bulk raw water infrastructure, managed by the Trans Caledon Tunnel Authority (TCTA), and bulk potable water infrastructure, guided by Umgeni-uThukela Water (UUW).

The primary objective of this project is to significantly increase the yield of the Mgeni System from 394 million cubic meters per annum (m³/a) to 608 million m³/a by December 2032.

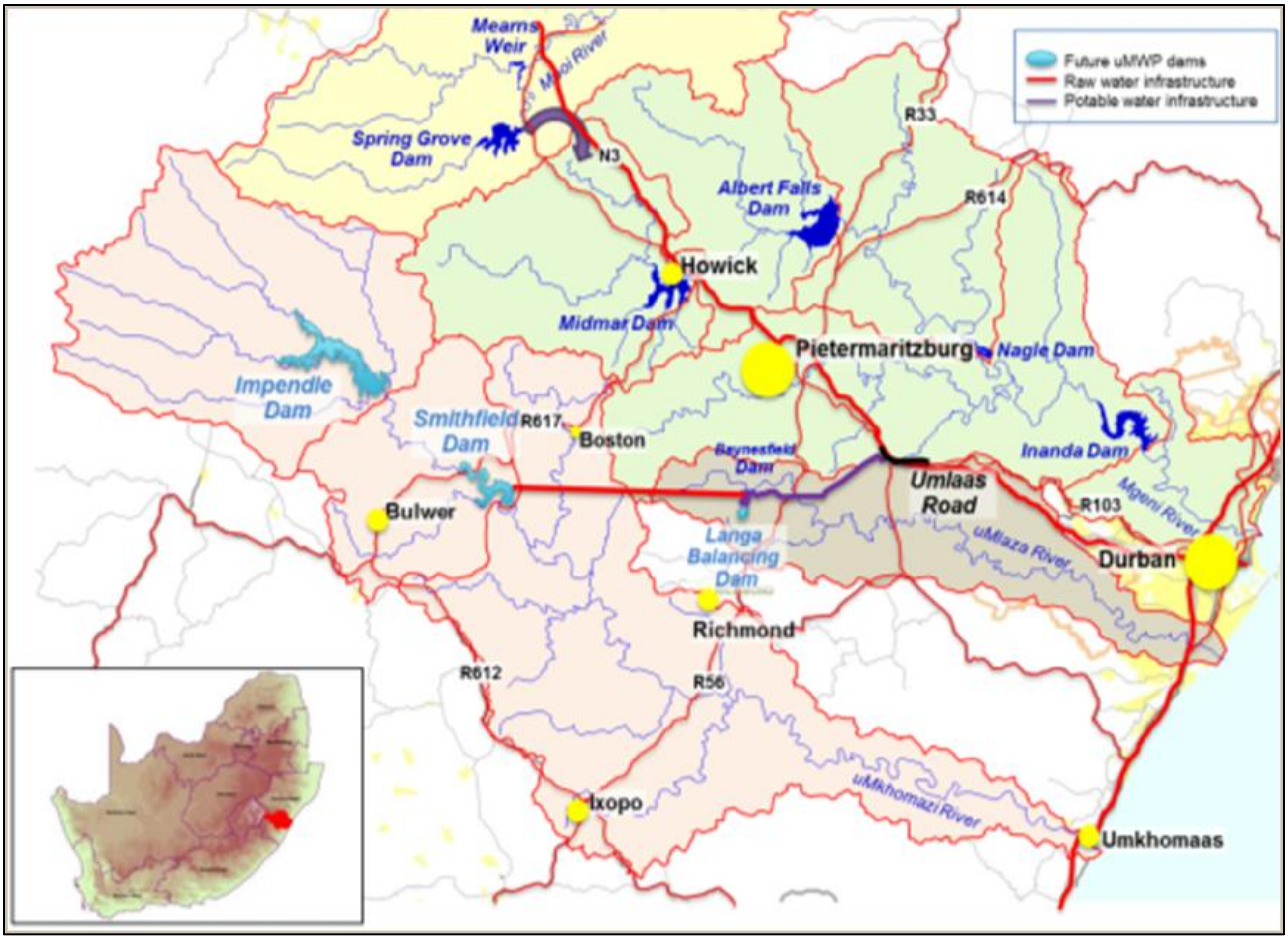


Figure 7.14: Schematic layout of uMWP-1. Source (DWS, 2024)

7.9.4 Nwamitwa Dam Project

To enhance the management of water resources in the region, it was proposed that the Tzaneen Dam be raised. This initiative aims to improve the water storage capacity and ensure a more consistent supply for various applications, including agricultural use, domestic consumption, and industrial processes.

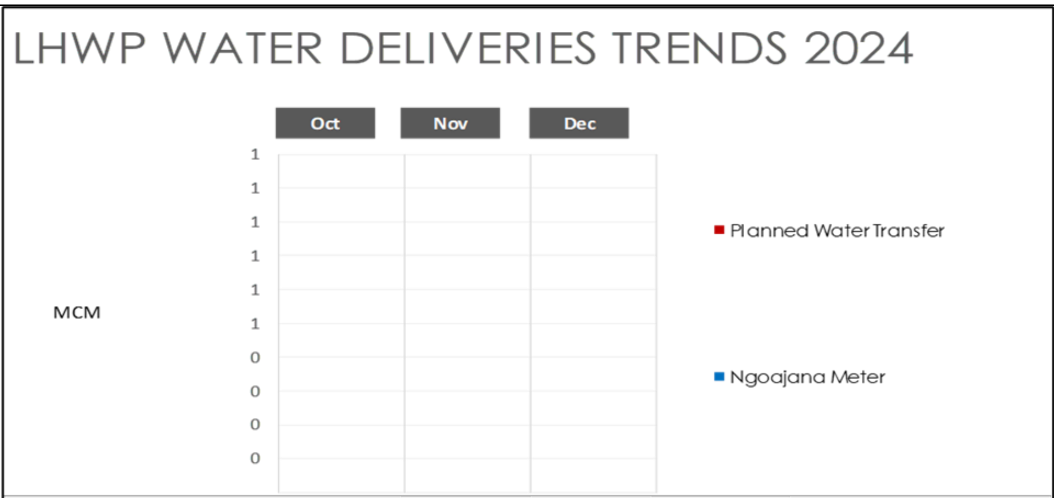
In conjunction with this effort, the development of the Nwamitwa Dam on the Groot Letaba River is recommended. This project will encompass essential supporting infrastructure to facilitate effective integration with existing systems. The following components will be included:

- Nwamitwa Dam

- Sanral Bridge
- Rail Bridges
- Roads
- Relocation of Eskom Substation and Power Lines

7.9.5 Lesotho Highlands Water Project Phase 2 Update

Target: LHWC delivery schedule compliance, November 2024 plan was 0 MCM (Figure 7.15). Actual delivery for October to March 2024 was 0 MCM as per Planned 2024 Shutdown. Planned maintenance consists of five yearly inspections and tests as per the O&M Manual, not annual routine inspections.



Volumes	Oct	Nov	Dec	Total	Trend
Planned Water Transfer	0,00	0,00	0,00	701,00	
Ngoajana Meter	0,00	0,00	0,00	698,75	

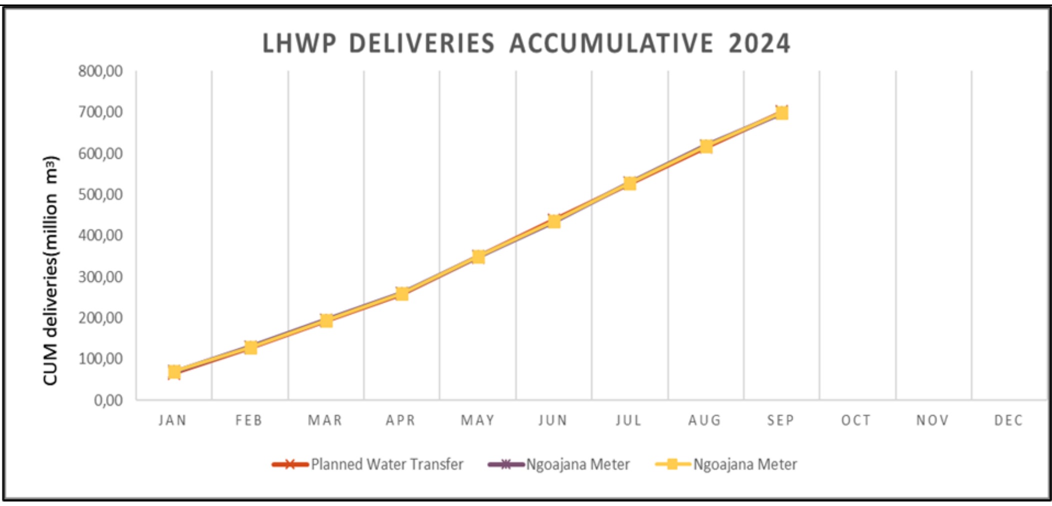


Figure 7.15: Lesotho Highlands Water Project water deliveries trends for 2024. Source DWS, 2024

7.10 Umgeni-uThukela Water Project

7.10.1 Stephen Dlamini Dam

The Stephen Dlamini Dam project aims to provide sustainable water supplies to Bulwer and surrounding peri-urban and rural communities. This project involves constructing a large storage dam on the Luhane River, which will serve as the main water source for the Harry Gwala District Municipality's Regional Bulk Water Supply Scheme.

7.10.2 Cwabeni Dam

The project involves the construction of a new concrete-faced zoned rockfill dam on the Ncwabeni River. It will include a multi-level intake tower, an abstraction weir on the uMzimkhulu River, and a pump station with a pipeline to transfer water into the off-channel storage dam. The project began in June 2017 and is currently 80% complete, with an anticipated completion date in 2030.

7.11 Reconciliation Strategies

The purpose of the Reconciliation Strategy studies is to determine the current water balance situation and to develop various possible future water balance scenarios for at least a 25-year planning horizon. It further aims to describe the proposed strategy, and the associated actions, responsibilities and timing of such actions that are needed to reconcile available resources and requirements, to enable additional interventions to be timeously implemented, to prevent the risk of a water shortage becoming unacceptable. The Strategies offers a system for the continuous monitoring and updating of existing Reconciliation Strategies.

7.11.1 Algoa System

Nelson Mandela Bay Municipality (NMBM) is regarded as the economic hub of the Eastern Cape Province, contributing 36,8% of the gross geographic product of the Province. The proximity of extensive commercial agriculture contributes to growth in the NMBM, providing permanent and seasonal jobs, as well as value-added activities for communities, both within and on the fringe of the NMBM. The opportunities within the NMBM have led to a rapidly increasing population through in-migration and growth in peri-urban settlements, which has exacerbated the backlog in services.

The Algoa WSS extends from the Kouga River system in the west to the Sundays River system in the east. The Algoa WSS provides water to the Gamtoos Water Users Association (WUA), NMBM and several smaller towns within the Kouga Municipality.

The system currently comprises three major dams in the west, several smaller dams, and a spring situated near NMBM, as well as an inter-basin transfer scheme from the Orange River via the Fish and Sundays rivers to the east. Towns located within Kouga LM are supplied from boreholes and springs, in addition to the supply from the Algoa Water Supply System (WSS).

System Yield and Water Balance

The updated 2024 1:50-year long-term stochastic system yield is 163.2 million m^3/a (447.1 Mℓ/d). The WSS is therefore in severe deficit because of over-allocation and reduced water availability, and the slow implementation of interventions. Considering the updated 2024 system yield, the WSS is currently in severe deficit of 58.76 million m3/a (161.0 Mℓ/day).

For the ***Medium Linear Per Capita Growth with Moderate Climate Change Water Balance Scenario***, as shown in Figure 7.16, and regarded as the preferred scenario to plan for, water requirements increase from the current (2022/23) 125.2 million m^3/a to 214.7 million m^3/a in 2055, i.e., an increase in water requirements of 89.5 million m^3/a.

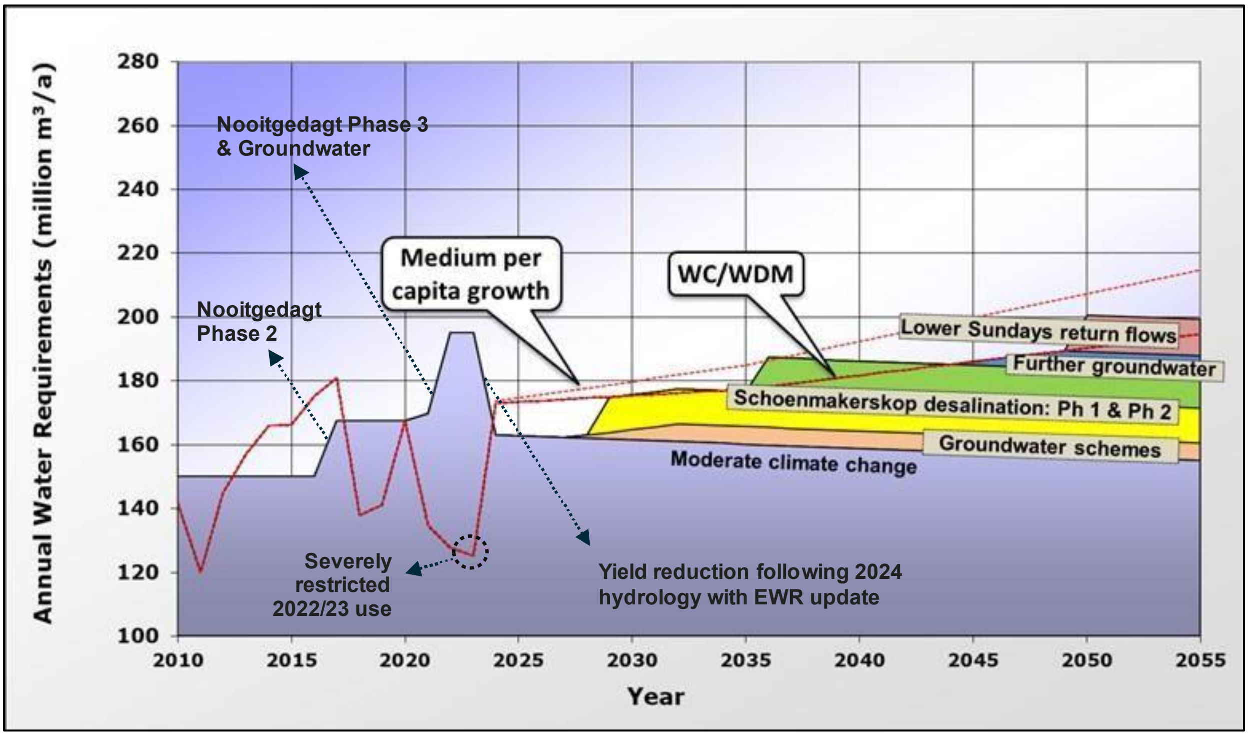


Figure 7.16: Medium Per Capita Growth with Moderate Climate Change Scenario

Intervention Options

A summary of the evaluated interventions to be considered for the water balance scenario evaluation are presented in Table 7-7.

Table 7-7: Intervention options for the Algoa WSS

WSS	Intervention	Progress
ALGOA	**Nooitgedagt-Coega Low Level Scheme Phase 3:**	NMBM completed the Phase 3 project, following earlier implementation by Amatole Water. Phase 3 is operational since 2022 and ensures a supply of 76.55 million m^3/a) (210 Mℓ/day).
	Municipal Groundwater Evaluations and Implementation of Groundwater Schemes	NMBM has constructed six new wellfields, all of which are in operation, however, some are not yet operating to full capacity. The estimated combined capacity is 27.1 Mℓ/day with an emergency supply potential of 36.3 Mℓ/day. NMBM recently completed an assessment of future groundwater target areas in and around the Metro. The CDC has been tasked by the NMBM to investigate these potential new groundwater sources. Kouga Municipality sought to reduce their reliance on surface water, from the Churchill and Kouga dams. In 2018/9 and 2022/3 numerous boreholes were drilled in Jeffreys Bay, Humansdorp, Hankey, Patensie, St Francis Bay and Oyster Bay - many of which have been equipped. The combined supplied yield is estimated to be ~11 Mℓ/day with the potential to increase it by an additional ~7 Mℓ/day.
	New Dam in the Kouga River	The comparative costs and potential impacts of the Guernakop Dam and the alternative 'raised' Kouga Dam were updated during this support cycle of the Algoa Reconciliation Strategy, during 2023.
	Nooitgedagt Scheme Phase 4	An evaluation of Phase 4 needs to be done, considering the required municipal treatment and distribution infrastructure, as well as implications of water efficiency measures needed for the Orange-Fish-Sundays transfer scheme from Gariep Dam, to ensure water availability. DWS indicated that any further allocations of Orange River water to NMBM would need to be coupled to proven associated savings in transferred Orange River water.
	NMBM 60 Mℓ/d phased Schoenmakerskop Desalination Scheme	The Nelson Mandela Bay Business Chamber (funded by Ezethu Trust) in cooperation with NMBM, has undertaken an Implementation Readiness Study to develop a preliminary design (Design Basis Report that will form part of an Environmental Impact Assessment submission) and advise on implementation readiness to guide the procurement process for construction of a phased 60 Mℓ/day seawater desalination plant at Schoenmakerskop south of the Metro.
	Coega SEZ 15 Mℓ/day Desalination Scheme	It was previously planned that the proposed phased desalination scheme in Coega be part of the augmentation for the SEZ, to be connected to the Olifantskop reservoir when built. An application for funding of the scheme was however not approved. In view of the various interventions being explored by NMBM to address the ongoing potable water supply shortages in the municipality, this

WSS	Intervention	Progress
		may negate the need for CDC to find additional water supply sources, particularly desalination plants.
	Lower Sundays River Return Flows Scheme	Flow monitoring in the Sundays River in support of this intervention is ongoing. Flow and water quality sampling to support the planning of the scheme have been done in the lower Sundays River by DWS. The reconnaissance-level evaluation of the scheme was revisited as part of this study, in 2023.
	Re-Use of Treated Effluent from WWTWs throughout NMBM	Treated effluent at small-scale are made available for irrigation or construction purposes.
	Direct Reuse of Treated Effluent from WWTWs	NMBM has identified a pilot project for the direct re-use of treated effluent from the Cape Recife WWTW. The feasibility study for the implementation of this pilot project has been completed. The Driftsands WWTW, with a treatment capacity of 22 Mℓ/day, together with the Driftsands Reservoir (with a storage capacity of 24 Mℓ), has been identified as a good prospect for the direct use of treated effluent at a large scale in the longer-term. The expected yield from this scheme is estimated at 3.65 million m3/a (10 Mℓ//day), based on an Average Dry Weather Flow (ADWF) of between 15 to 20 Mℓ//day. Further investigation is needed to explore the potential of installing a direct water reuse plant at the Driftsands WWTW.

7.11.2 Amathole System

The Amathole WSS is in the Eastern Cape Province, Amathole District Municipality (ADM). The WSS includes the catchments of the Buffalo River system, the Nahoon catchment, the Upper Kubusi catchment, which transfers water to the Buffalo River catchment, and the Gqunube River system.

In the original (2016) water reconciliation strategy of the Amathole WSS, it was determined that there may be potential to supply the system from the dams in the upper Keiskamma River catchment, given that Sandile Dam supplies Dimbaza in the Buffalo City Metropolitan Municipality (BCMM). Dimbaza was not in the original Amathole WSS footprint. Secondly, with boreholes drying to the east of the Gqunube River, BCMM had started providing water to areas in their jurisdiction that had previously not been included in the Amathole WSS. Based on the above, the study area was extended to include the whole of the BCMM area east of the Amathole WSS, including and up to the Kwelera River catchment and Cinsta Bay, as well as the upper Keiskamma catchment (quaternary catchments. R10A, B and C).

The extended Amathole WSS covers a total area of 4 293.94 km^2 with an estimated population of 896 726 as of 2022. The average population density of the WSS is 208 inhabitants per km^2. This is much higher than the average population of South Africa, which is 48.3 inhabitants per km$^{2.}$

System Yield and Water Balance

The water balance analyses indicate that the existing yield available at 1 in 50 years recurrence interval is insufficient to meet the Amathole WSS's water requirements. However, the additional water's quantum and timing differ depending on whether the yield is reduced by implementing preliminary Ecological Water Requirements (EWR) and the successful implementation of the Water Conservation/ Water Demand Management (WC/WDM) intervention measures. The additional water required for the median growth scenario without successfully implementing WC/WDM increases from 46.26 million m^3 /a, for the base scenario to 58.21 million m3 /a with the phased implementation of the preliminary EWR. This is an increase of 38.5% in additional water required with the phased implementation of the EWR. There is an urgency to undertake the classification of the water resources of the Amathole WSS to balance at least the ecologically sustainable base configuration (ESBC) with the need to ensure that the water resources of the Amathole WSS can sustain the economic utilisation of the water resources while maintaining the ecological status at the desired level based on the classification of the water resources of the Amathole WSS.

The determination of the water resource classes of the significant water resources in the Amathole WSS will ensure that the desired condition of the water resources, and conversely, the degree to which they can be utilised is maintained and adequately managed within the economic, social and ecological goals of the water users. With or without the phased implementation of the EWR, the future water requirements of the Amathole WSS will require either managing the consumer demands through implementing WC/WDM intervention measures and/or the development of conventional and non-conventional sources of supply.

The first initiative is to make up for the reduction in yield that is available for economic growth and development in the system due to the implementation of the preliminary EWR. The economic value of the additional water is critical for the sustainable economic growth and development of the Amathole WSS.

Table 7-8Figure 7.17 summarises the water reconciliation options required to meet the current and future water requirements with the phased implementation of the preliminary EWRs and implementing WC/WDM interventions to achieve a 50% rate in the water saving target.

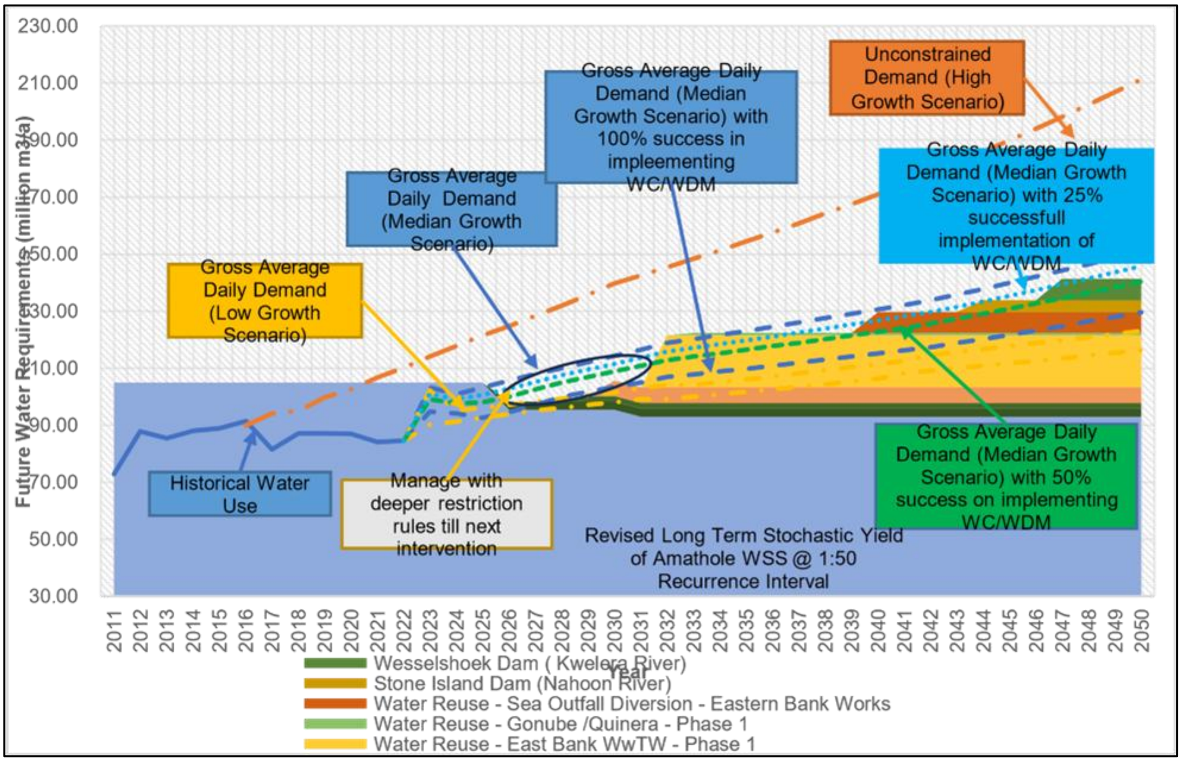


Figure 7.17: Water Balance Perspective to meet current and future water requirements- Median growth scenario with phase implementation of EWR & 50% successful Implementation

Interventions Options

A summary of the evaluated interventions to be considered for the water balance scenario evaluation are presented in Table 7-8.

Table 7-8: Summary of Water Reconciliation Options in the Amathole WSS

INTERVENTION	Water Reconciliation Options	Earliest First Water
Groundwater	Gasela Rooikrans Gubu Valley Sttuterheim Rabula-Keiskammahoek	2026
Water Conservation and Demand Management	Buffalo City Metropolitan Municipality Amatole Water- Rooikrants Pipeline Amatola Water- Laing Dam WTWs Amatola Water – Nahoon Dam WTWs Amathole DM- Stutt	2028 2026 2027 2027 2027
Water Re-Use and Desalination	Water Reuse - Reeston / Central Regional WWTW Phase 2 Water Reuse - East Bank WwTW - Phase 1 Water Reuse - Gonubie / Quinera WwTW- Phase 1 Water Reuse - Sea Outfall Diversion - Western Bank Works	2030 2032 2032 2030 2033
Desalination of Seawater and Brackish Water	Desalination Plant near East Bank WWTW	2030
Surface Water Resources	Stone Island Dam (Nahoon River) Mhalla's Kop Dam (Gqunube) Wesselshoek Dam (Kwelera River) North Slope (Toise River) Ravenswood Dam (Keiskamma River) Thornwood Dam (Keiskamma River)	2035 2038 2037 2029 >2050

7.11.3 Western Cape Water Supply System

The Western Cape Water Supply System (WCWSS) supplies water to the City of Cape Town, to towns in the Boland, West Coast and the Riviersonderend catchment, and to irrigators along the Berg, Riviersonderend, and the Eerste Rivers.

The current City of Cape Town (CoCT) population is estimated to be 4.98 million people. The future (medium growth population scenario) projections indicate that the total population of the WCWSS strategy area will grow from 5.98 million to 7.14 million by 2035 and to 9.19 million by 2055.

System Yield and Water Balance

As a result of the reduction in system yield, the WCWSS is currently over-allocated. It is mainly the Theewaterskloof and Voëlvlei dams that are over-allocated. The Western Cape economy is water-constrained, and this constraint applies even when the region's dams are full. The 2023/24 water use from the WCWSS was 506 million m^3/a, in comparison with the 98% assured system yield of 553 million m^3/a. The system water use in 2023/24 was 84 million m3/a less than the system allocation, mainly described to irrigation water use. New augmentation options and ways of managing them are required to avoid climate-water constraints and to sustain the resilient economic development of the CoCT and surrounding areas.

The Medium Growth scenario is regarded as the probable scenario to plan for, in combination with moderate climate change, as depicted in Figure 7.18 , whilst keeping in mind the potential implications of more severe climate change or higher future growth in water requirements.

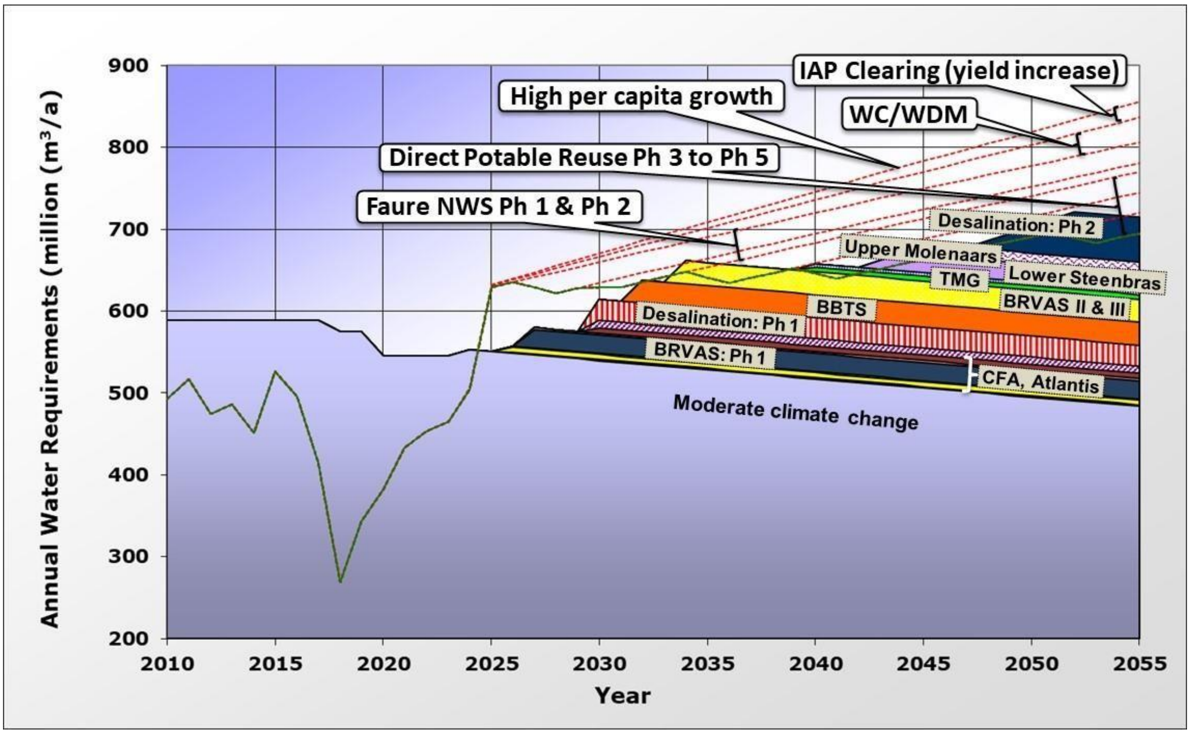


Figure 7.18: Total Medium Growth Scenario with Moderate Climate Change

Intervention options

A significant issue to address in the evaluation of potable water use scenarios is the current extent of reliance on surface water. While this is, to an extent being addressed through the implementation of groundwater schemes, this does not make the system adequately climate-resistant, and further diversification of sources is needed.

A summary of the features and costs of the evaluated interventions to be considered for the water balance scenario evaluation is given in Table 7-9.

Table 7-9: Summary of potential interventions

WSS	INTERVENTION	PROGRESS /COMMENTS
WESTERN CAPE WATER SUPPLY SYSTEM	COCT WC/WDM Programme	
SURFACE WATER		
	Alien Vegetation clearing Breed Berg River Transfer Scheme (BBTS)	IAPs clearing programmes Diversion of winter flows from a diversion weir on the Dewars River tributary of the upper Breede River to Voelvlei Dam, including raising of Voelvlei Dam.
	Raising Lower Steenbras Dam BRVAS Phases II / III	Raising of the Lower Steenbras Dam by 20m Simultaneous implementation of Phase II, increasing diversion capacity from 4 m³/s to 6 m³/s, and Phase III that entails raising of Voëlvlei Dam by 2m.
	BBTS + BRVAS Phases II / III, with 2m Raising of Voëlvlei Dam	Simultaneous implementation of the BRVAS Phases II / III and BBTS schemes.
	Upper Molenaars Diversion	Diversion of winter flows from the upper Molenaars River tributary of the Breede River, from where water would be pumped to flow through the existing Huguenot Tunnel. From there, water would be conveyed under gravity to various points.
	Raising Wemmershoek Dam	Raising of Wemmershoek Dam Wall.
GROUNDWATER AUGMENTATION SCHEME		
	Table Mountain Group (TMG) Aquifer Cape Flats Aquifer CFA	Nuweberg Phase 2 Wellfield, with a planned commission date of 2035 Groenlandberg Phase 3 Wellfield with a planned commission date of 2025 Hanover Park, with a planned commission date of 2025 Strandfontein North and East, with a planned commission date of 2026

WSS	INTERVENTION	PROGRESS /COMMENTS
		Philipi, with a planned commission date of 2026 Mitchells Plain WTW, with a planned commission date of 2027
	Atlantis Aquifer further phases	Scheme refurbishment because of significant losses in production capacity, plus increased abstraction from the aquifer.
	Langebaan Road (and Hopefield) Aquifer (LRA) wellfield expansion	Continuation of Phase 2, to implement a MARs Scheme (artificially recharged by Berg River from Withoogte WTW to reduce the impact of abstraction
DESALINATION		
	CoCT Seawater Desalination: Phase 1 Paarden Island CoCT Seawater Desalination further phases (3 phases)	Establishment of a CoCT 50 - 70 Mℓ/day permanent desalination plant (Paarden Eiland) located adjacent to Paarden Island in Cape Town. Preliminary site selection investigations were conducted for seven sites. A site has not been determined for this scheme; however, potential sites are being investigated along the west coast of the Western Cape province between Kleinbaai and Buffelsbaai.
EFFLUENT REUSE		
	Faure New Water Scheme Phase 1 Faure New Water Scheme Phase 2 Further potable use of treated effluent Treated Effluent Reuse (Dual infrastructure reticulation)	Phase 1 of the Faure New Water Scheme is currently being implemented. Phase 2 of the Faure New Water Scheme of which Phase 1 is currently being implemented. The CoCT Strategic Water Reuse Study considered the potential for the further development of direct water reuse schemes, following the implementation of the Faure New Water Scheme. Non-potable treated water supplied to end-users as an alternative use, from 11 existing WWTWs.

7.11.4 KZN Coastal Metro Area Reconciliation Strategy

The KZN Coastal Metro Area Reconciliation Strategy comprises three distinct, but interlinked water supply systems (WSS) with associated supply areas. Due to interlinkages in water supply and across administrative boundaries, they are covered in a single over-arching strategy. The water balances, however, cannot be lumped as there are realities such as certain users being supplied by certain sources, which need to be factored into the water balance projections.

Three WSS are described below and displayed conceptually:

1. The uMngeni WSS, which includes the bulk of the eThekwini, Msunduzi, and portions of uMgungundlovu Municipalities. This WSS is supplied by the major dams on the uMngeni River, supported by transfers from the Mooi River catchment.
2. The Upper and Middle South Coast WSS, that includes southern coastal portions of eThekwini, and northern coastal portion of Ugu municipalities. This WSS is supplied by local resources (3 water treatment plants (WTP), from local rivers and dams), augmented by a potable supply pipeline from a WTP linked to the uMngeni WSS.
3. The North Coast WSS, which includes the northern coastal portion of eThekwini, and the Coastal portion of iLembe municipalities. This WSS is supplied by The Hazelmere Dam on the uMdloti and an abstraction from the Lower Thukela River.

System Yield and Water Balance

uMngeni WSS

The water balance and status quo for the South Coast WSS is shown in Figure 7.19**.**

The uMngeni WSS is currently in deficit and has been for a few years. The wet years have masked this reality. The current water abstractions from the system are in the order of 515 million m^3/a (1 410 ML/d). This is approximately 20% higher than the "safe" yield of the water resources which are calculated to be 420 million m^3/a (1 150 ML/d), at a multi-user assurance level (approximately and average of 1:100-year recurrence of failure).

The current abstraction is also higher than the water use licence which has been aligned with the sustainable water resources potential. The throughput of water also exceeds the optimal operation capacities of the water treatment plant (WTP) facilities and is already equal to the maximum WTP capacities.

Thus, the system is stretched, and not only over-abstracted and at risk of drought impacts but has already reached its infrastructure supply potential. Further growth in effective supply will need to be achieved by making more water resources available and reducing water losses and the inefficient use of current resources.

Based on the level of over-abstraction, water requirements need to be managed, and the system brought back into balance as a matter of urgency to reduce risks to an acceptable level looking forward. The past few wet years have provided some gracious relief, but projections (coupled with the official progression into an El Niño cycle), means the system could already be at risk of needing some level of water restrictions in 2025 (from a resource perspective).

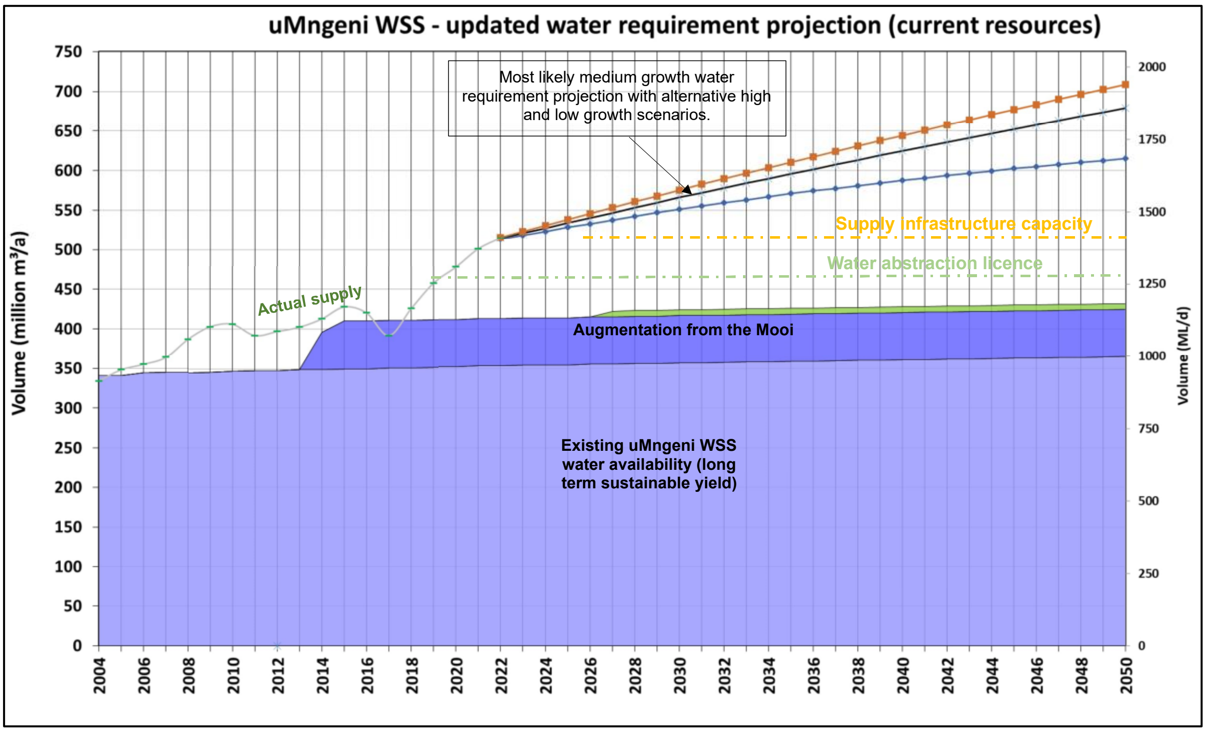


Figure 7.19: Water Balance with updated water requirement projections for the uMngeni WSS status quo

South Coast WSS

The Water balance and status quo for the uMngeni WSS is shown in Figure 7.20.

The South Coast WSS has reached a capped water supply situation, with water requirements exceeding the water resources available. As such, there is a suppressed water requirement situation. However, the Lower uMkhomazi Bulk Water Supply Scheme (BWSS) is under construction and should be completed by 2026 to augment the current shortage and meet growing water requirements over the projection period. While not a current resource, it is a committed project and in implementation. A smaller scheme named the Lovu River abstraction has recently been completed that improves the volume at which a suitable assurance of supply can be achieved from the local resources.

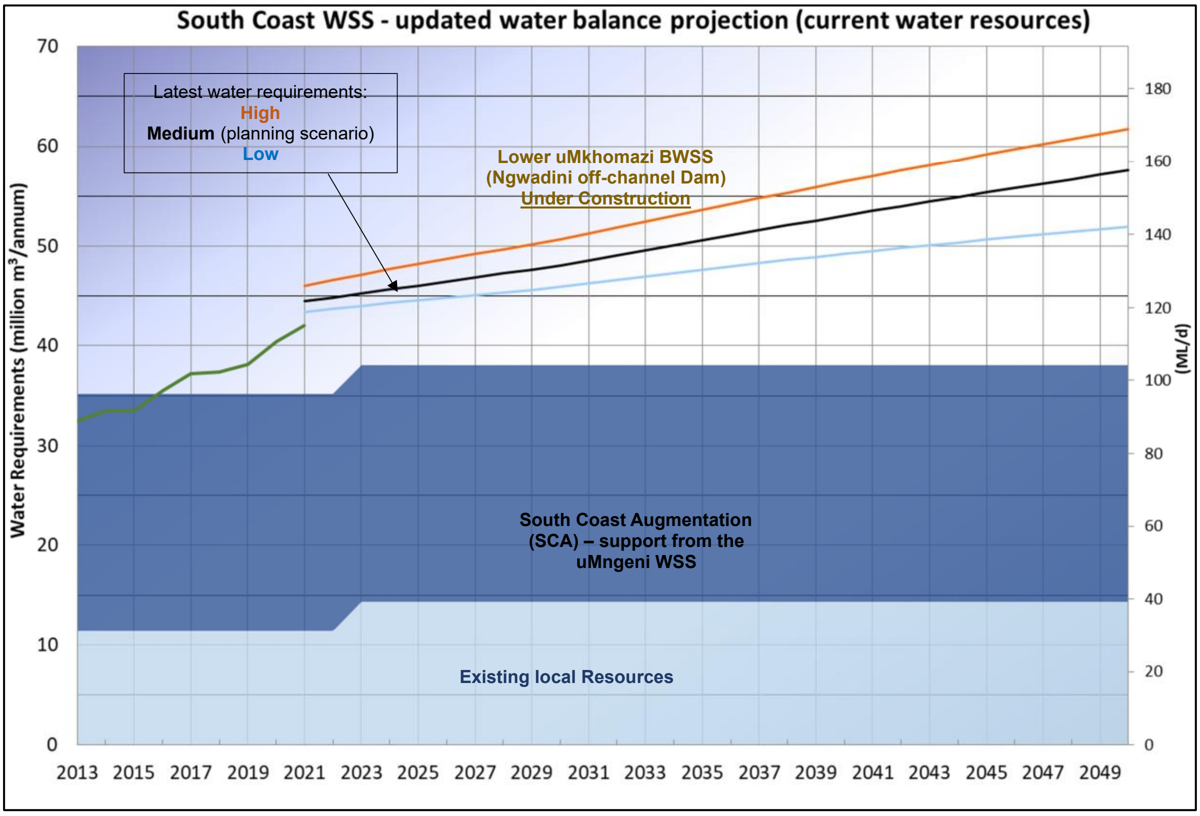


Figure 7.20: Water balance with updated water requirement projection for the South Coast WSS status quo

North Coast WSS

The water balance and status quo for the North Coast WSS is shown in Figure 7.21.

The North Coast WSS is also approximately in balance with current water requirements. Higher growth is projected for this area, with the requirements projected to exceed resources by 2024. This includes the increased water that will become available due to the raising of the Hazelmere Dam. The physical dam raising has been completed. However, there are some social issues related to households residing within the flood line of the raised dam level.

The abstractions of water associated with the raised dam is a risk while the dam is operated at a lower level. This issue is reported to be resolved in 2024, but it is important to be achieved prior to the ending of the wet season otherwise the increased storage will be of little benefit until the next year.

To augment supply to the growing water requirements an additional phase of the Lower Thukela BWSS is currently being pursued, as an extension to the existing Phase 1 that was completed and operational in 2018. Once Phase 2 is completed, it will add a volume of up to 20 million m^3/a (55 ML/d). Phase 2 of the scheme is currently in detailed design and is anticipated to proceed into construction with a projected completion date of around 2026/27.

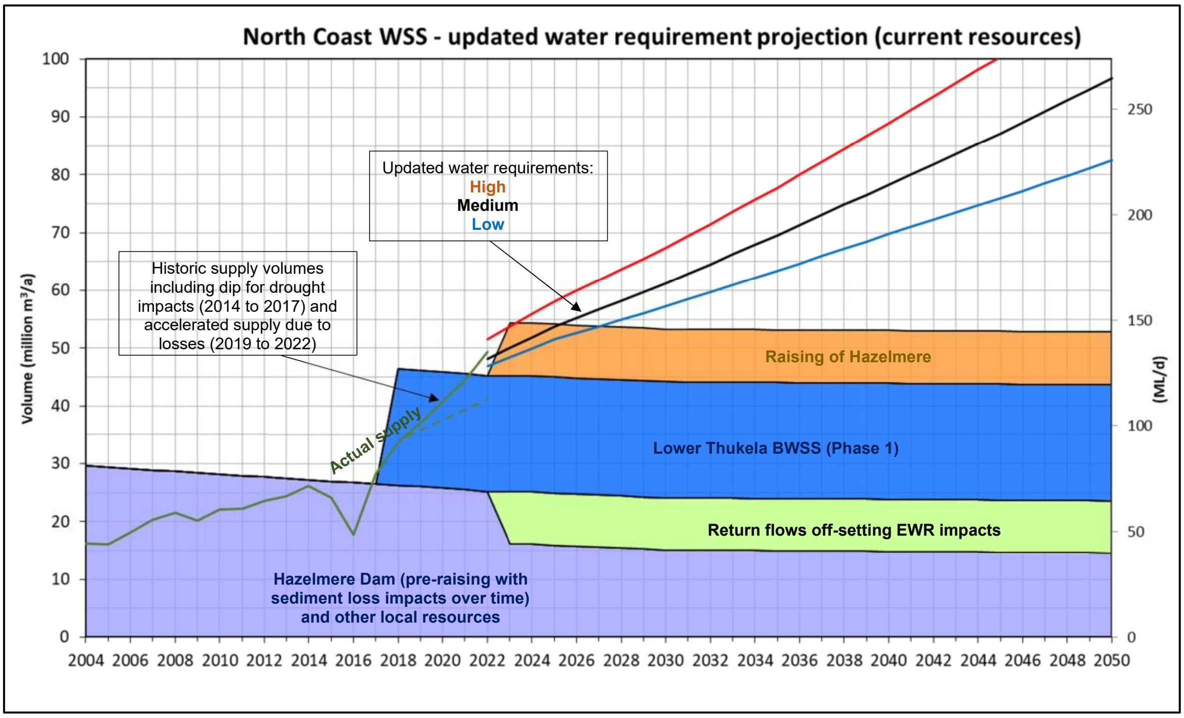


Figure 7.21: Water balance with updated water requirement projection for the North Coast WSS status quo

Intervention Options

Based on the status quo of the three WSS, there is a need for both short-term and long-term actions in all areas to address current and projected water security and supply constraint risks. Intervention options are summarised in Table 7-10: Intervention options for reconciling water requirements with water resources, together with the possible alternative options.

Table 7-10: Intervention options for reconciling water requirements with water resources

DESCRIPTION	INTERVENTION	PROGRESS/COMMENTS
Sustainable Supply Interventions	Mooi-Mgeni Transfer Scheme Phase 2A & B (DWS/TCTA)	Completed
	North Coast Pipeline and Hazelmere Supply Infrastructure (Umgeni Water)	Completed
	Hazelmere Dam Raising (DWS)	Raising of a dam by 7 m with piano key weir. Estimated completion date – Dec 2022
	Lower Thukela Bulk Water Supply Scheme Phase 1 (Umgeni Water)	Commissioning commenced Jan 2017

DESCRIPTION	INTERVENTION	PROGRESS/COMMENTS
Emergency Drought interventions		
	Mpambanyoni Emergency Abstraction Scheme (Umgeni Water)	Augment the Umzinto System (Umzinto and EJ Smith dams)
	uThongati Emergency Transfer	Augment supply of raw water to Hazelmere Dam
	Sembcorp Siza Water – Frasers WwTW	Treated effluent used for potable water supply in iLembe DM
Priority Management Interventions		
	Water Conservation and Water Demand Management	To bring use back in line with Water use licence. WSA WC/WDM Master Plans
	System Operations and Drought Management Forums	Protection of priority water use; avoiding system failure; managing short-term deficit
Priority Infrastructure interventions		
	Lower Thukela Bulk Water Supply Scheme Phase 2 (Umgeni Water)	Complete design and implement with urgency
	Indirect re-use of treated effluent (to off-set EWR releases from Hazelmere Dam)	Review growth of effluent return flows below the dam, reduce EWR release requirements accordingly.
	Re-use of treated effluent (possibly via Hazelmere Dam)	Update the initiative potential once regional WWTWs plans and dates are confirmed.
	Desalination of Seawater North Coast (Tongaat site)	Compare with alterative options. Consider phasing if selected.
	Mvoti River development (Isithundu Dam?)	Update hydrology and yields and compare with Desal and assess potential for All-towns areas supply.
uMgeni WSS		
	Remix project (Combination of desalination and re-use of wastewater)	Pilot is on hold. May be recommissioned if needed.
	Re-use in eThekwini (southern works)	Re-instate industrial supply contract.
	Re-use in eThekwini (Northern and Kwamashu works)	Linkages beyond 2030 when uMWP1 is implemented to be

DESCRIPTION	INTERVENTION	PROGRESS/COMMENTS
		resolved. Pilot phase at KwaMashu (20 to 25 Mℓ/d)?
	uMkhomazi Water Project Phase 1 (DWS)	Scheme to be implemented. Progress to be tracked.
South Coast WSS		
	Lower uMkhomazi Bulk Water Supply Scheme (Umgeni Water)	Scheme to be completed with urgency. Ability to reduce SCA to be reviewed and optimised.
	Lovu Desalination Plant	Desalination of sea water at Lovu. long standing option for beyond planning horizon
	iLovu River Scheme	Scheme to augment Toti WTP and reduce over-abstraction of Nungwane Dam
Support Interventions		
	Catchment Care and Ecological Infrastructure	Critical for maintaining water quantity and quality
	Rainwater Harvesting	Encourage the sustainable use of RWH in both formal and informal housing areas, and commercial buildings / office parks
Long-term Interventions		
	uMkhomazi Water Project Phase 2 (DWS)	Impendle Dam – long term option beyond 2050
	Thukela Water Project (Jana and Mielietuin dams)	Supply parts KZN (via lower Thukela) from surplus yield of Jana and Mielietuin dams.

7.11.5 Umhlathuze WSS

The focus of the Reconciliation Strategy Study was the Richards Bay Water Supply System (RBWSS). The RBWSS supplies water to the City of Umhlathuze Local Municipality (CoMLM), which comprises the towns of Richards Bay, Empangeni, Ngwelezane and Esikhawini, as well as a number of rural villages. Furthermore, the RBWSS also supplies large well-developed industries, commercial areas and business centres within the Study Area.

The RBWSS's supply area is within the Umhlathuze River Catchment, which is the major water resource. Water is, however, also sourced from various natural lakes within the Catchment such as Lake Nhlabane, Lake Mzingazi and Lake Cubhu. The

Catchment also serves as the resource for agriculture, both irrigated and dryland, afforestation, and ecological requirements.

The Study Area includes the Umhlathuze River Catchment. Umhlathuze River Catchment receives inter-catchment transfers from the Umfolozi River and Thukela (Tugela) River Catchments, and, as a result, these catchments are also part of the Water Supply System/Study Area. Additional smaller towns not incorporated in the Strategy (2015), namely Eshowe, Mtunzini, Melmoth, Gingindlovu and Amatikulu, were included in the Reconciliation Strategy Study. As a result of this, the catchments south of the Umhlathuze, namely the Mlalazi and Amatikulu, were also considered part of the study.

System Yield and Water Balance

The Umhlathuze system water balance is produced for users along the Umhlathuze River who have access to releases from the Goedertrouw Dam and abstractions from the Umhlathuze weir. In addition, the additional resources of Lakes Nsezi, Mzingazi and Cubhu as well as the existing transfer from the Umfolozi, are also included in the water balance representing the uMhlathuze System.

These users also make use of river runoff from tributaries entering the Umhlathuze River. It is assumed that the Thukela transfer from Middeldrift (Phase 1) is operational at its maximum installed capacity of 1.2 m^3 /s. The current resources are shown separately, including the available system yield and additional yield that can be obtained if the system is operated efficiently. The full benefit of runoff from tributaries is abstracted at the uMhlathuze weir. This efficient operation is reliant on real-time monitoring and controlled releases from Goedertrouw Dam. As of FY 2024, the catchment experienced a surplus in resources during the duration of this study due to the rainfall received above average. The growth in water use has been significant over recent years.

Figure 7.22 shows the high growth projection scenario and includes the full projection for Tronox (Exxaro) based on their contracted volume with uMngeni- uThukela Water of 17.83 million m^3/a. The scenario shows the steep jump, assuming that Tronox and RBM will take up their full water requirements in the upcoming year.

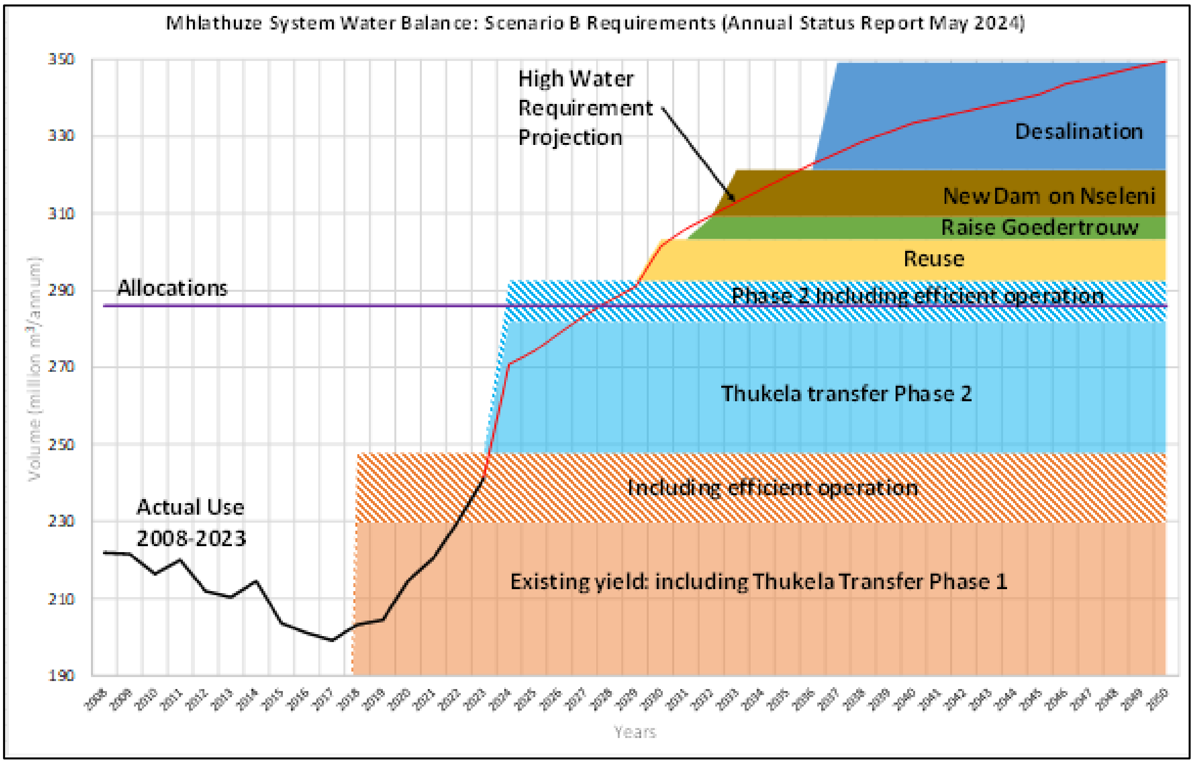


Figure 7.22: uMhlathuze System Water Balance Scenario B

Intervention options

Table 7-11 presents an updated Action plan to take forward for further interventions and monitoring.

Table 7-11: Action Plan of Interventions from 2024 update

WSS	Intervention	PROGRES/ COMMENTS
uMhlathuze WSS	Water Conservation / Water Demand Management	Implementation of the proposed WCWDM plan: Institutional: Improved political backing, capacity building Financial: Enhance revenue collection, improved tariff structure Social: Raise public awareness Technical: reduce water wastage, pressure management, bulk metering
	Maintain existing Thukela Transfer scheme	Ongoing maintenance of existing transfer scheme to ensure transfer can take place as and when required

WSS	Intervention	PROGRES/ COMMENTS
uMhlathuze WSS	Complete Thukela Transfer upgrade from Middeldrift	Minister to sign directive for uMngeni-uThukela Water to complete the work U-U W to finalise the construction and implement the scheme
	Water Reuse	Continue with existing PPP efforts to implement intervention, including establishing takers
	Interim Restriction Rule to Benefit Priority (Primary) Users	Carry out annual operating analyses to determine level of restrictions to be imposed on users on an annual basis, water requirement dependent Implement restrictions on lower priority users according to priority classification table Continuously monitor water use of large users to confirm actual growth is in line with projections
	Efficient system operation	Continuous maintenance of real time flow monitoring system, both data capture (measurement) and data sharing (cloud based) Enhancement of real time system based on pre-determined strategic monitoring points
	Existing Dam Raising	Feasibility Study and detailed design of raising Goedertrouw Dam
	New Dam Construction	Feasibility Study on new dam on the Nseleni River
	Remove alien vegetation	Implement programme to systematically clear alien vegetation and continuously maintain cleared areas Rehabilitate land and re-establish indigenous vegetation
	Desalination	Feasibility Study to determine viability and costing of large-scale desalination of seawater
	Groundwater use	Promote development of Groundwater resources on a local level

7.12 Ecological Infrastructure Rehabilitation

The conservation and restoration of wetlands are essential for ensuring water security in the country. Wetlands are natural resources and infrastructure that offer a range of functions and services. Despite their ecological significance, Wetlands constitute only 2.4% of the country's area (DFFE, 2021). Ecological assessment studies indicate that wetlands are among the most endangered ecosystems in South Africa and are presently in a deteriorated ecological state. The 2011 National Biodiversity Assessment indicated that 65% of wetland types were threatened, comprising 48% critically endangered, 12% endangered, and 5% vulnerable (SANBI, 2011).

Approximately 11% of wetland ecosystem types were identified as adequately protected, while the remaining 71% remained unprotected (SANBI, 2011). During the 1970s, governments globally, including South Africa, provided incentives to farmers to transform their wetlands into agricultural land. Over the years, these activities have profoundly influenced and transformed the landscapes of South Africa. SANBI (2011) and DFFE (2021) reported that 35% to 60% of South Africa's wetlands have been lost or significantly degraded. Figure 7.23 illustrates the national wetlands.

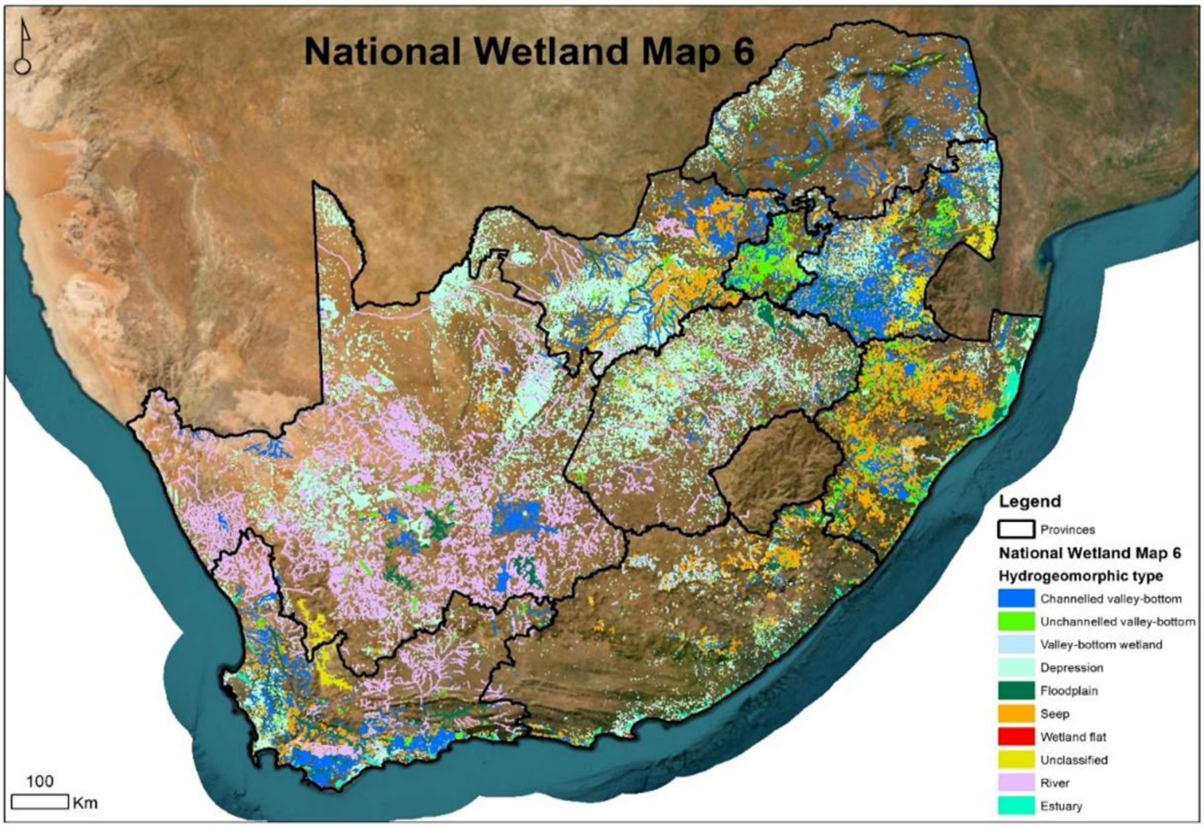


Figure 7.23: National Wetland Map (NWM) Version 06 showing the extent of wetlands (based on Hydrogeomorphic type, HGM) in South Africa.

7.12.1 Legislative Framework on Wetlands Protection

The South African government policy acknowledges that effective wetland conservation strategies must encompass both proactive measures for sustaining healthy wetlands and initiatives to remediate previous degradation. This aspect is fundamental to a government-initiated wetlands program. The following legislation advocates the safeguarding of wetlands in South Africa:

- ✓ **Section 24 of the South African Constitution** states that "everyone has the right to an environment that is not harmful to their health or well-being; and the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic growth."
- ✓ **The 1984 Conservation of Agricultural Resources Act** became the first substantial legal instrument for protecting wetlands and remains in force to this day.
- ✓ The **National Environmental Management Act (NEMA, Act No. 107 of 1998)** and the **National Water Act (Act No. 36 of 1998)** and the environmental provisions of the **Mineral and Petroleum Resources Development (Act No. 28 of 2002)** (MPRDA) ensure that urban and commercial developments do not affect or alter the natural state of wetlands.
- ✓ Principles such as the 'duty of care', enshrined in **Section 28 of the NEMA**, require that landowners take reasonable measures to prevent, minimise and rectify environmental degradation on their properties.

7.12.2 Ecological Infrastructure Rehabilitation and Restoration Projects

According to the 2018 National Biodiversity Assessment, rivers, wetlands, and catchment areas are critical ecological infrastructure for water security, often supplementing built infrastructure; however, the benefits of some of these ecosystems are currently jeopardised due to their poor ecological condition (SANBI, 2018). Water security can be enhanced through integrated natural resource management in Strategic Water Source Areas (SWSAs) and other critical catchments. SWSAs account for only 10% of South Africa's land area but supply 50% of all surface water, supporting half of the country's population and nearly two-thirds of its economy. Moreover, with climate change expected to alter rainfall patterns, wetlands will play a greater role in mitigating the effects of floods and droughts. All rehabilitation interventions aim to improve the condition and functioning of wetland ecosystems, addressing both causes and effects of degradation.

There are currently ongoing wetlands rehabilitation projects in the country; however, this report will focus on a few projects, including those implemented by DFFE in the provinces of KwaZulu-Natal and Mpumalanga. The wetland rehabilitation project in KwaZulu-Natal is currently in the process of restoring wetlands in the Isimangaliso Wetland Park. This park contains extensive areas of the system that have been historically degraded as a result of anthropogenic activities, including commercial forestry and human settlement development. The Park Authority, in collaboration with DFFE, has implemented the Working for Wetlands Programme to make substantial investments in financial and human resources to rehabilitate degraded areas and preserve the ecological integrity of the system. This has been achieved through the development of rehabilitation plans and associated implementation activities.

The DFFE also conducts a variety of rehabilitation interventions at the Verloren Vallei wetland site in Mpumalanga. These interventions aim to enhance water retention and habitat, with a particular emphasis on the White-Winged Flufftail, which necessitates a specific depth for breeding and hatching security. The White-winged Flufftail (Sarothrura ayresi) is a bird species of particular importance at the Verloren Vallei Ramsar Site and is critically endangered. One of the primary reasons the site has been designated as a Ramsar Wetland of International Importance is the elusive nature and preference for wetland habitats of this bird. Detailed information regarding the two DFFE projects is available in the case studies below.

In addition to these projects, DWS is rehabilitating a wetland along the Blesbokspruit River in collaboration with the City of Ekurhuleni and the Gauteng Department of Agriculture, Rural Development, and Environment (GDARDE). Upon its completion, this project will contribute to better managing and cleaning the Vaal Water Management Area (VWMA). This project's most recent progress report indicated that the wetland has experienced an increase in the number of new bird species, and water quality monitoring is ongoing.

The Rehabilitation of iSimangaliso Wetland Park, KwaZulu-Natal

The iSimangaliso Wetland Park, formerly known as the Greater St. Lucia Wetland Park, is a UNESCO World Heritage Site located in the KwaZulu-Natal province of South Africa. It is one of the country's most ecologically diverse and significant conservation areas, covering approximately 3,280 km² along the northeastern coast of KwaZulu-Natal. The Park plays a crucial role in environmental conservation, as it harbours several threatened and endangered species including three major lake systems, eight interlinking ecosystems, 700-year-old fishing traditions, most of South Africa's remaining swamp forests, Africa's largest estuarine system, 526 bird species and 25 000-year-old coastal dunes – among the highest in the world.

iSimangaliso also contains four wetlands of international importance under the Ramsar Convention. This dynamic ecological system comprises multiple interconnected wetlands of varying sizes and characteristics (i.e., Hydrogeomorphic units).

Large areas of the system were historically degraded due to anthropogenic activities such as commercial forestry and human settlement development. The Park Authority in conjunction with the Department of Forestry, Fisheries and the Environment (DFFE) through the Working for Wetlands Programme has made substantial investments to rehabilitate degraded areas and maintain the system's ecological integrity through the development of rehabilitation plans and associated implementation activities. These areas have since been cleared of forestry plantations, and earthworks in the form of 'historical forestry road removal' were the predominant rehabilitation intervention during the 2024/2025 financial year as guided by the Park's wetland rehabilitation plan. Figure 7.24 and Figure 7.25 show the progress of the historical road removal.

Figure 7.24: Historical road project site before revegetation.

Figure 7.25: Historical road project site after revegetation.

The Working for Wetlands Programme has adopted a multipronged approach towards wetland rehabilitation as it aims to address various socio-ecological challenges such as:

- **Invasive Species Control**: Non-native plant species threaten the natural wetland ecosystem. Rehabilitation often involves the removal of these invasive species to make room for native vegetation, which in turn supports native wildlife.
- **Water Quality Improvement**: Wetlands are critical in filtering and improving water quality. Efforts to rehabilitate these systems may focus on reducing pollution, such as nutrient overload from agricultural runoff, and restoring the natural hydrological flow.
- **Restoration of Natural Hydrology**: Many wetlands in the park have been altered by human activities such as drainage for forestry or development. Restoration includes re-establishing the natural water flow and flood regimes that are vital for wetland species and plant growth.
- **Biodiversity Conservation**: Wetland rehabilitation is also crucial for preserving the park's diverse range of wildlife, including migratory birds, amphibians, and fish. By restoring wetland habitats, the park supports these species' survival and increases their population numbers.
- **Community Involvement**: Local communities are involved in rehabilitation efforts through the Expanded Public Works Programme (EPWP) model, both as stakeholders in preserving the park's natural resources and as participants.

During the 2024/2025 financial year, a total of eight wetlands were rehabilitated within the park through the removal of historical forestry roads and revegetation of these areas with native wetland species. Rehabilitation of these wetlands ensures the continued ecological health of the area, benefiting biodiversity and supporting sustainable livelihoods for

Working for Wetlands Programme – A Case Study of the Verloren Vallei Wetland, Mpumalanga

The Verloren Vallei Ramsar Site is a wetland area located in the Mpumalanga province of South Africa. It covers approximately 6,300 hectares and is recognized for its ecological importance. The site is primarily known for its diverse range of wetland habitats, including marshes, grasslands, and peat bogs. Verloren Vallei is home to a variety of rare and endangered species, particularly birdlife, such as the Blue Crane, White-winged Flufftail (Sarothrura ayresi) and the Yellow-breasted Pipit. The site was designated as a Ramsar Wetland of International Importance due to its unique biodiversity and its value as a key habitat for migratory birds.

Conservation efforts are focused on preserving the area's ecological integrity while maintaining its importance for biodiversity. The Department of Forestry, Fisheries and the Environment (DFFE) is currently working on various rehabilitation interventions at the Verloren Vallei wetland site to improve water retention and habitat in particular for the White-Winged Flufftail which requires a specific depth for breeding and hactchling safety.

Project Progress

The progress at Verloren Vallei includes the following rehabilitation interventions:

- Raising the water level within the wetlands with the aid of Donga locks
- Construction of cattle grids on gates for access roads to minimise scouring and sedimentation of wetlands
- Upgrading of access roads (visitor) paths/roads to minimise disturbance of wetland soils and vegetation
- Alien invasive plant species removal to improve biodiversity, water retention and protection the soils.

Project Partners

Organisations involved in the work at Verloren Vallei include the DFFE, as the project implementer, MTPA, Bird Life SA, and Friends of Verloren Vallei.

Other rehabilitation projects currently in implementation in Mpumalanga include:

- Manyaleti Nature Reserve
- Loskop Dam Nature Reserve
- Wakkerstroom – KwaMandlangampisi Protected Environment
- Kruger National Park

The rehabilitation work involves various tasks and infrastructure development with a wide range of applications ranging from safe access for rangers, addressing head-cut erosion and removal of alien invasive plant species

Figure 7.26: Safe crossing over a wetland/watercourse in the Kruger National Park – This structure aids game rangers with safe and quick access to sites over watercourses to fight against poachers. The structure ensures that the vehicles do not disturb the wetland soils, protects the wetland from erosion and allows for free flow of the watercourse over the structure (Source: DFFE)