MPUMALANGA
GREEN CLUSTER
AGENCY

2023

Mpumalanga **Water**

Market Intelligence Opportunity Brief

Mpumalanga Green Cluster Agency

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LIST OF ABBREVIATIONS AND ACRONYMS

AMD	Acid Mine Drainage
B-BBEE	Broad-based Black Economic Empowerment
BOT	Build-Operate-Transfer
CCT	City of Cape Town
CHP	Combined Heat and Power
CoGTA	Cooperative Governance and Traditional Affairs
COVID-19	Coronavirus disease
DBSA	Development Bank of Southern Africa
DEDT	Department of Economic Development and Tourism
DFFE	Department of Forestry, Fisheries and the Environment
DORA	Division of Revenue Act
DWA	Department of Water Affairs (now DWS)
DWAF	Department of Water Affairs and Forestry (now DWS)
DWS	Department of Water and Sanitation
EIA	Environmental impact assessment
EME	Exempted micro enterprise
ERRP	Economic Reconstruction and Recovery Plan
ESG	Environmental, Social and Governance
GA	General Authorisation
GN	Government Notice
ILI	Infrastructure Leakage Index
KPA	Key Performance Areas
MFMA	Municipal Finance Management Act No. 56 of 2003
MGCA	Mpumalanga Green Cluster Agency
MIG	Municipal Infrastructure Grant
MIR	Market intelligence report
MLD	Megalitres (million litres) per day
NBI	National Business Initiative
NDP	National Development Plan
NRW	Non-revenue water
NRWP	Non-Revenue Water Programme
NSSS	Non-sewered sanitation systems
NT	National Treasury
NW&SMP	National Water and Sanitation Master Plan

NWA	National Water Act 36 of 1998
NWRIA	NWRIA National Water Resource Infrastructure Agency
NWRS-3	National Water Resources Strategy Edition 3
PCC	Presidential Climate Commission
PICC	Presidential Infrastructure Coordinating Commission
PPIAF	Public – Private Infrastructure Advisory Facility
PPP	Public Private Partnership
PPPFA	Preferential Procurement Policy Framework Act
PST	Primary Sedimentation Tanks
QSE	Qualifying Small Business Enterprise
RBIG	Regional Bulk Infrastructure Grant
SALGA	South African Local Government Association
SANS	South African National Standard
SDG	Sustainable Development Goal
SIDAFF	Sustainable Infrastructure Development and Financial Facility Programme
SIV	System Input Volume
SLA	Service Level Agreement
SSTs	Secondary Sedimentation Tanks
TIF	Technology and Innovation Forum
UISG	Upgrading of Informal Settlements Grant
VROOM	Very Rough Order of Measurement
W&S	Water and sanitation
WASH	Water, sanitation, and hygiene
WASH-FIN USAID	Water, Sanitation and Hygiene Finance Project
WBG	World Bank Group
WCWDM	Water Conservation and Water Demand Management
WEF	World Economic Forum
WRC	Water Research Commission
WSA	Water Services Authorities
WSI	Water services intermediary
WSIG	Water Services Infrastructure Grant
WUL	Water Use Licence
WULA	Water Use Licence Application
WW	Wastewater
WWF	World Wide Fund for Nature
WWTW	Wastewater treatment works

PROVINCES

EC	Eastern Cape	**MP**	Mpumalanga
FS	Free State	**NC**	Northern Cape
GP	Gauteng	**NW**	North West
KZN	KwaZulu-Natal	**WC**	Western Cape
LP	Limpopo		

CONVERSIONS

1 Megalitre = 1 million litres = 1 000 000 litres = 1 000 kl = 1 000 m3


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EXECUTIVE SUMMARY

This market opportunity brief is part of an annually updated series of reports that highlight investment opportunities in the green economy in Mpumalanga. It is written for investors who want to understand the opportunities for investment and job creation in green economy sectors in the province.

Investment in the Mpumalanga water sector is driven from a need for water security to enable economic development and resilience. Water pollution from economic activities such as mining and constraints on service delivery are some of the key challenges that inhibit this investment. The National Water and Sanitation Master Plan (2019) estimates that in South Africa as a whole the gap between supply and demand could be 10% by 2030 even with the implementation of planned additional water supply projects.

Mining accounts for about 2% of water use in Mpumalanga, but has a major impact on water quality, affecting the availability and cost of water. Particular concerns are degradation and acidification of current or potential future water supplies, including due to illegal mining, as well as the backlogs in water use licensing and irregularities in licensing processes. As the country intensifies its plans to transition to a low carbon economy, the closure of coal mines in the Mpumalanga region will require alternative economic activities to safeguard employment and create additional employment opportunities to address unemployment. Agriculture has been identified as such a critical lever to diversify the economy. However, the region of Mpumalanga is already water stressed - this presents an investment opportunity into water reclamation projects to support economic diversification initiatives.

Substantial investment is needed for the restoration of existing water infrastructure, as well as for providing additional capacity for both water resources infrastructure (for which the national government is responsible) and the water services infrastructure (for which municipalities are responsible). The capacity of national and local governments to support the financing of these investments is constrained, as a result of, among others, low water tariffs, high levels of non-revenue water and weak revenue collection.

This year's opportunity brief focuses on the opportunities linked to the public sector / municipal market and those linked to the private sector and specifically the coal mining industry to support the transition to a low carbon economy in Mpumalanga.

The key investment opportunities highlighted in the public sector / municipal market are:

- Upgrade, repair, replacement, maintenance and expansion of public wastewater treatment works (WWTWs) infrastructure
- Beneficiation of wastewater sludge.
- Reducing non-revenue water (NRW) [1].

The key emerging investment opportunity in the private sector / coal mining market is:

- Mine water reclamation for activities that are emerging as a means for economic diversification in the context of just transition.

[1] Non-revenue water (NRW) is the volume of water supplied by a water services provider (water utility) for which it receives no income due to various factors, including water losses, metering errors, billing errors, theft, and unbilled authorised consumption.

Opportunity	Key Drivers	Macro-environment	Risks & Barriers	Expected Timeframe	Targeted Stakeholder
Public sector / municipal market					
Upgrade, repair, replacement, maintenance and expansion of public WWTWs [2] infrastructure Based on the VROOM [3] index, it is estimated that a total of R960m in investment is required to get all of the public WWTWs in the province to a functional state. R625 million falls within municipalities with unqualified audit outcomes in 2021-22.	• Innovative blended financing models are starting to be applied in the water sector. • High operational expenditure on ageing infrastructure is highlighting the lifecycle savings of upgrading. • Constraints are being experienced on urban residential development due to constrained WWTWs and lack of bulk infrastructure. • There is an increase in project preparation support and available development finance linked to impact and sustainable development goals. • National government has committed to ensure that grant funding, namely Infrastructure Grant (MIG), Water Services (WSIG) and Bulk Infrastructure (RBIG) Grants is available and disbursed.	• The Mpumalanga Province has 76 municipality-owned WWTWs. The province is also serviced by 14 WWTWs owned by the national Department of Public Works resulting in a total of 90 WWTWs being monitored by DWS [4]. • A National Water Resource Infrastructure Agency (NWRIA) has been established aimed at raising commercial and development finance, domestically and internationally, and establishing public-private partnerships (PPP). • Development of the National Water Programme for South Africa through the Water Partnership Office by the DBSA [5] seeks to facilitate partnerships and manage joint accounts for funding projects implemented through collaboration between the public and private sector.	• Capacity constraints (knowledge, skills and personnel) are leading to several local municipalities failing to execute all their functions as a Water Service Authority (WSA). • Budget allocation to implement projects is inadequate and there are delays on project implementation. • Grant allocations are insufficient to immediately upgrade WWTWs in the short term and require a multi-year implementation approach. • Financial mismanagement of municipalities impacts their ability to access funding. • There is a limited pipeline of bankable projects with completed pre-feasibility reports to demonstrate viability of projects to potential funders. • Vandalism and theft of municipal infrastructure affects the viability of projects and willingness of investors to invest in municipal infrastructure. • Lack of verified or demonstrated technologies and projects locally limits municipal confidence in innovation.	Medium to long term	• Investors • Financiers • Technology providers

[2] WWTWs = wastewater treatment works

[3] The Very Rough Order of Measurement (VROOM) model was incorporated in the 2022 Green Drop Reports and provides insights on the state of the key elements of the wastewater infrastructure and provides an order of magnitude estimate of the cost to return infrastructure to a functional condition.

[4] DWS = Department of Water and Sanitation (national government)

[5] DBSA= Development Bank of Southern Africa

Opportunity	Key Drivers	Macro-environment	Risks & Barriers	Expected Timeframe	Targeted Stakeholder
Sludge beneficiation Diversion value: R30m per annum for municipalities in Mpumalanga.	• Liquid waste landfill ban (2019). As of August 2019, the nationwide ban of liquid waste disposal to landfill came into effect.[3] • Restrictions on organic waste disposal to landfill. (Phase-in has only started in the Western Cape, but is expected to be adopted in other areas of the country.)[4] • National strategy to divert 75% of organic waste by 2030. • Increasing transportation costs (as a result of rising fuel costs). • Increased demand for locally produced fertilisers (Fertiliser exports from Belarus and Russia – important fertiliser suppliers for Africa – have been disrupted by the Russia-Ukraine war). • Increased electricity costs, this leads to alternative energy sources like biogas being considered. • Potential for revenue: Sludge beneficiation has several circular economy options that could create potential revenue streams. • Availability of local innovative solutions to beneficiate sludge into commercial products, fertilisers and energy	• Key sludge treatment technologies used at WWTWs in Mpumalanga include belt press dewatering (3), anaerobic digestion (5), sludge ponds (10), solar thermal drying beds (36). There are 21 treatment works where information on technologies installed is insufficient. • 17 of the 76 municipal plants (22%) classify their biosolids according to the Water Research Commission (WRC) Sludge Guidelines. • 1 of the 76 plants (1.3%) monitors sludge streams (Kingston Vale WWTW in Mbombela). • 3 of 76 plants (4%) have sludge management plans in place. • 19 of 76 plants (25%) use sludge mostly for agricultural purposes, but also landfill application and commercial products.	• Policies and regulations required to enable industry to process sludge and waste by-products. • Aged wastewater infrastructure that is unable to sufficiently dewater sludge. • Poor infrastructure resulting in inconsistent volumes and quality of sludge production. • Poor sludge stream monitoring at WWTWs (1 of the 76 plants (1.3%) monitors sludge streams). • Lengthy municipal procurement processes. • Lack of technical skills to handle sludge and set up sludge offtake projects.	Short to medium term	• Climate financiers • Fertiliser producing companies • Farmers • Technology providers

Opportunity	Key Drivers	Macro-environment	Risks & Barriers	Expected Timeframe	Targeted Stakeholder
Reducing non-revenue water The savings if the NRW were to be brought back down to the global acceptable level of 20% is approximately R430 million per annum.	• Potential for savings (due to reduced water loss and wastage as well as inaccurate metering and billing). • Demonstrated short payback period. • Increasing water scarcity and droughts driving the need for more effective water management. • Awareness of high levels of water losses in Mpumalanga due to aged infrastructure.	• The water balance in Mpumalanga indicates NRW of 147.3 million m3/annum (51.2%) and water losses of 142.6 million m^3/annum (49.5%). [6]	• Lack of maintenance of wastewater infrastructure makes NRW difficult to detect and also puts investments into NRW at risk • Vandalism and theft affects the viability of projects and willingness of investors to invest in municipal infrastructure. • Complex contracting and financing models. • Municipal credit worthiness. • Political will.	Short to medium term	• Investors • Financiers • Technology providers
Private sector / coal mining market					
Mine water reclamation for activities that are emerging as a means for economic diversification in the context of just transition.	• Saline liquid waste ban to landfills took effect in the year 2021. • Stringent discharge standards, particularly licensing requirements for the establishment of brine ponds and pollution control dams. • Drive for repurposing of mine land and infrastructure as part of the economic diversification in response to the energy transition. • National push for diversifying the water mix to find alternatives to surface water. Increase in water reuse and groundwater by 2025 under the National Water and Sanitation Master Plan (NWSMP).	• There are 235 currently active coal mines in Mpumalanga. • It is estimated that 360 Ml/d may be generated after closure of all the Mpumalanga coalfields. • For the Upper Olifants Catchment, which is in the Nkangala district municipality, a volume of 170 Ml/d is estimated to be the currently generated volume.	• Policies and regulations required to enable industry to process mine water and waste by-products • Unclear business case for mines to develop water reclamation projects. • Current brine solutions not economically viable. • Skills and capacity constraints to develop bankable projects. • Public perception of water re-use. This is linked to contaminants of emerging concern (CECs) associated with mine impacted water.	Medium to long term	• Climate financiers • just transition funders • Coal mines • Technology providers • Agricultural sector

[6] Source: No Drop Water Report (DWS, 2023)

WHAT'S NEW?

The 2022 water market intelligence opportunity brief focused on the various emerging long-term investment opportunities in Mpumalanga that promoted a) economic recovery following the COVID-19 pandemic, b) water security and c) resilience. The 2022 brief highlighted business and investment opportunities in both the public sector, linked to water and wastewater infrastructure and sludge beneficiation, and the private sector, linked to decentralised wastewater treatment technologies, particularly for mines.

This year's report focuses on investment and business opportunities within the public market: **upgrade, repair, replacement, maintenance and expansion of public wastewater treatment works (WWTWs) infrastructure, circular economy solutions (resource recovery from the beneficiation of wastewater sludge)** and **reducing non-revenue water**. Within the private sector (mining) the focus is on mine water reclamation for activities that are emerging as a means for economic diversification in the context of the Just Energy Transition.

While the 2023 brief focuses on the public wastewater market and private sector mining water related opportunities, there are inherent links between wastewater treatment and reuse projects in agriculture, residential and industrial sectors.

Similarly, there are links between wastewater sludge management practices, and energy, agricultural and other valorisation opportunities related to treating wastewater. These opportunities have been included where they fall within the water value chain; while the **Sustainable Agriculture Market Intelligence Opportunity Brief** and **Renewable Energy Market Intelligence Opportunity Brief** present opportunities specific to those sectors.

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THE MPUMALANGA GREEN ECONOMY CLUSTER AGENCY

The Mpumalanga Province of South Africa faces socio-economic and environmental challenges arising from its resource intensive economic activities that contribute to climate change. Carbon intensive industries like mining, power generation and petro-chemicals are the core economic drivers in the province. The region is also currently navigating high levels of unemployment, inequality and poverty, even as pressure mounts to transition away from its current primarily coal-based economy.

The Mpumalanga Green Cluster Agency's (MGCA) mission is to stimulate a vibrant green economy for communities in the Mpumalanga province, enabled by a collaboration between government, business and academia. The vision is a vibrant, green and sustainable economy in the Mpumalanga Province, that leverages its rich natural resources and heritage to drive low carbon economic growth.

The MGCA is registered as a not-for-profit organisation in SA, with an appointed board of directors. The MGCA uses the triple helix cluster model with representation from government, business and academia .

Independent clusters can create the context to build trust between sector players, and work to unlock new mechanisms to enhance competitiveness and resilience. The green economy, in particular, lends itself to collaborative ecosystem building. Set in this system of rapidly changing technology, and the economics of this technology, are commitments to social inclusion, and greater equality. Collaboration through clustering on a local scale to build competitiveness on a global scale will support the growth of the green economy in Mpumalanga, and determine the green cluster in Mpumalanga's success.

The MGCA has made significant progress to date, in particular to systematically engage with businesses and local government in the province to identify and highlight opportunities and barriers for green economy projects in Mpumalanga. The MGCA has had several hundred engagements with the private sector to understand barriers and opportunities and it has launched several capacity building programs and technical support interventions in Mpumalanga.

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SECTOR OVERVIEW AND CONTEXT

This section presents an overview of the water sector, both at a national level and at a provincial level for Mpumalanga Province. The overview focuses on water supply, demand and wastewater treatment.

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2.1 SOUTH AFRICAN CONTEXT

2.1.1 WATER SUPPLY AND ALLOCATION

South Africa, which is the most industrialised economy on the African continent, is one of the world's 30 driest countries, with variable rainfall across the country averaging less than 500 mm annually. Climate change is projected to make the country even more arid and localised droughts will become more recurrent (World Food Programme, 2021).

The country has a reliable yield (i.e. supply from current infrastructure) of ~15 billion kl/year (at 98% assurance of supply, or 2% annual probability of supply failure). The majority of this yield is from surface water (77%), desalination (14%) and groundwater (9%) as shown in **Figure 1** (DWS (a), 2022). The projections of the water supply mix for 2025 and 2040 (**Figure 1**). The water use per sector in 2022 and projected water use in 2050 are indicated in **Figure 2**.

The national average consumption is reported to be around 237 litres/capita/day (l/c/d) (DWS 2019). This figure is much higher than the international average benchmark of 173 l/c/d (DWS 2019).

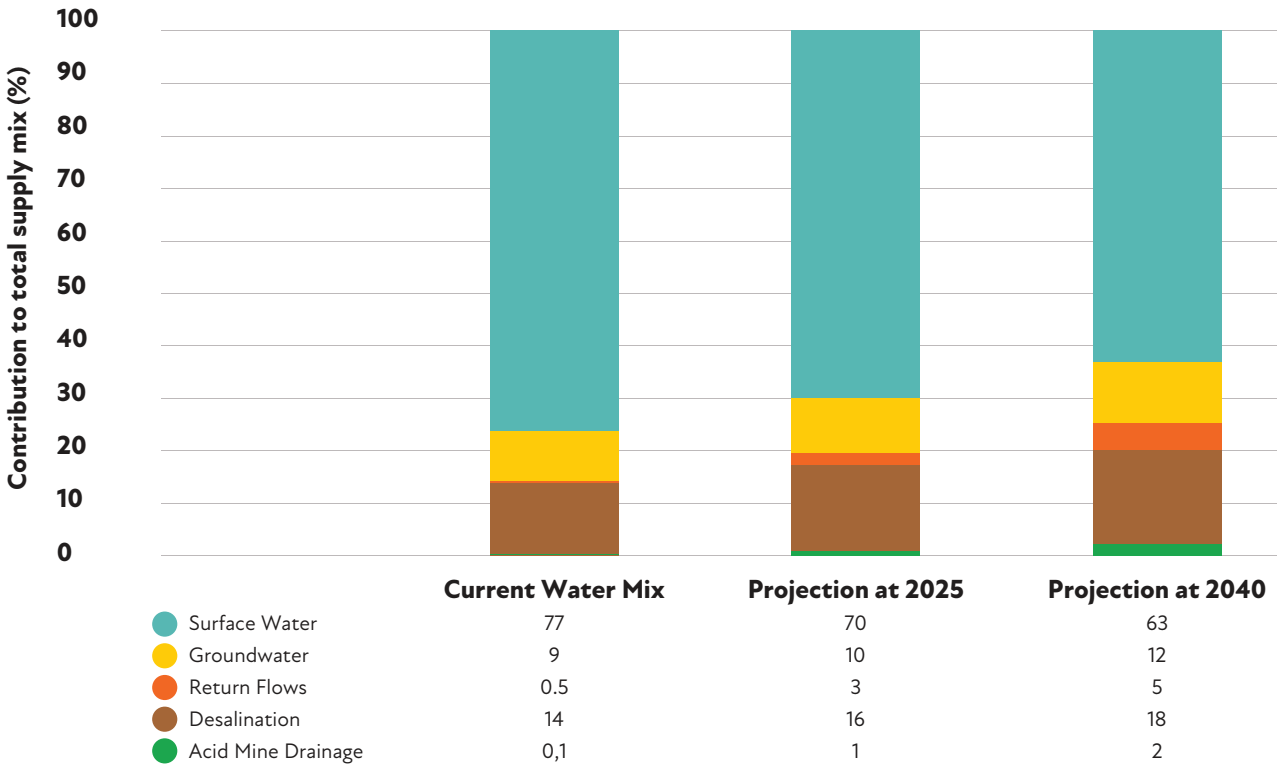


Figure 1: National overview of the current water resource mix and the projected resource mix for 2025 and 2040, respectively. *(Source: DWS (a), 2022)*

If demand continues to grow at current levels, the deficit between water supply and demand could be between 2.7 and 3.8 billion kl per annum by 2030, which represents a gap of about 17% between available surface and groundwater and demand (DWS, 2019). At present, South Africa is using 98.6% of the total water supply available nationally. Over the next 20 years, it is expected that supply of water will increase by roughly 24% while demand will rise by 25% (DWS, 2019). The very small margin growth in the water demand and plans for augmented supply to match demand puts South Africa's water security at high risk should any external shocks affect the supply of water. Furthermore, water supply varies across the country and there are some municipalities where demand exceeds supply.

It is evident that water security is mainly reliant on fresh surface water, with groundwater and return flows utilised to a much lesser degree. Surface water is however limited, so in order to build a resilient water system for the future, supply will need to be augmented with additional water sources such as additional ground water, sea water, water from springs, fog harvesting and rainwater harvesting.

Agriculture is the largest water-use sector (58%), followed by municipalities (30%), which covers residential, commercial, and industrial water users supplied by municipalities **Figure 2** (DWS 2022a).

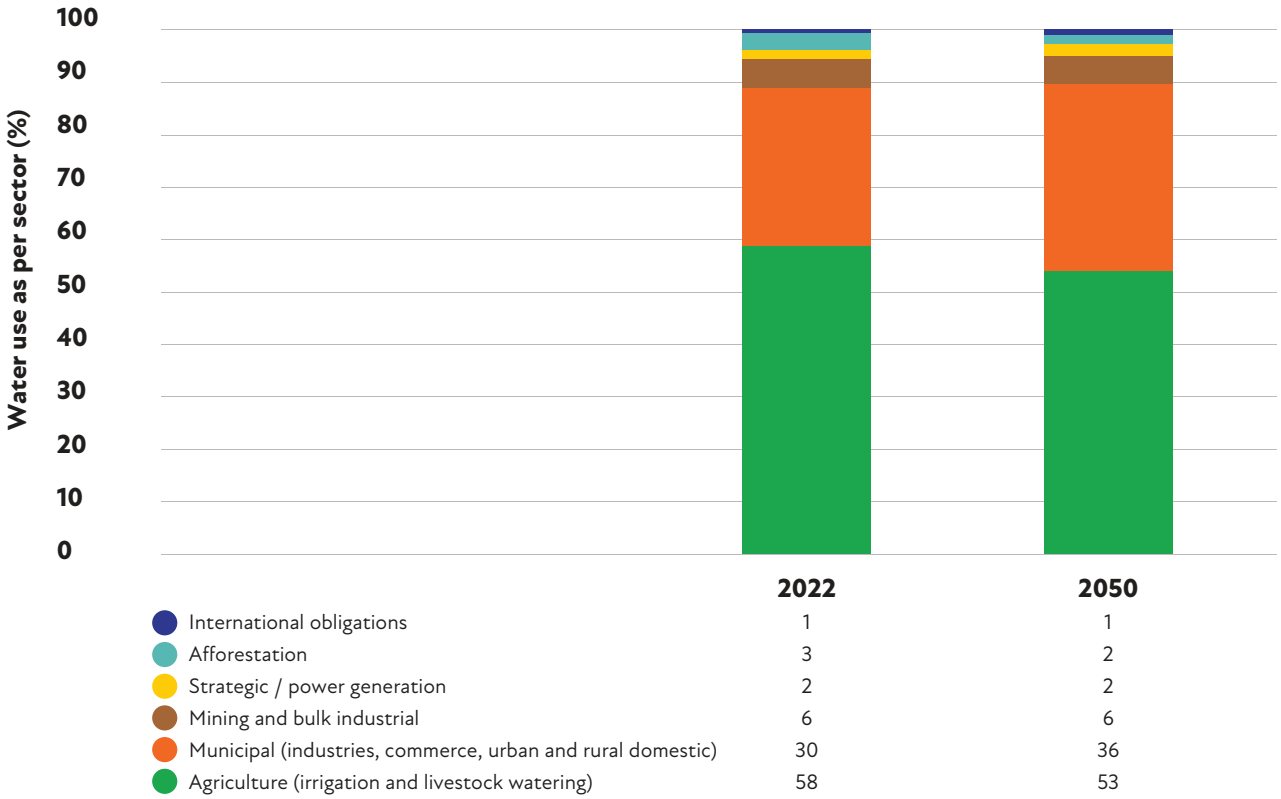


Figure 2: Water use per sector as at 2022 and projected for 2050
(Source: DWS, 2022a)

2.1.2 WASTEWATER TREATMENT IN SOUTH AFRICA

In South Africa, the focus within the water sector has more recently shifted to wastewater following the reinstatement of the Green Drop Programme to evaluate the state of WWTWs across the country. [7] A major decline in the functioning of WWTWs was noted since the last report was published ten years ago in 2013. While the DWS is responsible for local water resource management (funded through the national fiscus), local governments (i.e. municipalities) are responsible for the provision of water and sanitation services, including water resources infrastructure and regional bulk infrastructure (referred to simply as "bulk and resource infrastructure"). In this capacity, municipalities are considered Water Service Authorities (WSAs) [8].

The Green Drop audit covered 144 Water Services Authorities (WSA) (850 systems), the Department of Public Works (DPW) (115 systems), and five private and state-owned organisations (30 systems), totalling 995 wastewater networks and treatment facilities. Systems were assessed from 1 July 2020 to 30 June 2021 against the Green Drop Standards which resulted in a Green Drop score. The Green Drop Score by rating and type of system can be seen in **Table 1**:

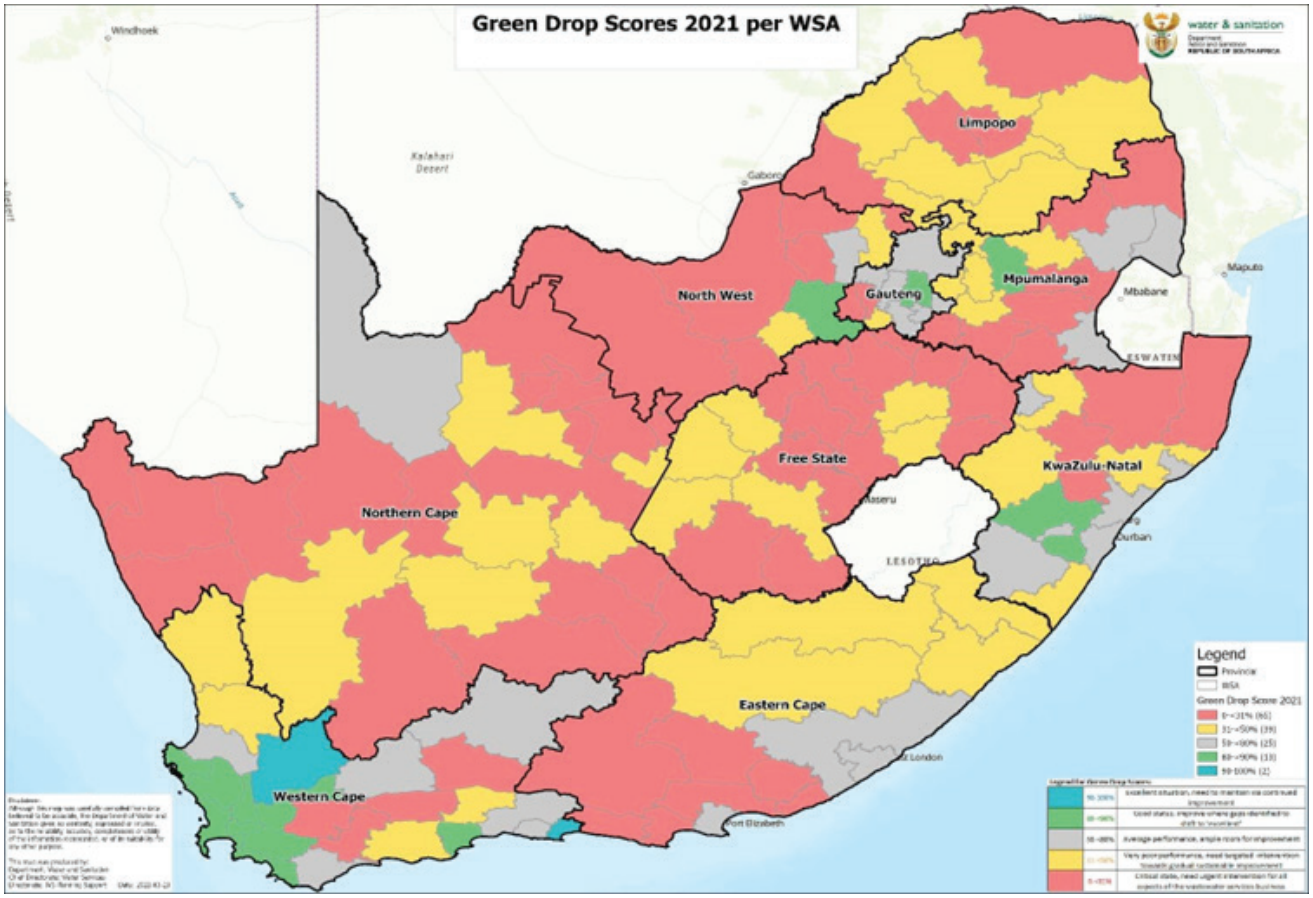
Table 1: Summary of Green Drop ratings for national wastewater treatment plants owned by different authorities *(Source: DWS, 2022b)*

Rating	Green Drop Score	Systems			Overall Percentage of Systems (%)
		Water Service Authority (WSA)	Department of Public Works (DPW)	Private and State-Owned Organisations	
Critical state	0 – <31%	334	102	1	44%
Poor	30 – <50%	208	11	8	22.8%
Average	50 – <80%	190	2	16	21%
Good	80 – <90%	96	0	4	10.1%
Excellent	90 – 100%	22	0	1	2.3%
Total number of systems		**850**	**115**	**30**	**995**

[7] The Green Drop process measures and compares the results of the performance of Water Service Authorities and their Providers, and subsequently rewards (or penalises) the municipality upon evidence of their excellence (or failures) according to the minimum standards or requirements that have been defined.

[8] According to the Water Services Act 108 of 1997, Water Services Authority is a municipality are responsible for water services provision.

The conditions of WWTWs vary greatly across the different Water Service Authorities in the different regions of the country as indicated in **Figure 3**.



Critical State, Urgent targeted intervention required for all aspects of wastewater management.

Very Poor Wastewater Performance. Requires targeted intervention by WSA to ensure sustainable improvement

Average Wastewater Management Performance. Ample room for improvement

Good Wastewater Management; Gaps identified during audit should be addressed to shift to next level

Excellent Wastewater Management; Situation needs to be maintained via continuous improvement.

Green Drop Score per WSA

0 - <31%	**(65)**
31% - <50%	**(39)**
50% - <80%	**(25)**
80 - <90%	**(13)**
90% - 100%	**(2)**

Figure 3: Green Drop score per province for municipal WWTWs
(Source: DWS, 2022b)

2.1.3 FUNDING FOR WATER SERVICES AND INFRASTRUCTURE

In order to ensure water security and universal access to water and sanitation in South Africa, significant investments are needed to refurbish, upgrade and maintain existing infrastructure and to develop new infrastructure. The 2019 South Africa National Water and Sanitation Master Plan (NWSMP) indicated a significant funding gap with **R898 billion required** to meet the national objectives of universal access to water and sanitation **over the following ten years with ~ R565 billion funding available, resulting in R333 billion additional funding required** (DWS, 2019). The institutions that are primarily responsible for providing investments in water and sanitation across the different areas of the water value chain and their projected funding and financing sources as at 2020 are shown in **Figure 4**.

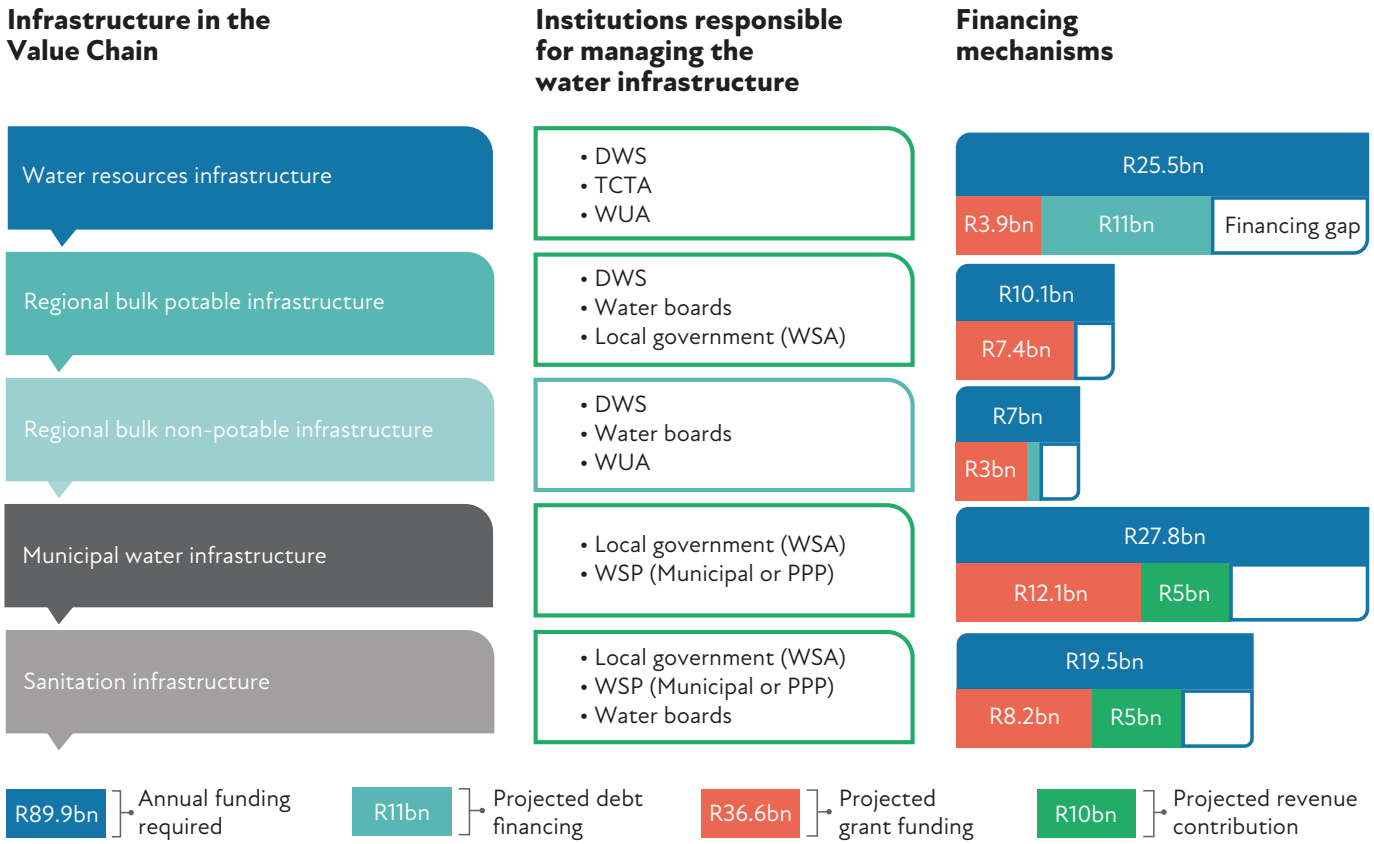


Figure 4: Institutional management of infrastructure in the value chain and financing mechanisms
(Source: USAID WASH-FIN, 2020)

As shown in **Figure 4**, there is a large capital investment funding gap for municipal water infrastructure. Municipalities receive funding from: (1) national government in the form of grants; (2) revenue from property taxes; (3) Income via tariffs for the provision of services such as water and electricity to consumers and solid waste collection. Tariff-income makes up 80% of all funding in the water and sanitation sector (at a municipal level), however many municipalities fail to recover operating costs due to the non-payment of services by users and a large proportion of households that benefit from the indigent support system (provision of free basic services). In 2020, 2.67 million households were beneficiaries of free water supply (Statistics South Africa (StatsSA), 2022). As a result, there is limited money available for capital investments, which then need to be covered by government grants, external grants and alternative financing. This represents an opportunity for private investors and financiers.

More up to date and detailed information on the immediate and medium-term funding requirements for water and sanitation infrastructure and services is provided in **Table 2**.

Table 2: Required, budgeted, and projected public sector funding for water and sanitation infrastructure and services
(Source: National Treasury, 2022)

Funding Need	Revised Estimate 2022/2023 (R bn)	Medium term estimates 2023/2024 (R bn)	Medium term estimates 2024/2025 (R bn)	Medium term estimates 2025/2026 (R bn)	Average year-on-year increase (%)
Community development:	**11.6**	**12.7**	**13.8**	**13.9**	**6.3%**
Regional and local water and sanitation services (subsidies for basic services)	11.6	12.7	13.8	13.9	6.3%
Water and sanitation infrastructure:	**33.3**	**42.6**	**46.9**	**54.2**	**1.6%**
Water resource and bulk infrastructure	27.5	36.4	40.1	47.4	19.9%
Regional Bulk Infrastructure Grant (RBIG)	2.2	2.5	2.9	2.8	7.3%
Water Services Infrastructure Grant (WSIG)	3.6	3.7	3.9	4.0	3.4%
Total planned public sector funding for water and sanitation	**44.9**	**55.3**	**60.7**	**68.1**	**12.9%**
Total estimated annual capital requirements (DWS 2019):	**90.0**	**90.0**	**90.0**	**90.0**	-
Water supply infrastructure	70.0	70.0	70.0	70.0	-
Wastewater infrastructure	20.0	20.0	20.0	20.0	-
Funding shortfall	**-45.1**	**-34.7**	**-29.3**	**-21.9**	**-21.3%**

It is evident that there will still be a considerable funding shortfall and the expectation is that this shortfall will be covered by channelling infrastructure investment or loan financing to the public sector. Without investment, public sector infrastructure will remain dilapidated. This need for investment opens up the related short- to medium-term opportunities highlighted in **Chapter 4**.

A number of other initiatives are being driven by DWS to strengthen water security and improve access to sanitation. These include:

- Technical regulatory assessments to measure the level of compliance with the Green Drop (wastewater), Blue Drop (potable water) and No Drop (non-revenue water) regulatory standards.
- Restructuring of the Water Boards following a review of the state, sustainability and functionality of the Water Boards to assure water supply and meet the growing demand.
- Establishment of the National Water Resource Infrastructure Agency (NWRIA) to raise private sector finance and to implement the large-scale water infrastructure projects. The draft bill was published for comment in September 2022 and the period of comment extended early in 2023. In August 2023, DWS published the draft bill's explanatory summary in Government Gazette 49063. The department plans to table the draft bill in Parliament; the date had not been made public at the time of writing.
- Cooperative governance: DWS will work together with National Treasury and the Department of Cooperative Governance and Traditional Affairs (CoGTA) to guide, support and monitor the business plans of the municipalities to ensure that water conservation and demand management projects are prioritised and that municipalities make use of the related grants available to them for this purpose, namely the Regional Bulk Infrastructure Grant (RBIG), Water Services Infrastructure Grant (WSIG), and Municipal Infrastructure Grant (MIG).

2.2 MPUMALANGA PROVINCIAL CONTEXT

Mpumalanga is the second smallest province (by land mass) in South Africa, but contains almost half of the country's high potential arable land. Mpumalanga is home to vast coalfields, that supply coal to the national electricity utility Eskom for power generation, and generate substantial revenue from coal exports. The bulk of the country's coal-fired power stations are located near the supplying coal mines. Another large consumer of coal in the province is the coal-to-liquid fuel plant at Secunda owned by Sasol. South Africa's focus area for a just transition away from a high carbon emissions coal-based energy economy is centred in Mpumalanga.

Geographically, Mpumalanga falls within the country's summer rainfall area and has a diverse climate due to changes in altitude in the two topographic areas, the Highveld and Lowveld. The mean annual rainfall in the province ranges from 593 – 748 mm in the Highveld area and 748 – 971 mm in the Lowveld area. In the south-west, water drains inland toward the Vaal River system. Water in the South-Eastern portion of the province flows across the national border with The Kingdom of Eswatini. Runoff that is generated in the northern region of the province drains predominantly in the direction toward the Limpopo and Inkomati rivers, which also passes through Kruger National Park and subsequently into Mozambique.

2.2.1 WATER DEMAND IN MPUMALANGA

In 2017, the total water demand in the province was estimated to be 5 580 Ml/d with an approximate deficit of 4% (DEDT 2019). In a low economic growth scenario projected until 2030, water use is expected to increase by 1.6% per annum to 6 821 Ml/d. Water demand in the province is mainly dominated by the agriculture (55%) and power generation (26%) sectors, as shown in Figure 5. The majority of the supply systems within the province are under pressure, with groundwater being considered as a future water source along with the treatment of acid mine drainage (AMD).

Acute water deficits have been observed in areas where dams have dried such as in Dr. JS Moroka Local Municipality. The current deficit is estimated at approximately 20 Ml/d based on an estimated demand of 60 Ml/d against a capacity supply of 40 Ml/d. The same was observed in Thembisile Hani and eMalahleni municipalities, where deficits of 17 Ml/d and 39 Ml/d are estimated, respectively. Observed deficits can be attributed to:

- High distribution losses due to aged infrastructure
- Vandalism of existing infrastructure such as drilling of pipes for illegal connections resulting in excessive water distribution losses.
- Deficiency in skills for operations and maintenance of existing infrastructure.

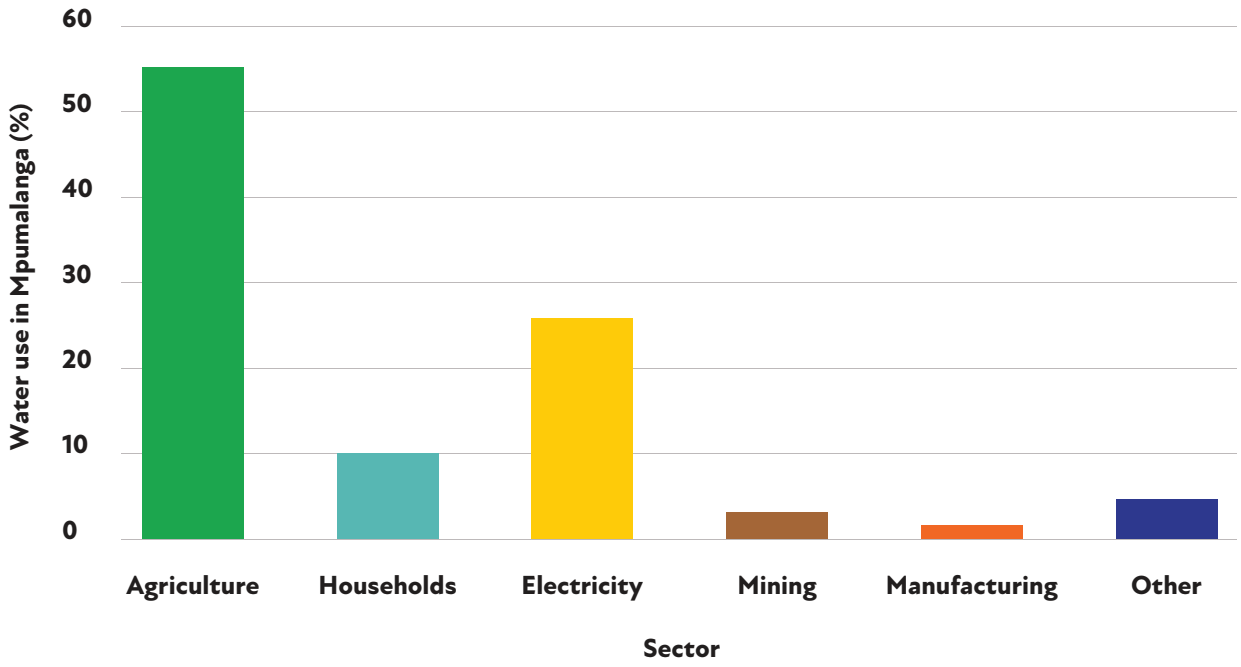


Figure 5: Water demand in Mpumalanga per sector *(Source: DEDT, 2019)*

More in-depth information on the water resource system balance, and sources and strategies for augmentation is available in the 2022 water market intelligence opportunity brief. This information remains relevant, as updated information on the supply balance and augmentation plans have not yet been published.

2.2.2 MPUMALANGA WASTEWATER TREATMENT OVERVIEW

The Mpumalanga Province has 76 municipal owned WWTWs. The province is also serviced by 14 WWTWs owned by the national Department of Public Works and Infrastructure resulting in 90 WWTWs being monitored by DWS. The publication of the 2022 Green Drop report highlighted the state of the WWTWs in Mpumalanga. Not a single WWTWs received an excellent Green Drop rating with the majority of the WWTWs being categorised as having poor performance. Some of the key contributing reasons to WWTWs being categorised as having poor performance include failing infrastructure, lack of maintenance and lack of skilled operating personnel on site.

From the five key performance areas (KPAs) assessed in the Green Drop Report 2022, effluent and sludge quality compliance received the lowest mean score of 20% for all Mpumalanga WWTWs (DWS, 2022) and about 3% of WWTWs could account for their Specific Power Consumption (SPC). This indicates inadequate sludge treatment, a lack of treatment infrastructure and poor data management with little to no data uploaded into the DWS Integrated Regulatory Information System. Business opportunities and financing opportunities are presented through infrastructure refurbishment, repair, replacement, maintenance and expansion, implementing energy efficiency and renewable energy, beneficial use of wastewater sludge, and reducing NRW.

The financial support available to Mpumalanga municipalities for the financial years 2023/24, 2024/25 and 2025/26 is tabulated in **Table 3** below. A further breakdown of the regional bulk infrastructure grants (RBIG) spent in several municipalities shows that a significant amount of the grant is allocated to water treatment for potable consumption projects and limited funding towards the refurbishment and expansion of existing WWTW and building of new WWTWs (DWS, 2023).

Table 3: Total grant allocations for the 2023/24, 2024/25 and 2025/26 financial years respectively for Mpumalanga local municipalities
(Source: National Treasury, 2023)

Grant	DORA Schedule [9]	2023/24 R'000	2024/25 R'000	2025/26 R'000
Regional Bulk Infrastructure Grant (RBIG)	Schedule 5B	505 793	528 508	534 289
	Schedule 6B	820 000	411 399	429 602
Water Services Infrastructure Grant (WSIG)	Schedule 5B	483 937	454 470	474 000
	Schedule 6B	478 474	429 973	444 364
Total		**2 288 204**	**1 824 350**	**1 882 255**

[9] Division of Revenue Act: Grant frameworks for conditional grants to local government

Some of the requirements determined via the VROOM will be addressed through this budget, however, additional funding will be required to address the full VROOM requirements.

In addition to the estimated R960 million to restore WW infrastructure in Mpumalanga, it is estimated that a total of R20.5 million will be required by all WSAs in Mpumalanga, on an annual basis, to maintain their assets. The maintenance estimate is based on the WATCOST-SALGA [10] model that makes provision for maintenance at 2.14%, annually, of the asset value.

In 2021, 12 of the 17 WSAs improved on their 2013 Green Drop scores, whilst five (5) of the 17 WSAs received lower Green Drop scores compared to 2013 baselines (**Figure 6**). Steve Tshwete is the highest scoring WSA in the province with a score of 88%. Nkomazi municipality achieved overall municipal score of 75% in 2021 (showing excellent progress from 32% in 2013 followed by an overall municipal score of 74% for Mbombela-Umjindi (supported by its water services provider (WSP), Silulumanzi, for selected systems). 33 WWTWs (43.4%) were identified to be in a critical state, compared to 41 in 2013. These WWTWs are managed by eight of the 17 municipalities. The most critical performance metrics that require attention include effluent quality compliance, technical expertise and management, and financial administration. The provincial Risk Ratio (which expresses the level of risk that a municipality poses in respect to its wastewater treatment facility) for wastewater treatment plants improved to 74.1% in 2021, compared to 76% in 2013, which suggests some reduction in risk in general since 2013. The most prominent risks were observed for treatment level, and pointed to works that exceeded their design capacity (most treatment works could not quantify the current operational capacity), dysfunctional processes and equipment (especially disinfection), and effluent and sludge non-compliance. The overall Green Drop performance for the province is characterised by pockets of strengths in technical capacity and capability, combined with good environmental management practices that have been embedded in the wastewater business at some municipalities.

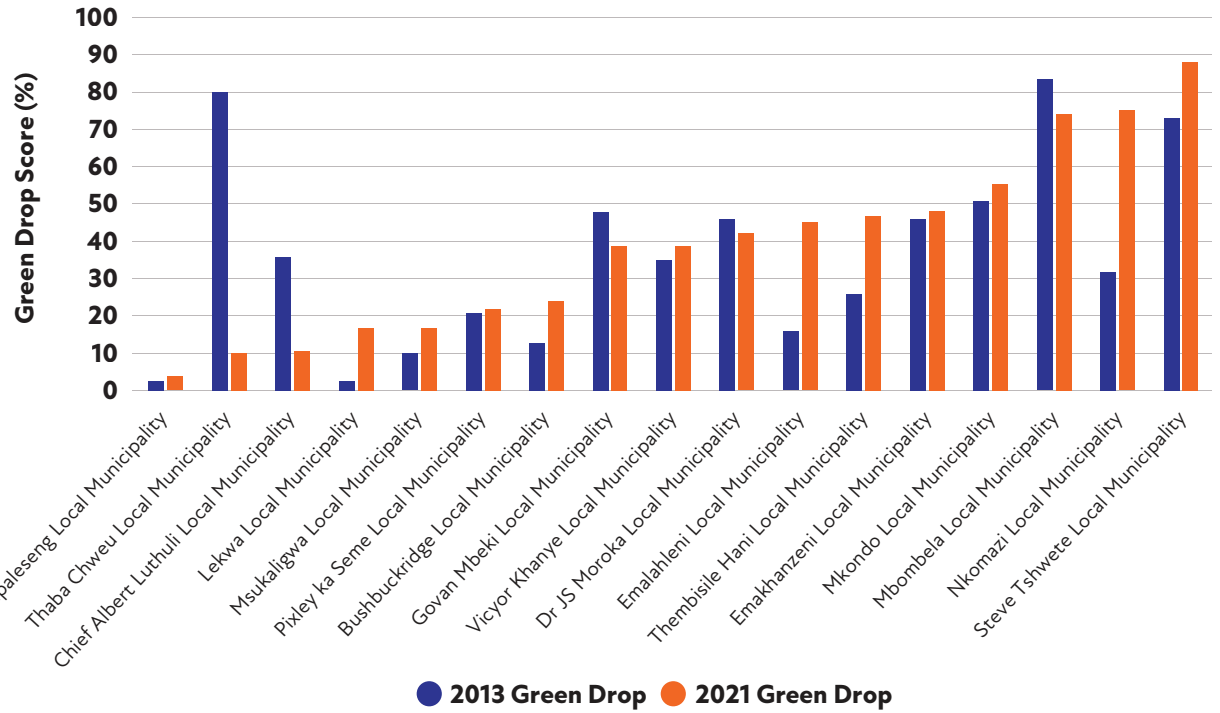


Figure 6. Municipal Green Drop scores for 2013 and 2022
(Source: DWS 2022c)

[10] A Water Costing model developed by the Water Research Commission (WRC) and the South African Local Government Association (SALGA) to estimate first-order capital and operating costs of water supply systems.

2.2.3 MPUMALANGA INDUSTRIAL CONTEXT AND IMPLICATIONS FOR WATER SUPPLY

Mpumalanga, hosting the majority of coal mines, power stations and coal-related industries, is the focus of the just energy transition in South Africa as the country aims to transition to a lower carbon economy. There are currently 235 active coal mines in the province. These activities are predominantly in the local municipalities of eMalahleni, Steve Tshwete and Govan Mbeki (Strambo, 2019). Within the current energy context of South Africa and the roll-out of the current Integrated Resource Plan (IRP 2019), and the Just Transition Framework for South Africa (2022), it is expected that South Africa's energy supply mix will change in the coming years. This change is likely to bring about the inevitable closure of coal mines and coal-fired power stations. According to Cole et al (2022), at least 17 of these mines could close by 2030 (total production of 33 Mt/a), a further 22 mines by 2040 (100 Mt/a), and 13 mines (47 Mt/a) by 2050 in South Africa. Data on the number of the total number of coal mines currently closing in Mpumalanga is not readily available. Those mines indicated earlier as closing supply coal to 15 Eskom power stations, which employ over 12 000 people. The power stations have or are almost reaching the limits of their design life, and six of them will be decommissioned by 2030 (9.3 GW), a further four by 2040 (14 GW), and three more by 2050 (12.3 GW) according to the IRP 2019. [11] The cumulative closure of the mines and power stations is likely bringing more water back into the available water supply. Grobbelaar et al. (2004) estimated that 360 Ml/d may be available after closure of the entire Mpumalanga Coalfields. For the Olifants Catchment, a volume of 170 Ml/d is estimated. However, the cumulative effects of poor closure, abandonment and lack of rehabilitation of the mine land pose a major risk to water quality and hence water system management and the sustainability of aquatic ecosystems.

[11] The updated version was released for public comment at the time of writing.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2.2.4 JUST TRANSITION AND WATER SECURITY

Water security is an essential component to building climate resilience and support a just transition. The Presidential Climate Commission (PCC) highlighted the importance of the management of water resources as an essential component of a just transition (Beukman and Reeler 2021). The PCC highlighted that investments in the water sector should focus on improvements in built infrastructure as well as of the natural (ecological) infrastructure, both of which are steadily deteriorating. Ecological infrastructure provides critical reinforcement to build systems (such as WWTWs) through services such as water provision, climate regulation, soil formation and disaster risk reduction, while the wastewater released by built infrastructure (e.g. WWTWs) impacts ecological infrastructure. Water allocations also need to be carefully considered in the just transition.

The following actions to support the just transition in the water sector are proposed (Beukman and Reeler, 2021):

- Strengthen water governance structures to focus on effective policy implementation, participatory and inclusive processes and strengthened institutions.
- Actively protect strategic water resource areas that provide most of the nation's water.
- Invest in ecological infrastructure to strengthen the provision of water and enhance the resilience of people and ecosystems.
- Support local communities to be custodians of critical resources, including through payments for ecosystem services.
- Capitalise on the labour potential involved in securing and strengthening ecological infrastructure to generate local jobs.
- Invest in strengthening and maintaining current built water infrastructure to cope with changing climatic conditions.
- Consider both climate adaptation and mitigation objectives for water-sector action.
- Move away from water-intensive energy sources such as coal and ensure that restoration activities benefit local communities.
- Improve water allocation processes by prioritising human welfare and those economic activities that support a Just Transition to a low-emissions and climate resilient economy.

With Mpumalanga being the focus area for the just transition in SA recommendations such as the above, if implemented, are expected to enable adaptation to climate change and enable broader economic diversification in response to the downscaling of the coal-based economy.


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3

POLICIES AND REGULATIONS

This section highlights some of the recent amendments to policies and regulations that are relevant to the investment opportunities highlighted in this report. Further information on existing policies and regulations can be obtained from the 2022 Market Intelligence Opportunity Brief.

The status of the policies and regulations provided in this section are applicable at the date of writing of this brief (October 2023).

3.1 CHANGES IN NATIONAL POLICIES AND LEGISLATION PERTAINING TO WATER MANAGEMENT

The key national policy and legislation developments that affect the investment opportunities span water quality regulation, water resource management, sludge management, water resources infrastructure and mine water management and include:

Amendment of the National Water Act (36 of 1998): The National Water Act (NWA) provides the legal framework for the effective and sustainable management of water resources (including surface water and groundwater) by the DWS on behalf of the national government. The NWA gives DWS the overall responsibility and authority to manage the use of water, protect water quality, allocate water, and promote inclusive water management.

The Act will be amended to: Measure impact in long term projects; facilitate the re-allocation of water use through curtailment of existing lawful water uses; strengthen penalties for environmental non-compliance; strengthen protection of strategic water source areas; promote equitable access to water and sanitation services to previously disadvantaged groups; redress past imbalances; and provide a more effective dispute resolution process (DWS, 2022d).

Status: The draft bill was planned to be released for public comment in 2023, with anticipated submission to Parliament at the end of 2023. However there has been delay as the department was awaiting a decision from the Constitutional Court on the amendment of section 25 [12] pertaining to the transfer of water use entitlements. The new roadmap for the amendment of the Act is yet to be published.

Amendment of the Water Services Act (WSA): This act aims to ensure sustainable water supply and to regulate the provision of water and sanitation services by WSAs.

[12] https://cer.org.za/wp-content/uploads/2023/03/Minister-Water-and-Sanitation-v-Lotter-CC-15-March-2023.pdf

The Act is to be amended to further clarify the roles, responsibilities and functions of WSAs and water services providers; set minimum standards for the functioning of water services providers, which must be enforced by WSAs; and provide the Minister with powers to regulate these matters. It also aims to address non-compliance by WSAs and the public in sludge handling, treatment and use; prescribe regulatory standards for the quality of drinking water SANS241:2015 [13]; and align the governance structure to new policy developments (DWS, 2022d).

Status: The draft bill was planned to be released for public comment in the first quarter of 2023, with anticipated submission to Parliament at the end of 2023, however the draft bill has not been released for public comment and there has not been any update thus far on when it can be expected.

National Water Resources Strategy Edition 3 (NWRS-3): The National Water Resources Strategy (NWRS) is the legal instrument for the implementation of the NWA and is acknowledged as the main mechanism to manage water resources across all societal sectors in order to achieve the development goals of the national government. The goal of NWRS-3 is to assist socioeconomic development and growth by ensuring water security and enabling equitable access to water and sanitation. The NWRS-3 is a strategy for all sectors and stakeholders who use and impact upon South Africa's water resources and it responds to the NWA by outlining strategic objectives and actions which are then carried forward for resourcing and implementation in the National Water and Sanitation Master Plan (NW&SMP) (DWS, 2022e).

Status: Cabinet authorised the publication of the NWRS-3 for public comment in September 2022 and it was concluded. The plan was approved and published in March 2023 (**link**).

Nation Water Resource Infrastructure Agency Bill (NWRIA): The aim of the agency is to raise commercial and development finance, domestically and internationally, and establish public-private partnerships (PPPs) (DWS, 2022f). Water infrastructure in South Africa requires large-scale infrastructure and maintenance on existing assets. Due to fiscal constraints, DWS cannot provide the amounts required and it was decided that an agency would be better positioned to raise external funds.

Status: The draft bill was published for comment in September 2022, with the comment period extended early in 2023. In August 2023, DWS published the draft bill's explanatory summary in Government Gazette 49063. The department plans to table the draft bill in parliament; the date has not been made public. The department plans to appoint the Board for the Agency by January 2024.

National Pricing Strategy for Raw Water Use Charges: This pricing strategy provides the framework for the pricing of the use of water from South Africa's water resources, i.e. the use of raw (untreated) water from the water resource and/or transfer schemes and the discharge of water into a water resource or onto land. Public consultations have been held to determine the pricing strategy for registered businesses abstracting water for commercial purposes. The charges will be applicable to registered water users (excluding subsistence farmers), who are abstracting water either from a river or from a government water scheme, discharging the water back into the resource. The updated pricing strategy will further provide for six water user categories, an increase from the previous four, to better represent the water user groups and to allow for more clearly targeted charges.

Status: The revised strategy was published in in August 2022 (**link**).

SANS241 Drinking Water Quality: The South African Bureau of Standards (SABS) together with its Technical Committee 147 - Water (SABS/TC 147) has been working to revise and update the requirements of the national standard for drinking water in South Africa leading to the draft seventh edition of the South African National Standard, SANS 241 – Drinking Water Quality.

Status: The draft standard was open for public comment and the public enquiry phase ended in June 2022. The finalised standard will be published once due process has been concluded including responding to the comments submitted by the public. The duration of the process will depend on the nature of the public comments and which may include further stakeholder engagements in the standards development process. As yet, a revised draft or final standard has not been made public.

[13] South African National Standard, SANS 241 – Drinking Water Quality of 2015

3.2 NATIONAL AND REGIONAL REGULATIONS THAT IMPACT ON WASTEWATER TREATMENT WORKS AND SLUDGE TREATMENT AND BENEFICIATION

Key regulatory regulations pertaining to WWTWs sludge treatment and beneficiation to note, include:

• **Liquid waste landfill ban (2019)**: As of August 2019, the nationwide ban of liquid waste disposal to landfill came into effect as required by the National Norms and Standards for the Disposal of Waste to Landfill (Notice R 636 of Government Gazette No. 36784, 23 August 2013) [14].

• **Organic waste landfill restrictions (2027)**: Objective 3 of Goal 3 of the Western Cape Integrated Waste Management Plan (DEADP, 2018), sets waste landfill diversion targets for organic waste. All Western Cape based municipalities, including the City of Cape Town (CCT), are required to reduce the landfilling of organics as no disposal of organics to landfill will be permitted by 2027.

• The Department of Environment, Forestry and Fisheries (DEFF) has released **National Norms and Standards for Organic Waste Treatment (GN1984 of 2022)** [15]. These Norms and Standards set minimum requirements for a wide range of organic waste treatment activities processing more than 10 tonnes per day [16]. This replaces the need for undertaking a potentially onerous, time consuming and costly waste management licence process, which includes undertaking an associated environmental impact assessment (EIA). One of these requirements is that organisations undertaking applicable activities must register their activities with the relevant provincial waste authorities. These Norms and Standards reduce regulatory barriers for organic waste beneficiation. The publication of these Norms and Standards has implications the opportunity for sludge beneficiation.

[14] As defined by Section 5.1.q of Notice R 636 of Government Gazette No. 36784, 23 August 2013.
[15] Can be accessed here: https://www.dffe.gov.za/sites/default/files/gazetted_notices/nemwa_organicwastetreatmentnormsstandards_g46169gon1984.pdf
[16] This range is applicable to most types of organic waste treatment, but for the processing of animal matter, these Norms and Standards apply to facilities processing over 1 tonne per day, and for thermal treatments, it is applicable to facilities processing over 10 kg per day.

3.3 REGULATIONS THAT PERTAIN TO MUNICIPAL PROCUREMENT

Municipal procurement is regulated by the Municipal Finance Management Act (MFMA) (56 of 2003) and its regulations including the Municipal Supply Chain Management Regulations (2005). These regulations specify the minimum requirements, but municipalities are allowed to apply stricter requirements. The MFMA outlines the competitive procurement processes for provision of products and services to municipalities; unsolicited bids are not usually not encouraged.

Through the Preferential Procurement Policy Framework Act (PPPFA) (5 of 2000) and associated regulations, municipalities could specify criteria to benefit companies with higher Broad-Based Black Economic Empowerment (B-BBEE) scores, exempted micro enterprises (EMEs) and qualifying small business enterprises (QSEs). However, these regulations have been amended in 2022 (Government Gazette No. 47452 dated 4 November 2022). In the new regulations, municipalities and state organs must determine their own preferential procurement policies in accordance with section 2 of the PPPFA and the thresholds and formula prescribed in the 2022 Regulations, and are also to consider programmes outlined in the Reconstruction and Development Programme (Government Gazette No. 16085 dated 23 November 1994) and provide for points to be awarded for specific goals in the development of procurement policies. For example, municipalities could set criteria to give points to companies that advance industrialisation or subcontract to local small and medium-sized enterprises (Department of National Treasury, 2022b). Municipalities are also allowed to issue directives on emergency procurement procedures when a state of disaster has been declared under Section 55(2) of the Disaster Management Act (57 of 2002). For example, to facilitate emergency procurement of water and sanitation services to prevent the spread of COVID-19, DWS established the National Disaster Water Command Centre led by Rand Water, and permitted direct engagement with manufacturers to provide water tanks, ablution blocks, sanitation packs, and related water services to communities without access to these services.

The procurement of services is permitted for a period of up to three years. If a contract is anticipated to extend beyond this three-year limitation, a municipal department must motivate for such an extension to be granted by its municipal council in accordance with the MFMA (Section 33). The process involves inviting comments from national and provincial treasury, relevant national and provincial departments, and the public.

For the provision of services by an external service provider, the Municipal System Act 32 of 2000 (Sections 77 and 78) requires a feasibility study to justify the advantage of external over internal service provision. In addition, for public-private partnerships (PPPs), the MFMA (Section 120) requires a bankable feasibility study. An industry brief detailing the steps and procedures to access the municipal market has been developed and can be viewed **here**.


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4

EMERGING OPPORTUNITIES, DRIVERS AND BARRIERS

Investment opportunities, together with the associated drivers and barriers, are discussed in this section. This year's brief focuses on the opportunities linked to the municipal sector and the coal mining industry to support the transition to a low carbon economy in Mpumalanga. The three key investment opportunities highlighted in the public sector / municipal market are:

- Infrastructure repairs, refurbishments and upgrades at WWTWs.
- Wastewater sludge beneficiation (primary and secondary sludge).
- Reducing non-revenue water (NRW) [17].

An emerging water sector investment opportunity in the private sector / mining market is:

- Mine water reclamation for activities that are emerging as a means for economic diversification in the context of just transition

These represent opportunities for technology and service providers, as well as financiers and investors interested in financing projects and/or businesses supplying these technologies or providing services. A summary of the key investment opportunities is shown in **Table 4**.

Table 4: Summary of business and investment opportunities in the Mpumalanga water sector.

Sector	Opportunity	Market size indicators	Main opportunities	Market segment
Public sector / municipal market	**Infrastructure repairs, refurbishments and upgrades at WWTWs**	R957 million in investment required according to the Green Drop VROOM* Index to restore the WWTWs in the province to a functional state. R625 million falls within municipalities with unqualified audit outcomes in 2023.	Various market opportunities related to the infrastructure refurbishment, repair, replacement, maintenance and expansion.	Municipalities with an interest to outsource operations or introduce performance based contracts and/or creditworthy municipalities with the highest efficiencies in terms of capital spending, asset upgrades and spending on repairs and maintenance.
	Wastewater sludge beneficiation (primary and secondary sludge)	Estimated available sludge: **~33 000 tonnes per year** translating to ~R30 million diversion value in cost savings.	Wastewater sludge beneficiation [18] including handling, transportation and off-take agreements.	
	Reducing non-revenue water	NRW of ~147 million m3/annum (51.2%) and water losses of ~143 million m³/annum (49.5%). The total cost of savings if the NRW was to be brought back down to an acceptable level of 20% is approximately R430 million per annum.	Technology for monitoring and physical losses reduction Detecting the ageing of pipes Accurate billing technologies.	
Private sector / Mining market	**Mine water reclamation**	It is estimated that 360 Ml/d may be generated after closure of the entire Mpumalanga Coalfields. For the Upper Olifants Catchment in the Nkangala district municipality, a volume of 170 Ml/d is estimated.	Mine water treatment technologies	Mines that are interested in diversifying their economies post closure.

[17] Non-revenue water (NRW) is the volume of water supplied by a water services provider (water utility) for which it receives no income due to various factors, including water losses, metering errors, billing errors, theft, and unbilled authorised consumption.

[18] Processing of wastewater sludge into value-added products as a resource recovery opportunity, for example biogas production, fertilisers, bio solids or soil conditioners.

4.1 PUBLIC SECTOR / MUNICIPAL MARKET OPPORTUNITIES

4.1.1 UPGRADE, REPAIR, REPLACEMENT, MAINTENANCE AND EXPANSION OF PUBLIC WWTWS INFRASTRUCTURE

The VROOM model incorporated in the 2022 Green Drop Reports, provides insights on the state of the key elements of the wastewater infrastructure and an estimated order of magnitude of the cost to return infrastructure to a functional condition. The VROOM estimations and key areas of investment for each municipality in Mpumalanga are presented in **Table 5**.

The total investment requirements are ~ R1 billion, of which R625 million falls within municipalities with unqualified audit outcomes in 2023. This represents an opportunity for financiers, investors and water sector businesses. Restoration of the mechanical and civil infrastructure makes up a large part of the cost of the estimated total VROOM amount as shown in Table 5.

Table 5. VROOM cost estimation and key investment areas for wastewater works at municipalities in Mpumalanga
(Source: Green Drop 2022)

Municipality	Audit outcome 2023 [19]	Green Drop Score (%)	VROOM Estimate	Contributing Factors to Key Investment Areas [20]
Dipaleseng Local Municipality	Qualified with findings	4	R1 050	• Commissioning delays in the upgrading of the treatment works. • The sewage is not being treated currently.
Thaba Chweu Local Municipality	Unqualified with findings	10	R107 280	Lydenburg WWTW • Plant not operational for more than a year. • All of the electrical and mechanical equipment is dysfunctional. • All pump stations are dysfunctional. • Vandalism. Sabie WWTW • Flood erosion requires urgent repair. • No chlorine gas tank. • Flow meters are dysfunctional. • Sludge drying beds require refurbishment. • Disinfection dosing system ineffective.
Chief Albert Luthuli Local Municipality	Qualified with findings	11	R49 170	• Urgent action is required for the supply and refurbishment of mechanical equipment. • Equipment required: additional return activated sludge pump, aerators, Secondary sedimentation tanks (SSTs), chlorine dosing equipment, flowmeters and sludge drying beds.
Lekwa Local Municipality	Disclaimed with findings	17	R11 155	• Flowmeters not operational. • Chlorination, drying beds, sludge recycle pumps and sewer pump stations are dysfunctional.
Msukaligwa Local Municipality	Qualified with findings	17	R50 065	• Grit classifier to be refurbished. • Aerators, recycle pumps are non-operational. • Facilities related to sludge handling (i.e. blocked SSTs, pumps, sludge drying beds and lagoons) need to be refurbished. • Pasveer ditch out of operation.

[19] Auditor General (2023).
[20] Updated information on this column will be released on the 2023 Green Drop assessment, this was based on the 2022 report and findings from engagements

Table 5 continued...

Municipality	Audit outcome 2023 [19]	Green Drop Score (%)	VROOM Estimate	Contributing Factors to Key Investment Areas [20]
Dr Pixley ka Seme Local Municipality	Unqualified with findings	22	R178	• Pump stations vandalised. • Spillages. • No standby pumps, pumps are dysfunctional. • No flow measurement devices installed. • Plants are dysfunctional as no flow is received into the plant.
Bushbuckridge Local Municipality	Unqualified with findings	24	R34 916	• The majority of the wastewater treatment works are being upgraded and are nearing completion. • In some cases, waiting for final commissioning and handover.
Govan Mbeki Local Municipality	Qualified with findings	39	R7 376	• Biofilter module not operational due to refurbishment. • Faulty sludge pumps lead – no sludge control in activated sludge basin. • Disinfection not operational – no chlorine gas. • Low flow to WWTW as pump stations are dysfunctional.
Victor Khanye Local Municipality	Qualified with findings	39	R112 704	• Flow meter to be installed. • Disinfection. • Chlorine contact channel. • Overflow balancing tank.
Dr JS Moroka Local Municipality	Disclaimed with findings	42	R50 000	• Key equipment required: electrical cables, disinfection, clarification, aeration and recycle pumps.
Emalahleni Local Municipality	Qualified with findings	45	R21 516	• General lack of plant maintenance. • Many process units are dysfunctional. • Collector system pumps are defective. • Mechanical screen, primary sedimentation tanks (PSTs), biofilters and recirculation pumps are out of operation. • Drying beds, disinfection and associated contact channels are dysfunctional.

Table 5 continued...

Municipality	Audit outcome 2023 [19]	Green Drop Score (%)	VROOM Estimate	Contributing Factors to Key Investment Areas [20]
Thembisile Hani Local Municipality	Unqualified with findings	47	R250	• Repair needed for automated screens. • Chlorine stock shortages.
Emakhazeni Local Municipality	Adverse with findings	48	R6 930	• Mechanical screen to be refurbished. • Replacement of flowmeters. • Aerators to be replaced or refurbished. • SST rotating bridge not operational. • Reed beds to be replanted or by-passed.
Mkhondo Local Municipality	Unqualified with findings	55	R17 940	• PST bridged and automated desludge valves to be refurbished. • Aerators not operational. • Recycle pumps are not operational. • SSTs are blocked with sludge and the weird baffle plate requires adjustment.
Mbombela Local Municipality	Unqualified with findings	74	R351 268	• Screening and grit removal. • Activated sludge plant module decommissioned. • Secondary clarification not effective. • Chlorination is not effective.
Nkomazi Local Municipality	Unqualified with findings	75	R23 157	• Requires restoring functionality of the flow metering, aeration, secondary clarification and process monitoring and operation.
Steve Tshwete Local Municipality	Unqualified with findings	88	R112 704	• Gas chlorination system required.
TOTAL			R957 659 300	

4.1.2 BENEFICIATION OF WASTEWATER SLUDGE

Depending on the size of the WWTW and the characteristics of the wastewater, the cost of managing wastewater sludge can be as much as 40-60% of the total operating costs of the plant (Domini et al., 2022). Wastewater sludge can be drawn from a number of stages of treatment at a WWTWs such as from primary settling tanks, ponds, secondary settling tanks and clarifiers. A summary of sludge treatment technologies currently used in municipal WWTWs in Mpumalanga can be seen in **Figure 7**.

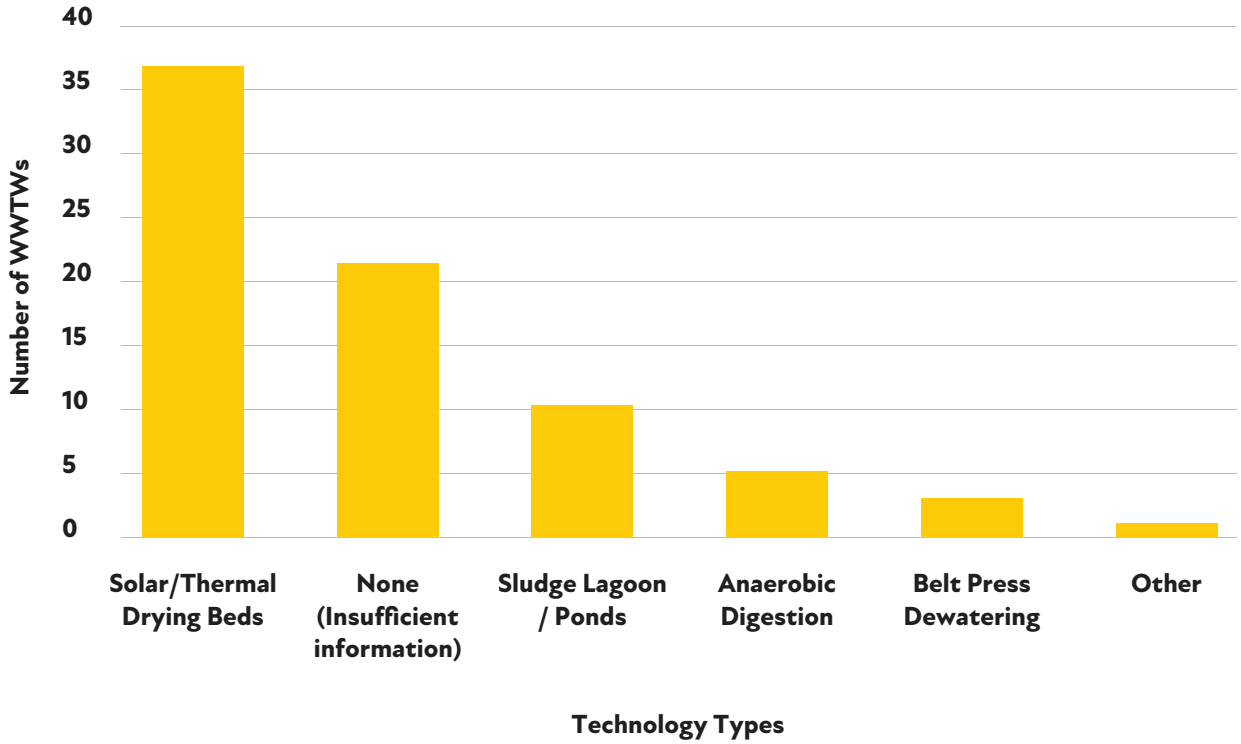

Figure 7: Treatment technologies used for sludge handling at the WWTWs in Mpumalanga *(Source: DWS, 2022c)*

In terms of sludge disposal, the common method in place in most municipalities in Mpumalanga is on-site and off-site disposal (34% and 12% of WWTWs, respectively), followed by landfilling and agricultural applications (**see Figure 8**). WWTWs that are marked as "No Management" are a combination of those that do not have management in place and those where no information exists at the time of writing. From engagements, some of the WWTW managers that have on-site disposal are currently looking at other disposal options citing issues of land availability and the environmental risks of runoff and leaching during high rainfall seasons.

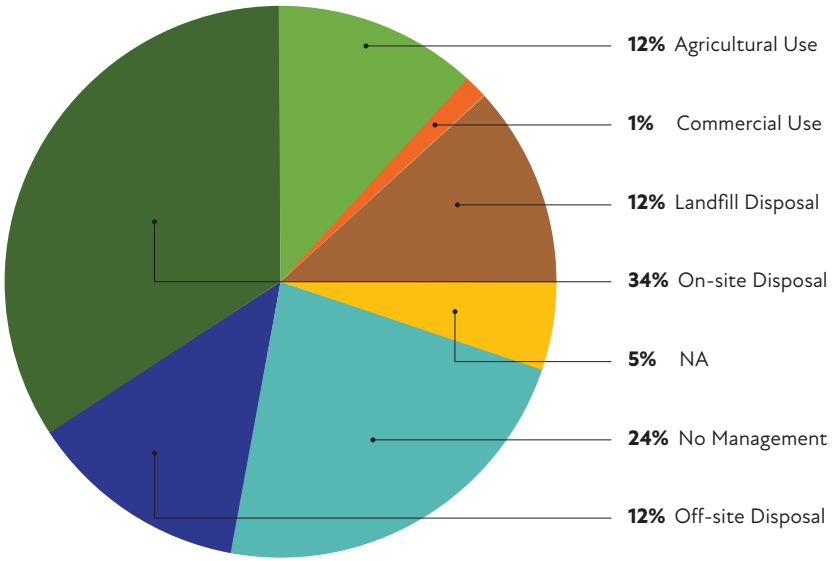

Figure 8: Sludge disposal at the 76 WWTWs in Mpumalanga
(Source: DWS 2022c and public sector engagements)

The total sludge produced from all WWTWs of Mpumalanga is estimated at **90 tonnes per day**. This adds up to approximately **33 000 tonnes per year**, which equates to **R30m per annum**, should all of the sludge be disposed of via landfill, considering that the nearest hazardous landfill is the City of Tshwane.

This presents a business opportunity for technology providers that provide technologies that are able to beneficiate wastewater sludge as municipalities can independently, or through funding from financiers, invest in these technologies. Additionally, service providers can provide sludge management services to municipalities or enter into a service level agreement or performance based contract to generate biogas and supply electrical energy onsite. The opportunities need to be explored on a case-by-case basis as many variables need to be considered such as sludge quality, degree of treatment of sludge, sludge volumes to ensure economies of scale and potential for private off-take agreements. Generally, for the opportunity to have a good business case, the quality and quantity of sludge produced must be consistent. Therefore, the opportunity mainly exists in well run WWTWs. However, there are opportunities of overcoming this by co-blending with other wastewater sludge and/or organic waste: In some WWTWs, wastewater infrastructure restoration and/or setting up of new infrastructure is needed in order to realise the sludge beneficiation opportunity.

There are emerging opportunities for the beneficiation of wastewater sludge into value added products such as, but not limited to, bricks, biochar, briquettes and soil enhancers. The following are the main business and investment opportunities associated with sludge beneficiation that can be implemented.

4.1.2.1 ENERGY GENERATION (COMBINED HEAT AND POWER)

The sustainable treatment of sludge also includes electricity generation from biogas. Energy shortages and climate change considerations have increased the appeal to utilise anaerobic digestion of wastewater sludge for energy recovery and power generation [21]. Electricity generated from biogas could potentially replace ~40-100% of the electricity requirements of the WWTWs [22]. As a guideline, only WWTWs that have a capacity of 10 Ml/d or greater are likely to have financially viable biogas and combined heat and power projects. In Mpumalanga, 12 WWTWs have potential for biogas projects [23] (DWS, 2022c). The biogas (methane) that is produced is flared (or just released into the atmosphere [24]). The opportunity to utilise this biogas by-product to offset the energy requirements of the WWTWs requires the implementation of generators or combined heat and power (CHP) systems, and in many cases requires refurbishment of the existing anaerobic digesters.

Sewage sludge from WWTWs provides relatively constant feedstock volumes and quality for anaerobic digesters (unlike most commercial and industrial effluent). Anaerobic digesters have an average yield of ~35m³ biogas per tonne of sewage sludge digested, which can be converted into ~70 kWh (SABIA 2016). This translate to 16 242.5 kWh offset savings for the 12 WWTWs.

Based on value potential multiplier per tonne of R48 - R726 (GreenCape, 2021), the current wastewater sludge production levels in Mpumalanga present a value-add potential of ~R1.6 million to R23.2 million per year in electricity and/or heat generation assuming all the generated sludge is beneficiated.

Anaerobic digestion also results in a higher quality of treated effluent, which helps municipalities comply with standards for disposal. This could reverse the trend of increasing incidences of non-compliance and pollution of water resources linked to municipal WWTWs. Higher quality of treated effluent implies that should the municipality consider a water reuse project as well, this would require fewer further treatment steps, resulting in lower capital and operational costs for such projects.

There is limited infrastructure for anaerobic digesters in Mpumalanga as shown in **Figure 7**. This presents an opportunity for a regional plant that will collect sludge from WWTWs that fall within a financially viable radius to provide a constant stream of feedstock. The presence of agricultural waste also presents an opportunity for co-digestion.

[21] Anaerobic digestion is a biological process that uses acid forming bacteria to convert organic matter into organic acids which then form a combination of methane and carbon dioxide known as biogas. Biogas can then be used to offset the energy requirements of the WWTWs through the implementation of combined heat and power (CHP) technology.
[22] The amount of energy that can be produced is dependent on the quantity and/or composition of the sludge, process employed at each specific WWTW and the quality of biogas produced. The composition of sewage sludge is also dependent on the community that the WWTW services.
[23] Includes WWTWs with required essential infrastructure to produce biogas but may not necessarily be technically feasible or financially viable for CHP projects
[24] Methane is a greenhouse gas that contributes to global climate change and thus its direct release to the atmosphere is not desirable.

4.1.2.2 BIOFERTILISER PRODUCTION

There are various other business opportunities relating to sludge beneficiation such as brick and organic fertiliser manufacturing that are less complex and may be suitable for smaller municipalities with smaller budgets and/or poor creditworthiness to be able to access capital. The value chain can be easily integrated by producing the fertiliser onsite or nearby and supplied to farmers within a few kilometre radius.

There is a successful project in the City of Tshwane (link) where a third party beneficiates sludge from one of the WWTWs into a fertiliser [25]. These opportunities need to be explored on a case-by-case basis as many variables need to be considered such as sludge quality, degree of treatment of sludge, sludge volumes to ensure economies of scale and (private) off-take agreements.

4.1.2.3 OTHER PRODUCTS

There are various other innovative products that can be produced from wastewater sludge and their business case and financial viability will depend on the feedstock (quantity and quality) and availability of a market for such products. The 2022 MGCA Industry Brief: Sewage sludge beneficiation opportunities in Mpumalanga provides a more detailed description of the beneficiation options available for sludge produced at WWTWs. The brief covers:

- Energy recovery, such as combustion, anaerobic digestion and bio-diesel
- Agricultural products, such as feed for black soldier fly farmers, fertiliser manufacturers and composters
- Commercial products, such as bricks and soil enhancers

[25] For more information on this sludge beneficiation example, see project available from https://www.youtube.com/watch?v=rv5nsPHxd2Y

4.1.3 REDUCING NON-REVENUE WATER

The No Drop Watch Report states that the water balance in Mpumalanga indicates NRW of 147.3 million m3/annum (51.2%) and water losses of 142.6 million m³/annum (49.5%) (DWS, 2023). This translates to a **potential total cost savings of approximately R430m per annum** if the NRW was to be brought back down to a generally acceptable level of 20%. This presents an opportunity for technology providers, service providers, investors and municipalities to invest in NRW reduction projects.

Table 6 presents an extensive range of options for water conservation and water demand management (WC/WDM) interventions. The majority of these interventions are also low-hanging fruit for addressing NRW.

The savings brought about by these interventions enable various benefits, including increased revenue, deferred capital expenditure, lower energy costs, and reduced bulk water spending. Customer service is also improved through fewer service interruptions, more continuous supply, higher pressures, and cleaner water (PPIAF and WBG 2016).

The National Water and Sanitation Master Plan (NW&SMP) (2019) targets an NRW of 26% (a 15% reduction from the 39.3% average at the time) nationally by 2030. It has committed a total investment of R676 million over ten years, distributed between WSAs, to assist with achieving this target, but it is expected that further private and municipal investment in NRW projects is needed.

Table 6: Water conservation and demand management (WC/WDM) interventions including options to reduce non-revenue water

Category	Water conservation and demand management (WC/WDM) intervention
Monitoring and data	Smart or remote meters, asset management, database polishing, water balance analysis, real-time system monitoring, improved billing and revenue collection systems
Physical loss reduction	Leak detection, early warning major leak prevention, **active leak repair systems**, pressure reduction schemes, night flow pressure reduction, water efficient devices, removal of unlawful connections
Educating users	Non-billed authorised consumption reduction, customer leak reporting system, water restrictions, **efficient consumption**, informative billing, education and awareness programmes

A fundamental part of an NRW reduction project is to confirm the water balance of the distribution system(s), or of sub-sectors of the system, through flow and/or pressure monitoring. To support this fundamental requirement for monitoring, the NW&SMP has targeted a revitalisation of the No Drop Certification programme, with monthly reporting required from municipalities. To kick-start this regulatory compliance driver for NRW reduction, the NW&SMP estimates a once-off investment in the monitoring system of R0.2 million per municipality, totalling R29 million nationally, will be required.

The following support plan for the NRW market is available in South Africa:

- DWS, CoGTA and DBSA are developing a national NRW reduction implementation support programme to ensure a standardised and informed approach across municipalities [26]. The programme is currently at pre-feasibility stage, but once approved, it is estimated at R35 billion to R50 billion for potential loans and services (National Treasury, 2020).

[26] A summary of this programme at the time of its announcement can be found at: https://www.engineeringnews.co.za/article/national-non-revenue-water-programme-in-development-2020-03-13/rep_id:4136

4.2 DRIVERS FOR MUNICIPAL MARKET OPPORTUNITIES

Need for water conservation and demand management: The major driver for wastewater infrastructure upgrades and projects to address non-revenue water is the need for water conservation and demand management. These projects are particularly triggered by the following:

- Key provincial development plans driving these opportunities are: (1) Mpumalanga Vision 2030 Strategic Implementation Framework, (2) Mpumalanga Economic Growth and Development Path, (3) Mpumalanga Spatial Development Framework.
- Regulatory compliance (DWS, the reinstatement of the Green Drop Programme and the planned reinstatement of the No Drop Programme);
- Revenue enhancement (increasing the income of municipalities)

Operations maintenance backlog: There are significant maintenance backlogs due to ineffective supply chain management and underinvestment in staff and skills development. The increased operation and maintenance expenditure associated with ageing WW infrastructure has brought to light the potential lifecycle savings when upgrading or replacing dilapidated infrastructure. Municipalities are increasingly considering these long-term savings, where the business case can be proven.

Increased pollution and non-compliance: As per the 2022 Green Drop Report, most of the WWTWs discharge non-compliant effluent directly into the environment making a shift to effective treatment critical. DWS is planning to strengthen its role in supporting and intervening in municipalities where water and sanitation services are failing. DWS took over the WSA of some municipalities nationally, as enabled by Section 63(2) of the Water Services Act of 1997, to assume responsibility for a specific duration and fix wastewater challenges.

Increased cost of sludge handling: Typical sludge handling practices include waste piling and disposal at landfills. Disposal at landfill involves logistics and landfill costs which have seen steep price increases, especially the former due to rising fuel costs. This has resulted in on-site disposal and waste stockpiling becoming the predominant option for sludge disposal at WWTWs. This has associated risks such as the contamination of water resources through leaching. Municipalities are ultimately liable for large sludge disposal fees (in excess of R30 million per year), despite the fact that sludge could be regarded as a valuable resource for additional revenue as highlighted in section 4.1.2.

Potential for additional revenue stream through sludge beneficiation: Sludge beneficiation is an untapped business opportunity and potential revenue stream for municipalities. As discussed in section 4.1.2 above, there are various circular economy solutions for the beneficiation of sludge, such as energy generation from biogas, heat generation and the recovery of nutrients. As infrastructure is upgraded and the design capacity of plants is increased to match requirements, sludge production will increase substantially. Further to this, the mandate of the NWRIA is to develop options to increase the sources of revenue from water and wastewater (DWS (e), 2022). This presents an upcoming opportunity for interested service providers offering circular solutions to manage primary and waste activated sludge from municipal WWTWs.

Increased demand for locally produced fertilisers: Fertiliser exports from Belarus and Russia – important fertiliser suppliers for Africa – have been disrupted by the Russia-Ukraine war.

Liquid waste and organic waste discharge regulations: In 2019, all liquid waste was banned from landfill nationally, and in the Western Cape targets have been set to divert organic waste from landfill (targeted 50% diversion by 2022 and 100% by 2027). These are key drivers for biogas and resource recovery projects at WWTWs.

4.3 BARRIERS TO WASTEWATER INFRASTRUCTURE AND SLUDGE BENEFICIATION OPPORTUNITIES

Although public sector water and wastewater projects have been prioritised by National Treasury and financing opportunities are increasing, significant barriers still exist, as outlined below:

Lack of technical skills and capacity at municipalities: A lack of technical skills and capacity in municipalities hampers both access to funding and the operation of WWTWs. There is a lack of capacity and skills at municipalities to develop feasibility studies and bankable projects as well as to structure appropriate contracts reduces the potential to access funding for projects. Although investors and banks are looking for projects to fund, a pipeline of feasible and well-investigated projects is required to reduce risks and increase investor confidence. In Mpumalanga, 60% of WSAs stated that WWTWs are not operated by the appropriate number of staff and that 59% of the WWTWs are not operated by staff with the correct skills/qualifications and experience (MuSSA 2019). These capacity constraints limit the ability of municipalities to confidently operate existing infrastructure or pilot innovative water technologies.

Municipal creditworthiness: In the budget vote to the National Council of Provinces (NCOP), the minister of DWS highlighted that the department's Water Trading Entity is owed R24.57 billion by the customers it sells water to. Municipalities and the water boards are responsible for 65% of the debt. Municipalities owed the water boards R13. 94 billion due to non-payment by their water users. This in turn resulted in the water boards owing the Department R7.6 billion. In addition, direct municipal debt to the Department amounted to R8 billion. Municipal-scale projects are capital intensive, and the inability to access funding is a major constraint. According to the Auditor General's report for 2020/21, irregular, fruitless, wasteful, and unauthorised expenditure totalled R34.58 billion across all municipalities in the country. Thus, only a small number of municipalities (with favourable audit findings) have the capacity and financial standing to access private sector funding or leverage PPPs to enable infrastructure projects.

Municipality procurement regulations and processes: Municipal procurement processes can be lengthy, tenders are often poorly specified, and legislation can be restrictive, particularly when municipalities wish to trial innovative technologies. Public Private Partnerships (PPPs) in particular are complex, expensive and can take between 8 to 12 years to facilitate (Fouad, 2021).

Barriers to market entry for new technologies and access to climate finance: The procurement processes make it difficult for municipalities to trial and invest in new (unproven) technologies; hence it is difficult for municipalities to access innovative technologies and potential alternative finance mechanisms. While the mitigation impact may be indirect, the refurbishment or upgrade of a treatment plant can significantly reduce carbon emissions through improved energy efficiency by new equipment. The stabilisation of sludge through anaerobic digestion, the capture of biogas and associated energy production can reduce greenhouse gas emissions in comparison to leaving wastewater untreated. The uptake of these technologies can be enabled by support from climate finance initiatives. However, research and demonstration to expand the range of water and wastewater treatment technologies that can reduce the carbon footprint of water and wastewater treatment works is required to better leverage climate finance.

4.4 INVESTMENT ENABLERS FOR THE PUBLIC SECTOR

Due to the barriers outlined above, private sector involvement in the municipal water and sanitation sector has been low to date. To address this, several enabling measures are being put into place. These include:

• Public-private collaboration agreements with industries, such as mining and agriculture, for the joint funding of infrastructure projects.

• A Water Partnerships Office (WPO) to assist municipalities to contract via PPPs and with potential independent water producers (IWPs) [27]. The WPO is a ring-fenced entity led by the Development Bank of South Africa (DBSA) and assisted by the reforms of the PPP regulatory framework.

• As indicated in **Section 2**, DWS is in the process of establishing the National Water Resource Infrastructure Agency (NWRIA) to finance and implement large-scale investments in national water resource infrastructure that are required to ensure that South Africa has sufficient bulk water and wastewater supply and water management infrastructure now and in future (DWS (h), 2022).

• Increased project preparation support outlined in the Economic Reconstruction and Recovery Plan (ERRP).


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[27] More information on Independent water producers can be accessed here: https://www.wrc.org.za/wp-content/uploads/mdocs/Working%20Paper_IWP_Feb%202022.pdf

4.5 EMERGING INVESTMENT OPPORTUNITY IN THE PRIVATE SECTOR / MINING MARKET

4.5.1 MINE WATER RECLAMATION FOR AGRICULTURAL ACTIVITIES

The 2022 and 2023 Agriculture MIR identifies and shows agriculture as the major opportunity economic development (in terms of potential employment, economic return and environmental rehabilitation), for economic diversification and for repurposing of mine land and mine infrastructure post closure. This section analyses the emerging water sector opportunity in support of the agricultural opportunity.

As shown in **Section 2** agriculture in South Africa heavily relies on a significant portion of the country's high-quality water resources for irrigating various crops, including food and energy crops. The use of mine water for irrigation in this area presents an opportunity to resolve the mine water problem while also contributing to agricultural production and socio-economic development. There are several studies that show compelling advantages to utilising mine water for crop irrigation (Annadale et al. 2009).

Gypsiferous mine water may require minimal treatment before it can be reused for irrigation, resulting in substantial cost savings, potentially reducing capital and operating expenses for mine water treatment by 87% and 78%, respectively. Moreover, many areas with irrigated farmland are situated near sources of mine water, which would reduce the costs associated with collecting and distributing this water if it were employed for irrigation. Additionally, there is an opportunity to repurpose existing mining infrastructure for various uses by the farmers such as storage, office space, farm worker accommodation and other uses depending on the type of infrastructure available. This would also reduce costs associated with demolition and rehabilitation. It is important to note that any such use and repurposing would be subject to the National Environmental Management Act (NEMA) regulations for rehabilitating mine infrastructure, and any specific conditions set in the mine's original EIA and decommissioning plans and commitments.

There is uncertainty regarding the volumes of mine-impacted water being produced in coal mines in Mpumalanga and the rate at which these mine-impacted waters are being decanted into catchments. In cases where mine water from operating and closed coal mines is of too poor a quality to be discharged into rivers, water treatment processes such as high-density sludge plants and reverse osmosis are typically used. The degradation of river water quality has been observed in Mpumalanga, and can, at least partly, be attributed to mining activities in the Crocodile and Olifants river catchments. As indicated in section 2, according to Grobbelaar et al (2004), 360 Ml/d decant may be generated after closure of the entire Mpumalanga Coalfields, and for the Upper Olifants Catchment, a volume of 170 Ml/d is estimated. [28]

[28] At the time of writing this was the most up to date peer reviewed estimation of the water balance from coalfields in Mpumalanga

The treatment and reuse of mine water has the potential to generate revenue from the sale of the water to the agriculture sector or used directly for agriculture. The income generated from water sales or from crops irrigated with mine water can be used to fund the treatment of mine water. The use of water for agriculture would create employment opportunities, and, depending on the type of water and extent to which it can be cleaned, potentially also enhance food security for the local community. Additionally, having water available for irrigation could incentivise the rehabilitation of mined land, transforming it into usable space for commercial or industrial activity thus further enabling job creation and economic revival.

This approach goes beyond merely stabilising the land or meeting regulatory requirements; it focuses on proactive fostering of economic growth and community development. As an example, converting rehabilitated mine land into bioenergy crop farms offers the potential to open opportunities for emerging commercial farmers. It is important to acknowledge that irrigating with mine water, especially on conventional agricultural land, may pose challenges due to higher salinity levels. Rehabilitated land, with its disrupted geology and poor topsoil quality and depth, may present even greater difficulties. Therefore, it is crucial to provide technical support, training, and mentorship to emerging commercial farmers to increase the likelihood of success in such projects.

There have been some successful projects in the province which include reuse of mine water and/or repurposing of infrastructure at mines in Middleburg and eMalahleni, and also at the Optimum mine near Hendrina. Some of these projects have focussed on treating water to potable standards for sale to municipalities. The success of these projects has demonstrated the viability of treating mine reclaimed water to potable standards, however communication with plant operators has highlighted that the cost of treatment is too high and the return is low due to low water tariffs and lack of payment from partnering municipalities.

4.6 DRIVERS FOR MINE WATER RECLAMATION

Environmental, Social and Governance (ESG) Reporting and Targets: Commitments by large industrial businesses (particularly those with large international parent companies) often require them to report on their water consumption against set targets, and submit their plans for investment in water efficient technologies.

Water scarcity and adaptation: 98% of water is already allocated in South Africa. There will be a demand for water for any industrialisation opportunities that arise in the province. Reclamation of mine water can cover this shortfall.

The need to address the legacy of historical mining pollution: South Africa has a long history of mining, and many mines have been abandoned without being properly rehabilitated. This has led to the pollution of water resources, which has had a negative impact on the environment and public health. Mine water reclamation projects can help to address this legacy pollution and improve the quality of life for communities that have been affected.

The need to create jobs and stimulate economic development: The energy transition in South Africa is expected to lead to job losses in the mining sector. Mine water reclamation projects can help to create jobs in the mining sector and in other sectors, such as agriculture. This can help to mitigate the negative economic impacts of the energy transition.

The technological advances in mine water treatment: There have been significant technological advances in mine water treatment in recent years. These advances have made it more feasible and cost-effective to reclaim mine water.

4.7 BARRIERS TO MINE WATER RECLAMATION AND POTENTIAL RISKS

Lack of updated information: There is a lack of data for a provincial water balance and information about land rights that makes calculating the market size a challenge.

Access to finance: The cost of mine water reclamation can be high, especially for large-scale projects. This is due to the need to use specialised equipment and technologies, as well as the high cost of energy for their operation.

Reputational risk and reluctance to deviate from core business: Mines typically do not see any incentive to setting up projects of this nature that are outside their core business and are usually risk averse when dealing with projects that could result in reputational damaging if something is goes wrong

Regulatory complexities: Mine closure, water treatment and irrigation are regulated by different departments which can have conflicting requirements that could prolong the setup a mine water reclamation and use project.

Licensing and authorising processes: Obtaining licences and authorisations needed for water-related projects can be a complex and lengthy process. DWS has announced in 2021 to reduce the Water-Use licence application (WULA) timeframe from 300 days to 90 days. The implication is that projects generally now have to advance to the feasibility stage rather than pre-feasibility to ensure that WULA comply with the level of detail required.

Increased operational complexity: Advanced water projects often increase the operational complexity beyond the operations and management skills available within industrial companies (and this is more so in small to medium sized operations). This can lead to operational risks, and a reluctance to proceed with more complex water projects. Skills development or upskilling of existing staff is required, which adds to the cost of the project. There is an opportunity to overcome this barrier through innovative procurement models that place the operational responsibilities on the technology and service providers.

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FINANCE AND INCENTIVES

South Africa ranks as one of the top 15 nations in the world in terms of driving the green growth agenda (ahead of Australia, Singapore, and Finland). This drive is on the back of a range of funding solutions and tax incentives available to green technology manufacturers and service companies, as well as those who use or procure such goods and services.

The South African Climate Finance Landscape looks at detailed projectlevel data, understanding in detail the source, disbursement, instrument and use. The insights can support public and private role-players with information to shape sectoral strategies and selected policies and improve coherence and coordination between public and private level spending in the sectors. The South African Climate Finance Landscape has tracked R131 billion in annual climate finance invested in SA. *Find out more here.*

General database web page

The GreenCape Finance Desk hosts a web page with a number of Green Finance resources that cover funding and incentives available to companies operating in the green economy. A few of the available database are highlighted below.

The Green Finance Desk (GFD) primarily acts as a facilitator in the financing of green projects and green business. The GFD works across all sector desks at GreenCape. For more support please contact jack@greencape.co.za

Green Finance Database

GreenCape maintains a database of funding sources and incentives that may be relevant to green economy investors. The database contains information on more than 150 funding opportunities, including an overview of the opportunity and relevant contact details and links. It is ideal for any entity seeking a broad range of funding solutions and financial incentives, with South African institutions being the main source of opportunities. The database is available to view and download online [9].

Government funding and incentives database

An updated document focused on South African government funding and incentives is available to view and download online [10]. These incentives cover local manufacturing, critical infrastructure grants, small enterprise development and a diverse set of sector specific incentives (i.e. Aquaculture Development and Enhancement Programme).

Finfind database

Finfind [11] is an innovative online finance solution that brings together SMME finance providers and finance seekers. With a focus on finance readiness, Finfind has more than 200 lenders and over 350 loan products available to SMEs. The database is ideal for South African SMMEs who are seeking funding and/or business advisory services, and those who want to improve their understanding of finance.

AlliedCrowds database

AlliedCrowds [12] is the first complete aggregator and directory of alternative finance providers in the developing world.

Sign-up is free and allows users to access a global database where one can filter for sector (including greentech, agriculture and social impact), type of capital (equity, lending, grant), and type of funding (crowdfunding, angel investing, venture capital, impact investing). In addition:

- Themed databases around the Sustainable Development Goals (SDGs) and the World Green Economy Organisation (WGEO) are available.

- Reports, including a number specifically about African funding sources, can also be downloaded for free.

- Businesses / organisations can also contact Allied Crowds to create a customised funding database. This resource is ideal for any entity seeking a broad range of financial solutions on a global scale.

[9] https://www.green-cape.co.za/content/focusarea/green-finance-databases
[10] https://www.greencape.co.za/assets/Uploads/Government-Funding-and-Incentive-Booklet.pdf
[11] https://www.finfindeasy.co.za/
[12] https://alliedcrowds.com/

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