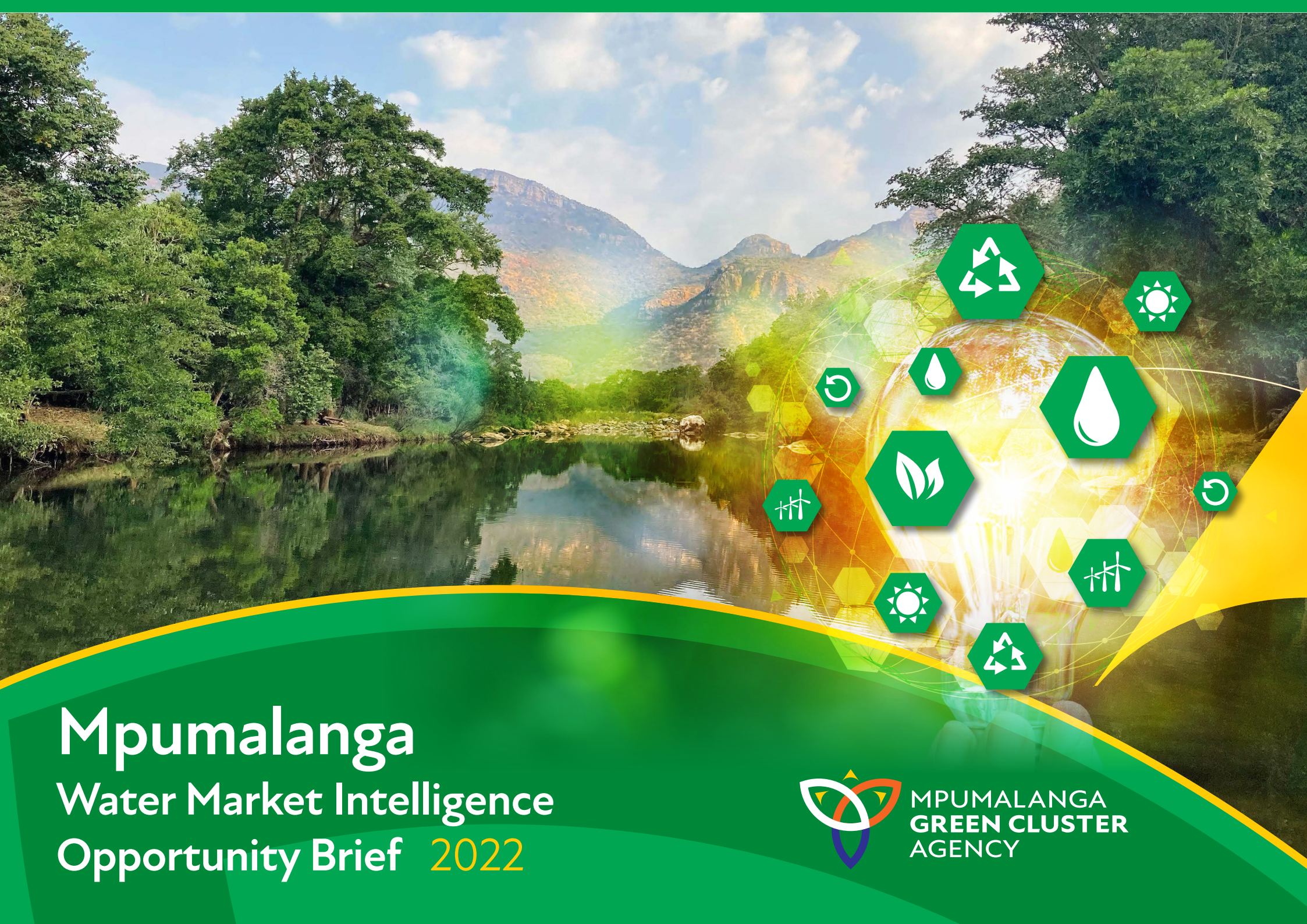

Mpumalanga
Water Market Intelligence Opportunity Brief 2022

MPUMALANGA GREEN CLUSTER AGENCY

Mpumalanga Green Cluster Agency

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Mbombela, South Africa

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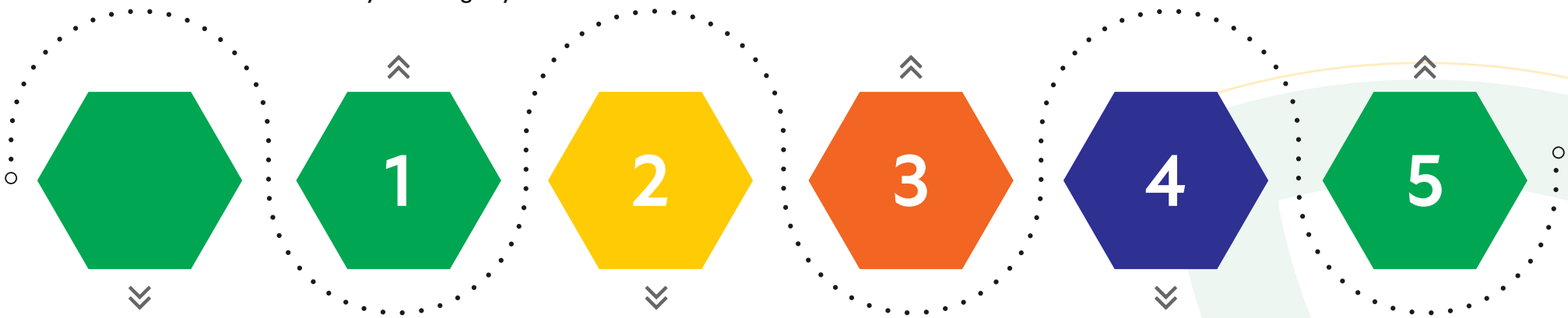

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LIST OF ABBREVIATIONS AND ACRONYMS

Abbreviations & Acronyms	Meaning
AGSA	Auditor General South Africa
AMD	Acid Mine Drainage
ASP	Activated Sludge Plant
BLM	Bushbuckridge Local Municipality
CER	Centre for Environmental Rights
CHP	Combined Heat and Power
COGTA	Cooperative Governance and Traditional Affairs
DBSA	Development Bank of Southern Africa
DDM	District Development Model
DEDT	Department of Economic Development and Tourism
DFFE	Department of Forestry, Fisheries and the Environment
DORA	Division of Revenue Act
DTIC	Department of Trade, Industry and Competition
DWS	Department of Water and Sanitation
ELU	Existing Lawful Use
ESG	Environmetal, Social and Governance
GA	General Authorisation

Abbreviations & Acronyms	Meaning
GN	Government Notice
GRR	Global Risk Report
GVA	Gross Value Added
IPAP	Industrial Policy Action Plan
IRP	Integrated Resource Plan
KOBWA	Komati Basin Water Authority
IUCMA	Inkomati-Usuthu Catchment Management Area
IRR	Institutional Reform and Realignment masterplan
LM	Local Municipality
MFMA	Municipal Finance Management Act
MIIF	Municipal Infrastructure Investment Framework
Ml/d	Mega Litres per Day
MPAP	Municipal Priority Action Plan
MTSF	Medium Term Strategic Framework
MuSSA	Municipal Strategic Self-Assessment
NBI	National Business Initiative
NBR	National Building Regulations

Abbreviations & Acronyms	Meaning
NDP	National Development Plan
NRW	Non-Revenue Water
NWRIA	National Water Resource Infrastructure Agency
NSSS	Non-Sewered Sanitation Systems
ORWRDP	Olifants Water Resource Development Project
PGM	Platinum Group Metal
PPP	Public-Private Partnership
PPGI	Public-Private Growth Initiative
PST	Primary Sedimentation Tank
RAS	Return Activated Sludge pump
RBIG	Regional Bulk Infrastructure Grant
RWM	Rand Water Mpumalanga
SA	South Africa
SABS	South African Bureau of Standards
SANS	South African National Standard
SASTEP	South African Sanitation Technology Demonstration Programme
SST	Secondary Sedimentation Tank
SWPN	Strategic Water Partnership Network
TCTA	Trans-Caledon Tunnel Authority
VROOM	Very Rough Order of Measurement

Abbreviations & Acronyms	Meaning
W&WW	Water and Wastewater
WEF	World Economic Forum
WMA	Water Management Area
WASH-FIN	USAID Water, Sanitation and Hygiene Finance Project
WSA	Water Services Act
WSA	Water Service Authority
WSIG	Water Services Infrastructure Grant
WSP	Water Service Provider
WRC	Water Research Commission
WTE	Water Trading Entity
WTW	Water Treatment Works
WUL	Water Use License
WULA	Water Use License Application
WWTWs	Wastewater Treatment Works

Exchange rates used:
1 US Dollar = R16.64 (August 2022)

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.

CLICK:
To access last year's Report

South Africa is facing an imminent water crisis primarily due to recurring droughts resulting from climate change, exacerbated by ageing water and wastewater (W&WW) infrastructure, ensuing from inadequate maintenance and a lack of sufficient investment in infrastructure renewal and refurbishment. The pursuit of economic development, resilience, water security, univeral access to W&WW services have become key drivers for investment in the country's public W&WW infrastructure. This national picture has regional application, also in Mpumalanga.

Mining activities account for only ~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 and illegal mining, as well as the licensing backlog and irregularities in licensing processes.

Water supplied through municipal-managed systems accounts for ~30% of water use in Mpumalanga. This use includes domestic, industrial, commercial and institutional use. The vast majority of this use is in urban areas.

Substantial investment in the restoration of existing W&WW infrastructure is needed. Investment into providing additional capacity for both water resources infrastructure (for which national government is responsible) and the water services infrastructure (for which municipalities are responsible) is also required. The capacity of national and local government to support the financing of these investments is limited, as a result of low water tariffs, high levels of non-revenue water and low revenue collection.

This year's opportunity brief elaborates on key opportunities highlighted in last year's report (access **here**), particularly relating to public sector wastewater infrastructure. With the reinstatement of the Green Drop Programme and the publishing of the 2022 Green Drop Reports, up-to-date data is included in this document to highlight the need for investment to upgrade wastewater infrastructure, clearly indicating an overall improvement in Green Drop scores in the province from 2013. In addition, sludge beneficiation as an untapped municipal revenue stream is explored as an investment opportunity along with innovative decentralised water treatment technologies, particularly to alleviate the pressure on the already constrained wastewater treatment works. Inadequate municipal service delivery has provided the context for industries to invest in decentralised water treatment systems to ensure sustainable operations.

Opportunity	Key drivers	Barriers	Expected timeframe	Macro-environment
Public sector wastewater infrastructure	• There is a renewed focus on national infrastructure catalysed by the reinstatement of the national Department of Water and Sanitation's Green Drop Programme and reports being published every two years. • As per the 2022 Green Drop Report, most of the WWTWs discharge directly into rivers, making effective treatment critical. DWS took over the WSA of some municipalities nationally, as enabled by in Section 63(2) of the Water Services Act of 1997, to assume responsibilities including management of potable water, domestic wastewater and sewage systems for a specific duration to deal with the challenges faced by the WWTWs. • COGTA has intervened to assist with the issues of sewer spillage in various municipalities (namely Lekwa, Govan Mbeki and Thaba Chweu municipalities), furthermore they will be assisting municipalities in terms of project preparation, master planning, asset care, revenue enhancement and spatial restructuring. • Private sector funding is being mobilised through the Public-Private Growth Initiative (PPGI)[1] via its District Development Model (DDM) approach. • A National Water Resource Infrastructure Agency (NWRIA) has been established. • In the 2022/23 financial year 24 WWTWs in Mpumalanga are under refurbishment indicating that this is a key priority for local governments. • Water demand is escalating in a number of towns such as Mbombela, White River, Middelburg and eMalahleni due to urbanisation.	• Capacity constraints are leading to several local municipalities failing to execute all their functions as Water Service Authority (WSA). • Lack of provincial water and sanitation master plans. • Lack of technical capacity in municipalities as evidenced by poor infrastructure planning and poor implementation of infrastructure projects. • Inadequate budget allocation to implement projects and delays on project implementation. • Grant allocations are insufficient to immediately upgrade WWTWs in the short term and requires a multiyear implementation approach.	0 – 10 years	• Sewer spillages of untreated waste water contaminates ground and surface water resources and degrades the ecological infrastructure of the province. • The Mpumalanga province has 76 municipal owned WWTWs. The province is also serviced by 14 WWTWs owned by the national Department of Public Works resulting in 90 WWTWs being monitored by DWS. 12 of the 17 WSAs improved on their 2013 scores, whilst five of the 17 WSAs received lower Green Drop scores compared to 2013 baselines. Steve Tshwete is the only municipality that was commended for Green Drop efforts and scored 88%. • The Ehlanzeni District currently still has an excess of sanitation bulk infrastructure capacity of 20 Ml/d. Gert Sibande and Nkangala Districts exceeding bulk sanitation infrastructure capacity by 86 Ml/d and 8 Ml/d respectively. • The VROOM[2] index estimates that a **total of R960 million in investment** is required to get all of the public WWTWs in the province to a functional state.

[1] PPGI is a voluntary special purpose platform established to build co-operation and collaboration between the private sector and government towards the stimulation of inclusive growth. It enjoys participation and support from government, the private sector, and leaders in over 20 economic sectors.

[2] 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.

Opportunity	Key drivers	Barriers	Expected timeframe	Macro-environment
Public sector wastewater infrastructure (cont.)	• There is increased demand for good quality raw water for downstream users, particulary rural residents and neighbouring countries. • Expected growth due to key provincial development plans: (1) Mpumalanga Vision 2030 Strategic Implementation Framework, (2) Mpumalanga Economic Growth & Development Path, (3) Mpumalanga Spatial Development Framework.			
Sludge beneficiation	• Sludge beneficiation is an untapped business opportunity for municipalities as a potential revenue stream. • Availability of local innovative solutions to beneficiate sludge.	• Producer beneficiater infrastructure gap (this could also be a potential driver). The beneficiator requires the sludge to be in a specific state, i.e. dewatered, hence the infrastructure requirement to upgrade the sludge to a point where it can be utilised by beneficiators need to be explored. • Sludge and effluent monitoring and evaluation at WWTWs.The majority of the WWTWs in the province scored below 50% for effluent and sludge compliance, which is a barrier to beneficaition opportunities as the sludge quality is unknown.	0 – 5 years	• The most prominent risks in the Green Drop assessment were observed on treatment level, and pointed to works that exceeded their design capacity, dysfunctional processes, and equipment (especially disinfection), and effluent and sludge non-compliance. Opportunities are presented in terms of reducing cost through process optimisation and improved energy efficiency, and beneficial use of sludge, nutrients, biogas, and other energy resources. • 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) and 21 treatment works where information is insufficient.
Innovative decentralised[3] water treatment technologies (Mining; power generation sectors and agro-processing)	• Water treatment required for raw water sources due to poor raw water quality and increased pollution. • High and increasing energy costs promoting exploration of energy efficient water treatment technologies with low operations and maintenance requirements. • Stringent effluent discharge standards due to local ecological degradation.	• Most mines are remote where some technology types are difficult to implement and monitor. • Regulatory authorities are risk averse to new technologies from a water use lisensing perspective. • Long waiting periods for water use lisencing applications.	0 – 5 years	• Current mining projects in Mpumalanga include 68 coal, 19 industrial, 14 platinum group metals, 13 gold, 5 nickel, 3 iron ore and 1 chrome. • The province produces 83% of the countries coal. • The province currently hosts 12 power stations: 7 coal-fired operating, 4 coal-fired shortly to be repurposed and 1 coal-fired new build.

[3] Decentralised treatment is a practice of placing water or wastewater treatment at the site of supply, demand or ideally both. It is a flexible, sustainable alternative to large treatment plants that require costly supply and delivery infrastructure.

Opportunity	Key drivers	Barriers	Expected timeframe	Macro-environment
Innovative decentralised water treatment technologies (Mining; power generation sectors and agro-processing) (cont.)	• Improved financial viability of non-potable reuse options, such as agri irrigation and reuse for process water due to fit-for-purpose treatment trains. • Environmental, Social and Governance (ESG) reporting and targets. • Liquid waste-to-landfill ban (also an opportunity).	• Lack of clarity over key pieces of legislation: Mine water closure and rehabilitation, mine water irrigation regulations and financial provisions for mine closures. • Public perception and health risks on use of treated effluent. • Access to information on best practice and locally validated technologies. • Access to capital. • Operational complexity.	0 – 5 years	• In 2016 it was estimated that water use in coal mining totalled to 53.8 million cubic meters per annum with a large portion ending up as wastewater. • The estimated water use in coal-power generation is ~3 184 L per MWh. • Mine and groundwater is contaminated with mainly sulphates. • Mines often take on the responsibilities of local governments to provide water and sanitation for local mining communities. • Manufacturing sector such as petroleum and agro-processing is struggling to meet production targets due to poor municipal service delivery and thus investing in decentralised water treatment solutions for sustainable operations.
SUB-OPPORTUNITY: Non-sewered sanitation solutions	• Municipal wastewater treatment works operate beyond design capacity due to mushrooming of mining communities. • Covid-19 pandemic reemphasised the need for universal access to sanitation. • Need for rapid implementation options. • Constraints on development due to lack of bulk infrastructure. • Strategies and government initiatives that aim for the provision of universal access to sanitation. • Increase in water and sanitation related service delivery protests. • Pollution of water courses by informal settlement dwellers using them for disposal of waste including faecal matter. • Lack of availability of potable water to flush toilets and use for water borne sanitation.	• Policies, bylaws & regulations make it onerous to install non-sewered sanitation solutions (NSSS). • Public acceptance of alternative sanitation solutions. • Negative perceptions of cost and maintenance requirements.	0 – 10 years	

[3] Decentralised treatment is a practice of placing water or wastewater treatment at the site of supply, demand or ideally both. It is a flexible, sustainable alternative to large treatment plants that require costly supply and delivery infrastructure.

1.

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 coal-based economy.

Under the leadership of the Mpumalanga Department of Economic Development and Tourism work has begun to design a strategic intervention for the green economy in the province to attract investment and create jobs. This strategy identified the concept and theory of cluster development as an effective way to transition to an economy that has the ability to provide labour absorbing capacity through competitive green jobs.

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 approaches. Set in this system of rapidly changing technology, and the economics surrounding that technology, are commitments to social inclusion, and greater equality.

The Mpumalanga Department of Economic Development and Tourism, working with GreenCape and with support from the international development finance community, has set up the Mpumalanga Green Cluster Agency. This cluster will focus on unlocking and unblocking economic opportunities in the green economy, with the aim of making a contribution to regional economic diversification and job creation efforts.

The Mpumalanga Green Cluster Agency is registered as a not-for-profit organisation in South Africa, with an appointed board of directors. The Cluster uses the triple helix cluster model with representation from government, industry and academia as part of its design set up. The Cluster hosted the Mpumalanga Energy Summit in 2022, where it was formally launched by the Mpumalanga Government MEC: Finance, Economic Development and Tourism.

The Cluster has made significant progress to date, in particular to systematically engage with businesses in the province to identify and highlight opportunities and barriers for green economy projects in Mpumalanga. The Cluster 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.

Some of these interventions has led to investment declarations and intent to develop ~ R60bn worth of projects, a primary impact goal for the Cluster. The Cluster has also been accepted to be the second African member of the International Cleantech Network, creating an international eco-system access point for green businesses in the province for potential growth opportunities.

The Mpumalanga Green Cluster Agency's mission is to stimulate a vibrant green economy for communities in the Mpumalanga province, underpinned by a collaboration between government, business and academia. The vision is a vibrant, green and sustainable economy in the Mpumalanga province, that leverages the province's rich natural resources and heritage to create a legacy for South Africa low carbon economic growth. 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.

To become a member of the Mpumalanga Green Cluster Agency, please sign up **here**.

Green Economy Market Opportunity Briefs

This market opportunity brief is part of an annually updated series of reports that highlight green economy 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 the province.

Each brief provides an overview of the market within a sector, including key developments and achievements, the key players, legislation and regulation, market opportunities and challenges, and funding opportunities.

This brief focusses on the green economy investment opportunities in the water sector.

To access the other sector briefs, please visit: **http://www.mpumalangagreencluster.co.za/**

2.

SECTOR OVERVIEW AND CONTEXT

2.1.

South African Context

South Africa, classified as 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 500mm annually. Climate change is expected to make the country even more arid, and localised droughts will become more regular. The country struggles to meet the current water demand and continually faces challenges relating to poor water and sanitation service delivery, and inequalities in access to water and sanitation. Some of the factors contributing to the challenges mentioned have been documented as insufficient and failing water and wastewater infrastructure, lack of maintenance and investment, deteriorating raw water quality and a skills shortage in technical departments in municipalities.

Sustainable Development Goal 6 prioritises clean water and sanitation, highlighting that the provision of high quality drinking water and safe sanitation for all communities is essential for human health and wellbeing, economic development and the realisation of the constitutional rights of all South Africans.

An overview of the South African water sector is presented below with specific focus on water governance, water allocations, and the water services and pricing strategy.

2.1.1. The three-tiered water governance system

The national Department of Water and Sanitation (DWS) is responsible for bulk raw water supply, monitoring and control (rights and licensing), while the respective water services institutions are responsible for end-user water supply (installations, metering and billing).

South African water governance is driven by the Constitution of SA and water related legislation such as the National Water Act [No. 36 of 1998] (NWA) and the Water Services Act [No. 108 of 1997] (WSA), administered by DWS. DWS is responsible for managing dams and maintaining water infrastructure, such as boreholes and storage reservoirs, for both urban and rural communities. The NWA recognised the need for suitable water management institutions to be able to achieve robust water management. The Act defines water management institutions such as Catchment Management Agencies (CMA) and Water Users' Associations (WUAs)[4].

The aim of the NWA was to establish a CMA in all the nine water management areas (areas of operation of CMA) of South Africa. The CMA manages water resources within its defined water management area according to its catchment management strategy.

Within the CMAs are Catchment Management Committees, and Catchment Management Forums which promote community participation within a water management area.

The water services institutions manage water supply services and delegate responsibilities for such services to Water Services Authorities (WSAs), such as municipalities, water utilities, and private firms. According to the Water Services Act of 1997, the local municipality is responsible for taking care of the distribution network and the use of water. A high-level diagram of the institutional arrangements of the South African water management system is presented in **Figure 1**.

Other key stakeholders in the Mpumalanga water resources management structure are listed in **Table 1**.

[4] WUA is a grouping of water users who wish to work together because of a common interest. WUAs enable individual water users, who wish to undertake water-related activities for their own benefit, to form cooperative associations.

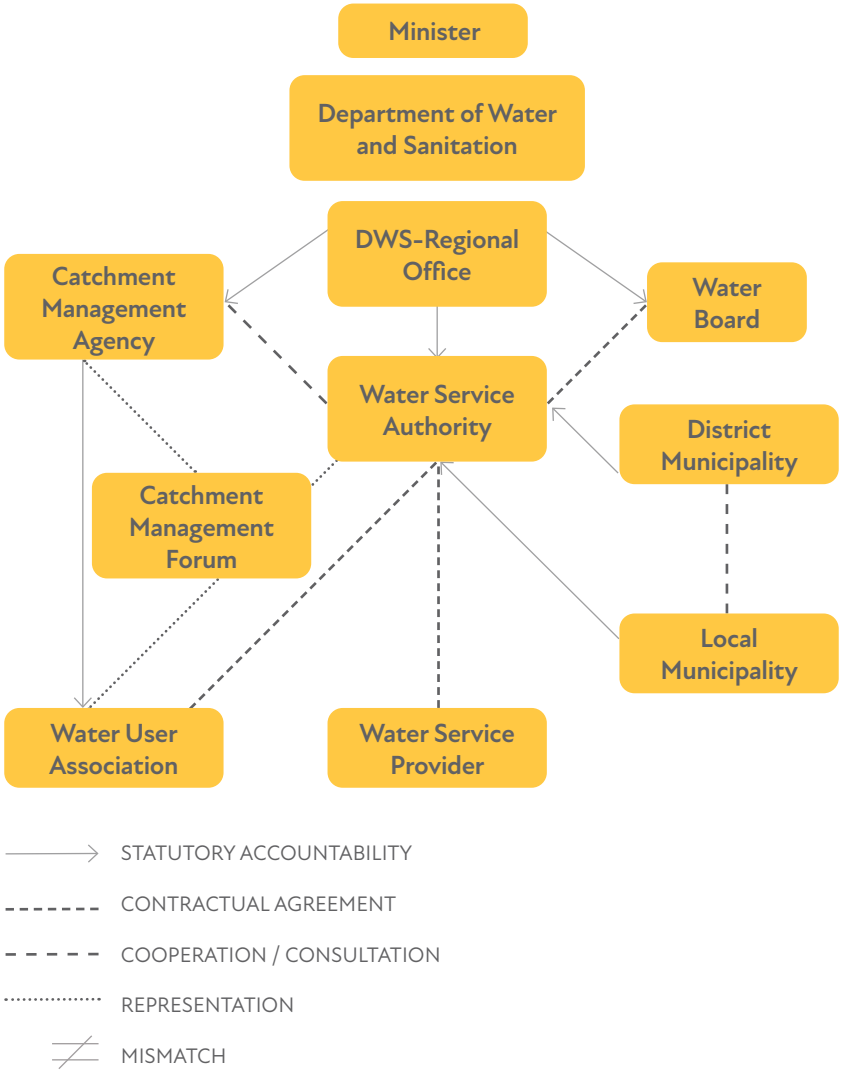


Figure 1. Instituitional mapping for water resources management in South Africa (adapted from Weaver 2017)

Table 1. Functions of key stakeholders in the water resources management structure relevant to Mpumalanga.

Entity	Function
Rand Water	Rand Water was established in 1904 and was reconstituted in terms of the Water Services Act (No. 108 of 1997) with the mandate to supply quality bulk potable water to water services authorities and government departments. Rand Water Mpumalanga provides bulk water services to the Bushbuckridge Local Municipality (BLM). The total area of operations is 15 644km^2 (that is 10 250km^2 for BLM). Rand Water Mpumalanga region is currently operating seven water supply systems. There is a total of 13 booster stations and 106 bulk reservoirs in Rand Water's area of operations under BLM. The average daily production for the entire area of RWM operation is about 146 Ml/d. In line with the Institutional Reform and Realignment (IRR Masterplan), Rand Water's area of operations has been extended to cover the rest of Mpumalanga and parts of the Free State, North West and Limpopo Provinces.
Magalies Water	Magalies Water provides quality bulk water and secondary services directly to municipalities, mines and other industries, which in turn helps to grow the economy and improve the lives of communities. Raw water is drawn from the rivers which flow into dams that are owned by the DWS, and Magalies Water buys the water from the Department. Water from the dams is channelled to Magalies Water's four water-treatment plants where the water is treated for public consumption. Municipalities draw the water provided by Magalies Water through the reservoir and provide it to consumers for household use.
Inkomati-Usuthu Catchment Management Agency	The Inkomati-Usuthu Catchment Management Agency (IUCMA) was established in 2004 in terms of the National Water Act (No.36 of 1998) to perform sustainable and equitable integrated water resource management within the Inkomati-Usuthu Water Management Area (WMA) in Mpumalanga. The agency plays a key role in the use, protection and development of water resources in the Inkomati- Usuthu water management area, and aims to ensure that water is used and managed to support equitable and sustainable socio-economic transformation and development. Over the medium term, the agency aimed to meet water demand for the domestic, agriculture and commercial sectors by processing water-use licence applications and ensuring that the area's quality of water resources remains high.

Entity	Function
Water Research Comission	The Water Research Commission (WRC) was established in terms of the Water Research Act (No. 34 of 1971). It is mandated to conduct research in the water sector by determining needs and priorities for research; promoting coordination, cooperation and communication in the area of water-research development; stimulating and funding water research; promoting the effective transfer of information and technology; and enhancing knowledge and building capacity in the water sector. Over the medium term, the commission planned to continue driving research and enhancing knowledge within the water sector.
Water Trading Entity	The Water Trading Entity (WTE) was established in 1983 and was converted into a trading entity in 2008 in terms of the Public Finance Management Act (No.1 of 1999). The entity's primary role is to manage water infrastructure and resources, and the sale of raw water. Over the medium term, the entity planned to continue focusing on maintaining existing water resource infrastructure, supporting the long-term sustainability of water resources, and supplying bulk water to strategic users such as large industrial companies to stimulate and support economic development.
The Komati Basin Water Authority	The Komati Basin Water Authority (KOBWA) is a binational organization that was established in 1993 in the terms of a treaty on the development and utilisation of the Komati River Basin, signed between the governments of the Kingdom of Eswatini (formerly named Swaziland) and South Africa. KOBWA is accountable to a Joint Water Commission (JWC) that has six members: three members from each signatory country. The purpose for KOBWA was to design, construct, and operate phase one (Driekoppies Dam in South Africa, and Maguga Dam in the Kingdom of Eswatini), of the Komati River Basin Development Project (KRBDP). When the construction of the two dams was completed in 2001, KOBWA moved on to the operations part of the project which included operating releases from the reservoirs and related infrastructure in order to meet (and balance) the needs of water users in the Kingdom of Eswatini and South Africa. Furthermore, to their mandate, KOBWA has a responsibility to monitor and report on the water quantity and water quality status of rivers and reservoirs in their area of operation.

Entity	Function
Trans-Caledon Tunnel Authority	The Trans-Caledon Tunnel Authority (TCTA) was established in 1986 as a specialised liability management entity, deriving its mandate from the National Water Act (No.36 of 1998). It is responsible for financing and implementing the development of bulk raw water infrastructure and providing treasury management services to the DWS. The authority plays an important role in providing: financial advisory services such as structuring and raising project finance, managing debt and setting tariffs; project implementation services; and other technical support to the department and water boards. Over the medium term, the authority planned to continue planning and implementing phase 2 of the Lesotho Highlands Water Project, phase 2A of the Mokolo-Crocodile River water augmentation project and providing a short-term solution to acid mine drainage in Gauteng.
National Water Resource Infrastructure Agency (NWRIA)	Established in 2022 with the objective to increase investment in the maintenance and construction of water infratsructure and improve water quality. NWRIA will develop and maintain national bulk infrastructure.

In May 2022 it was reported that the Minister of Water and Sanitation, Minister Senzo Mchunu, after various consultations with stakeholders, reviewed the state, sustainability and functionality of the national waterboards and decided that Rand Water will continue to service Gauteng, Mpumalanga and Hammanskraal.

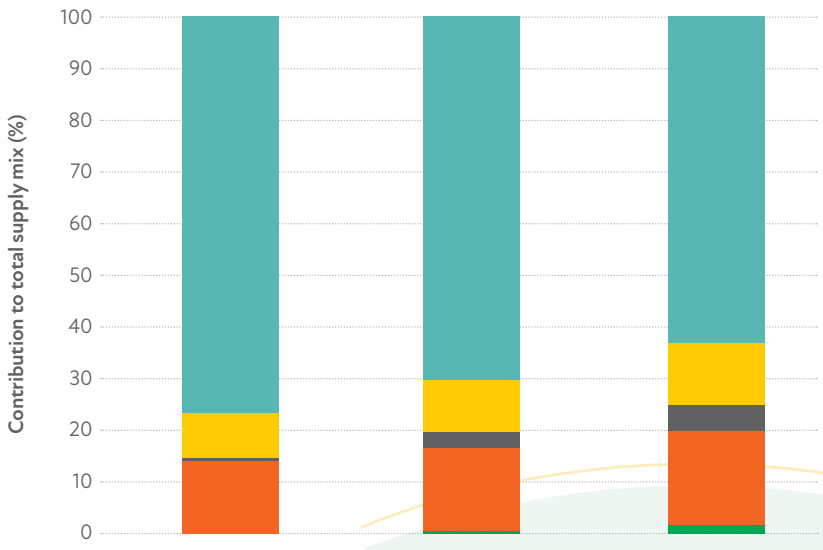
Over the medium-term, DWS plans to continue conducting technical regulatory assessments on the provision of water services. These valuations measure the level of compliance with the Green Drop (wastewater) and Blue Drop (potable water) regulatory standards. The Green Drop Programme was reinstated in 2021 for all WSAs, with detailed reports published in 2022. The findings of this report are elaborated on in **Chapter 3**.

A status report for the **Blue Drop report** was published in April 2022, with a full analysis and completed report expected to be published in March 2023.

2.1.2. Water allocation and supply system

The country has a reliable yield (i.e. supply from current infrastructure) of ca. 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 2** (DWS 2022). Agriculture is the largest water-use sector (58%), followed by municipalities (30%), which covers residential, commercial, and industrial water users supplied by municipalities (**Figure 3**; DWS 2022). The projections of the water supply mix for 2025 and 2040 (**Figure 2**) and projected water use in 2050 (**Figure 3**) are also included. These indicate that surface water supply will likely decrease in terms of percentage of supply resulting in the need for augmenting with additional water sources such as desalination and the treatment of acid mine drainage. The relative proportion of municipal and agricultural use differs between provinces and municipalities, depending on human settlement patterns and the local economy.



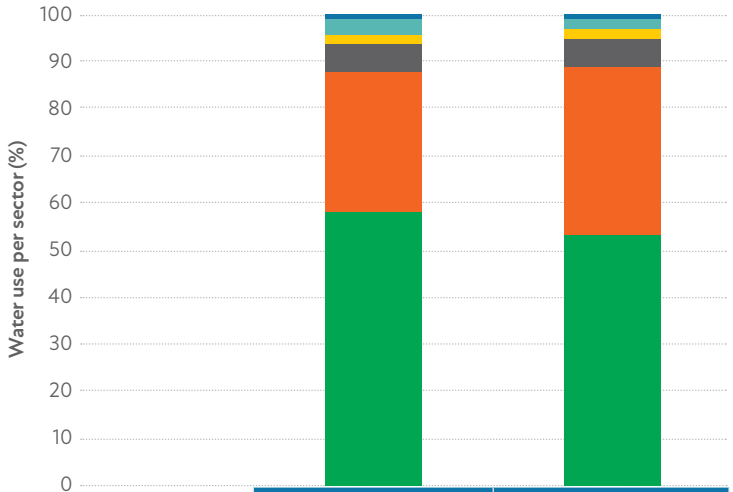
	Current Water Mix	Projection at 2025	Projection at 2040
Surface water	77	70	63
Groundwater	9	10	12
Return Flows	0,5	3	5
Desalination	14	16	18
Acid Mine Drainage	0,1	1	2

Figure 2. National overview of the current water resource mix and the projected resource mix for 2025 and 2040, respectively (based on data from DWS 2022)

Despite South Africa being a water-scarce country, the national average consumption is around 237 litres/capita/day (l/c/d) (Murwirapachena, 2021). These figures are much higher than the international benchmark of 173 l/c/d (DWS 2019a)[5]. Forecasts indicate that water demand will exceed supply by 10% by 2030 (DWS 2019a, DWS 2022). This will be driven by low water tariffs, inefficient use, inadequate cost recovery, leakages, inappropriate infrastructure choices (e.g. water-borne sanitation in a water-scarce country), and increased demand in the municipal, industrial, and agricultural sectors (Donnenfeld et al. 2018). The growth in demand by the municipal sector is expected to be the greatest, which is partly driven by urbanisation, but also by increased industrial production, commercial activity, and population growth.

A model of the future water balance for South Africa indicates that if planned additional water supply is added, and realistic water efficiency[6] is achieved, the gap between supply and demand by 2030 can be narrowed substantially (**Figure 4**; DWS 2019a). Implementation of adaptation projects that promote water conservation and water demand management would aid in narrowing the supply-demand gap.

The national Economic Reconstruction and Recovery Plan highlights the retrofitting of public and private buildings with technologies to improve water efficiency as a major part of South Africa's green agenda. The implementation of the programme to public buildings has the potential to build a labour intensive local industry (Presidency 2020).



	2022	2050
International obligations	1	1
Afforestation	3	2
Strategic / Power generation	2	2
Mining and bulk industrial	6	6
Municipal (industries, commerce, urban and rural domestic)	30	36
Agriculture (irrigation and livestock watering)	58	53

Figure 3. Water use per sector as at 2022 and projected for 2050 (based on data from DWS 2022).

[5] These figures are based on the system input volume divided by the population served. The system input volume includes commercial and industrial demand, and water losses through infrastructure leaks.

[6] The water demand management target aims to reduce the per capita water consumption by 26% from 2018 to 2030 to match the international benchmark. During the 2016-2018 drought in the City of Cape Town, a far greater (~50%) per capita reduction in water consumption was achieved over a period of four years, which suggests that this target is very much achievable.

While total demand is projected to increase despite increased efficiency, and planned augmentation schemes can narrow the supply gap, it is important to note that the augmentation sources will need to be diversified. Water resource development projects underway and planned that could augment water supply in Mpumalanga are highlighted in **Table 2**.

It is notable that the augmentation for the Vaal River from 2031 onwards is expected to come from the use of acid mine drainaged and that the Olifants and Crocodile West River Systems will be augmented with re-used effluent. DWS plans to undertake the prefeasibility studies accordingly in an incremental manner. These studies entail the appraisal of projects to ascertain the viability by analysing (i) the engineering and related aspects such as dam type and size, and location, (ii) costing and infrastructure components, (iii) economic evaluation and assessment of the cost effectiveness of the project, (iv) environmental and social impact assessments and (v) the legal and institutional funding arrangements.

Figure 4: National water balance projections by 2030 with and without critical interventions (DWS 2019a)

Table 2. Water resource development projects planned by DWS between 2020 to 2050 that could augment supply in Mpumalanga (DWS 2022)

Water Resource System	Current Prioritised Water Resource Development Option and Estimated Date of Water Delivery		
	2020 – 2030	2031 – 2040	2041 – 2050
Integrated Vaal River System	Phase 2 of the Lesotho Highlands Water Project by 2025 **(R32.6 billion)**	Use of acid mine drainage	Thukela Water Project (Jana and Millietuin Dams)
Olifants River System	Olifants Water Resource Development Project (ORWRDP) Phases 2B **(R6.6 billion)**, 2D **(R1.8 billion)** , 2E **(R0.5 billion)** & 2F **(R2.3 billion)** Exploitation of the Malmani Dolomitic Groundwater Aquifer	Re-use of effluent	Olifants Dam (Possibly Rooipoort Dam)

The latest 2022 Green Drop report reveals that all of the WWTWs in South Africa fail to treat wastewater properly. Of the 850 municipal WWTWs, 334 (39%) are in critical state, obtaining a Green Drop score of 30% or less. The average Green Drop score across all provinces was 50%. This is an 11% decline from the average score of 61% achieved in 2013. It was noted that a significant portion of wastewater spills into the environment before getting to the treatment works.The resulting raw water pollution from untreated wastewater and poorly managed WWTWs presents a significant environmental challenge, as well as a health and socio-economic risk to vulnerable communities that access water directly from rivers.

Additionally, poor surface raw water quality increases treatment costs for potable uses as well as downstream industrial uses, and has a negative impact on agricultural yields.

2.1.3. Water resources and services pricing

The National Water Act (No. 36 of 1998), the Water Services Act (No. 108 of 1997) and the National Pricing Strategy for Raw Water Charges of 2007 set a finance system in place for water resources and services management. This funding scheme allows for the inclusion of seven elements (**Figure 5**): (1) a water resource management charge, (2) a raw water tariff, (3) a bulk water tariff, (4) a retail water tariff, (5) a sanitation charge, (6) a bulk wastewater tariff and (7) a water discharge tariff.

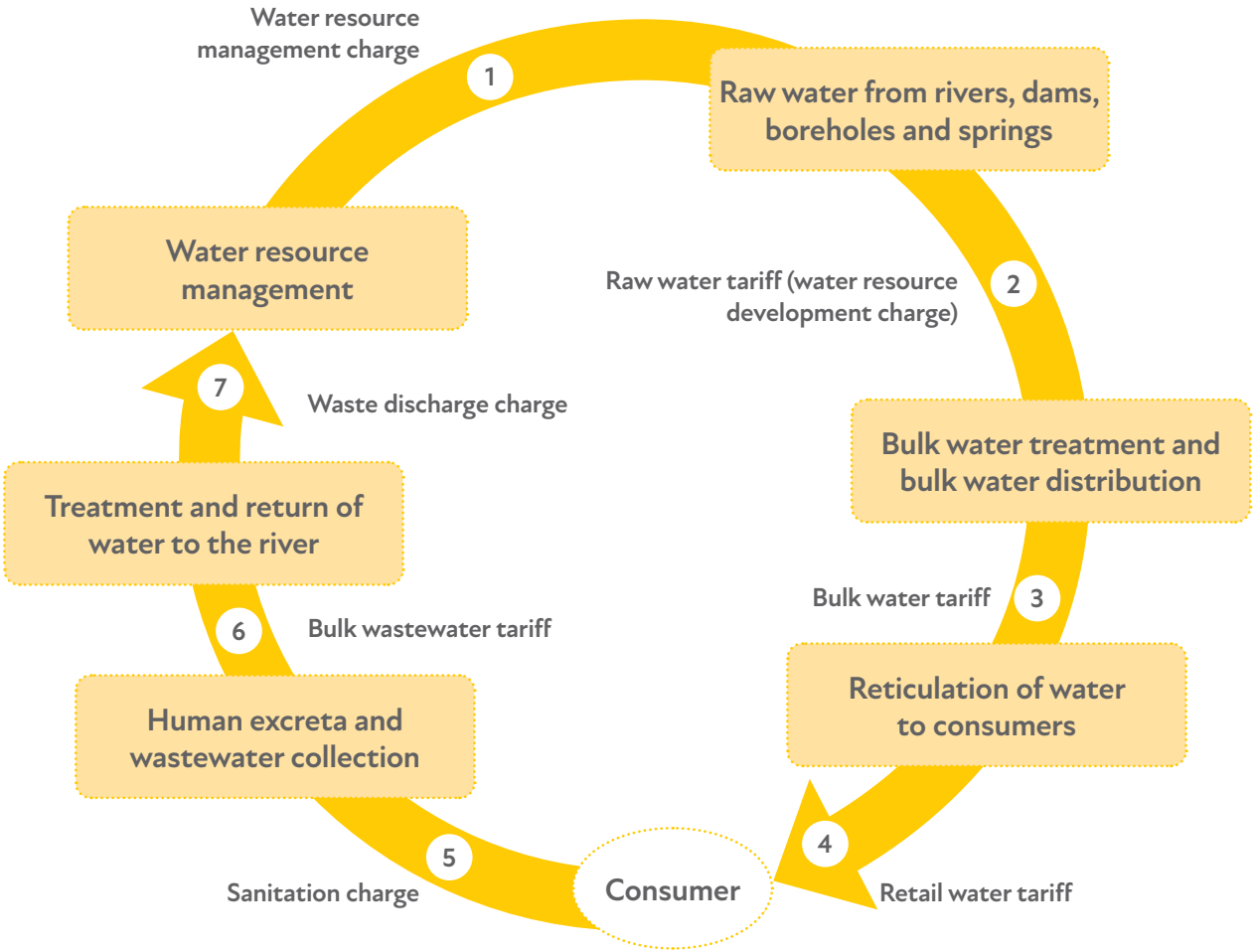


Figure 5. Water resources and tariff scheme in South Afrca (adapted from OECD 2021)

Table 3 details the institutions responsible for setting, regulating, collecting and cashing each type of charge included in the overall water price.

Table 3. Responsible instituitions for setting, regulating, collecting and cashing in water charges (DWS 2007, OECD 2021)

Type of charge	Set by	Regulated by	Collected by	Cashed in by
1. Water resource management charge	CMA or DWS (when no CMA is established)	DWS	CMA or WTE	CMA or DWS
2. Water resource development charge	DWS	DWS	WTE	DWS
3. Bulk water tariff	Water Boards or WSA (when no Water Board established)	DWS or WSA (when no Water Board is established)	WSA	Water Boards or WSA
4. Retail water tariff	WSA	WSA	WSA	WSA
5. Sanitation charge	WSA	WSA	WSA	WSA
6. Bulk wastewater tariff	Water Boards or WSA (when no Water Board is established)	DWS or WSA (when no Water Board is established)	WSA	Water Boards or WSA
7. Waste discharge charge	CMA or DWS (when no CMA established)	DWS	CMA or WTE	CMA or DWS

The financing of water and sanitation provision is done through tariffs paid by the different groups of users, and subsidies stemming from national and local budgets (including grants). Subsidies are used to finance both capital and operational expenditures. The Water Services Act (No. 108 of 1997) stipulates that water economics flux[7] should be ring-fenced i.e. meaning that all water tariff income is to be user for water related costs only. A visual representation of the water services financial framework of South Africa is presented in **Figure 6**. Detailed water tariffs for the major metros can be viewed in the **2022 GreenCape Water Market Intelligence Report**. From the above it can be seen that, in the case of Mpumalanga, which has one CMA and 17 WSAs, the bulk of the income for municipalities will be in the form of service charges (~42%), which is a combination of water and electricity sales, sewarge and sanitation and refuse removal charges. It is important to note that revenue collection by municipalities remains a challenge as consumers do not pay their bills timely.

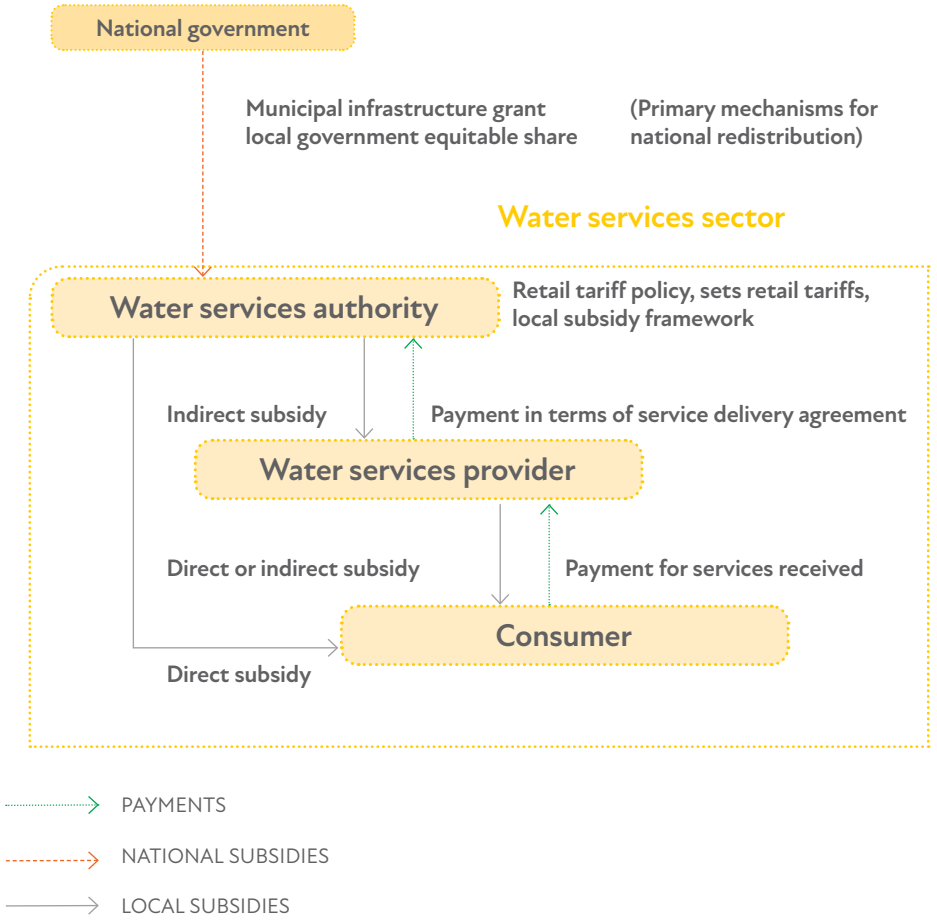


Figure 6. Water services financial framwork of South Africa (Eberhard 1999, OECD 2021)

[7] Water economic flux rerfers to the flow of money throughout the water value chain.

2.1.4. Public water sector funding

It is estimated that ~R90 billion per year of investment is needed in water and sanitation infrastructure over the next 10 years (DWS 2017a; DWS 2019a) in order to ensure reliable water supply and wastewater treatment.

This includes refurbishing and upgrading existing infrastructure, and new infrastructure to support population and economic growth. Budgeted funding of R45.1 billion in 2021/2022 falls well short of what is required, but estimated medium-term budgets indicate that the national government has plans in place to reduce the shortfall (Table 4).

It is evident from the above that there will still be a considerable shortfall and the expectation is that this shortfall will be filled by channelling infrastructure investment or loan financing to the public sector. Without investment in the public sector infrastructure will remain poor, emphasising that the opportunities highlighted in Chapter 3 will remain relevant particularly in the short term.

Table 4. Required, budgeted, and projected public sector funding for water & sanitation services & infrastructure (R bn) (National Treasury 2022)

Funding Need	Revised Estimate 2021/2022 (R bn)	Medium term estimates 2022/2023 (R bn)	Medium term estimates 2023/2024 (R bn)	Medium term estimates 2024/2025 (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%

2.2.

Mpumalanga provincial context

Mpumalanga lies in 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 – 748mm in the Lowveld area and 748 – 971mm in the Highveld area.

This high rainfall region in the center of the province is indicated by the hatched area entitled "**Strategic Water Source Areas**" in Figure 7. Although prospecting and mining rights coincide with less than 1% of the national water resource areas, there is a considerable overlap of 70% of the mining activities in Mpumalanga water source areas. Annual evaporation generally increases from east to west across the province from 1 800 to 2 200 mm per annum (Simpson et al. 2019).

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 portion 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.

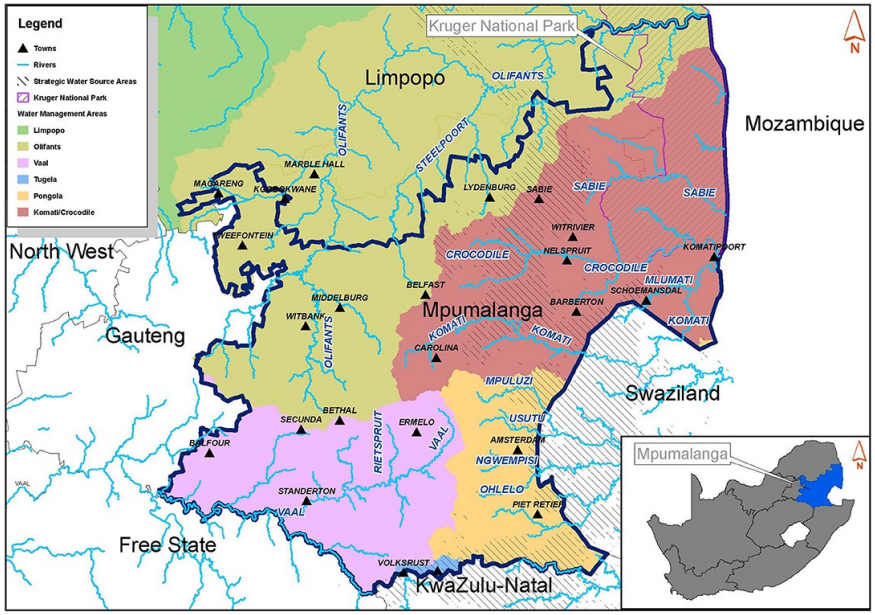


Figure 7. Map of water management areas, main rivers and major towns within the Mpumalanga Province (Simpson et al. 2019)

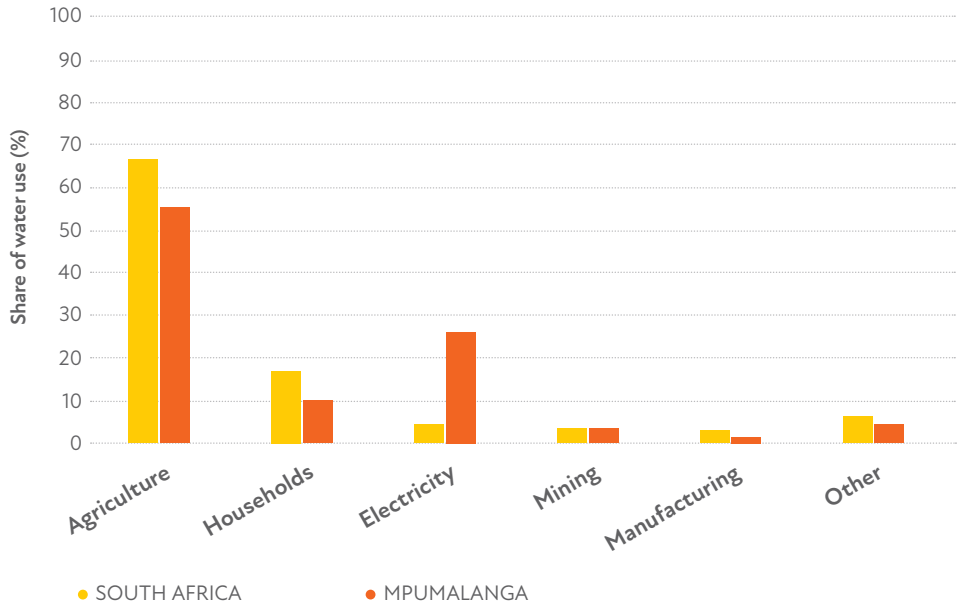


Figure 8. Water demand in Mpumalanga compared to the national water demand per sector (DEDT, 2019)

The Mpumalanga Province is the second smallest province in South Africa but contains almost half of the country's high potential arable land. Mpumalanga is home to vast coalfields, which plays a major role in national power generation but also garners significant revenues 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 coal-based energy economy is centred in Mpumalanga.

2.2.1. Water demand

In 2017, the total water use in the province was estimated to be 5 580 Megalitres per day (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 8**.

Table 5 presents the current water resource balance within the province (Balzer 2020). The majority of the supply systems within the province is under pressure, with groundwater being considered as a future water source along with the treatment of acid mine drainage (AMD).

Table 5. Mpumalanga water resource systems balance (Balzer 2020).

Water supply system	Major water users	System water balance	Major dams in the system	Future water sources*
Upper Usuthu	Chief Albert Luthuli LM; Eskom; Irrigation; Gauteng; Mkhondo	Stressed	Heyshope, Morgenstoond, Westoe, Jericho	Groundwater
Upper Olifants	Eskom, Irrigation	Stressed (water quality issues)	Witbank, Loskop	Treatment of mine affected water
Upper Vaal	Standerton, Eskom, Sasol, Secunda	Balanced	Grootdraai	–
Upper Inkomati	Chief Albert Luthuli LM, Mining, Irrigation, Eskom	Balanced	Lomati dam, Boesmanspruit, Nooightgerdact, Vygeboom	–
Lower Inkomati	Nkomazi LM, Transboudary Flow, Irrigation	Stressed	Driekoppies dam and various smaller dams	Groundwater
Crocodile	Mbombela LM, irrigation	Stressed	Kwena and various farm dams	Crocodile East Water Project (dam development)
Sabie	Bushbuckridge	Balanced	Inyaka, Mwarite and various small dams	Groundwater

LM = Local Municipality

*Table 2 provides a detailed list of future projects to augment water sources

Future water demand in Mpumalanga is expected to increase. Acute water deficits have been observed in areas where dams have dried, such as the Dr. JS Moroka local municipality The current deficit is estimated at approximately 20 Ml/d (demand is estimated at 60 Ml/d against a capacity supply of 40 Ml/d). The same is observed in municiplaities of Thembisile Hani and eMalahleni 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 (60% of the water reticulation pipes are manufactured from asbestos);
- 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; and
- Escalations of water debts owed by municipalities (WSPs) to the amount of R2.3 billion to the WSA.

The provincial government is exploring options to augment water sources and to ensure that future demands will be met. These strategies and the likelihood of each is highlighted in **Table 6**.

Table 6. Potential sources and strategies, and the likelihood of each, for augmenting water sources to meet future demands (DEDT 2019)

Potential sources/strategies	Likelihood	Decsription
Development of surface water resources and transfer of water	**Somewhat likely** – Specifically in the Sabie river system and the Crocodile river system of Inkomati-Usuthu WMA.	Dam sites are and would be expensive to develop. Any impact on additional storage on South Africa's ability to meet international obligations would also have to be negotiated with neighbouring countries.
Groundwater development, management and artificial recharge	**Likely** –Specifically in the Olifants WMA.	Drilling of boreholes to access groundwater and the management thereof is an ongoing process. Artificial recharge (the process whereby surplus surface water is transferred underground to be stored in an aquifer for later abstraction and use), is growing in importance in South Africa.
Water re-use	**Likely** – specifically in the Olifants WMA and the Inkomati-Usuthu WMA.	This is becoming more acceptable and feasibile to meet the increase in water demand and supply shortages. Improved purification technologies and decreasing treatment costs increase the feasibility of water re-use. Improvements in membrane technologies and their affordability have made a significant contribution in recent years.
Alien invasive plant removal	**Likely** – specifically in the Olifants WMA and the Inkomati-Usuthu WMA.	Clearing alien invasive plants is a cost-effective strategy for water catchment management.
Desalination of seawater	**Highly unlikely**	High energy costs and not feasbile for non-coastal areas.
Management of acid mine drainage	**Likely** – specifically in the Vaal WMA and the Olifants WMA	While the pollution from AMD is a significant problem, the potential increase in water availability from treated AMD offers opportunities for making additional water available to supplement traditional water resources. The quantity of additional water that can safely and reliably be made available from this source has yet to be confirmed. Whether water sources are augemented by the management of AMD, the AMD must be managed and treated via the polluter-pays principle, especially where mines still have an identifiable owner.
Water harvesting	**Likely**	A water harvesting programme (i.e. rainwater) has a narrow but important focus on the provision of water shortage tanks for rural households and other instituitions such as clinics, schools and hospitals. While the collected water is intended for irrigation of food gardens to improve food sufficiency and for other productive water uses, this water will also be used for domestic purposes.
Next generation toilet technologies	**Likely**	The South African Sanitation Technology Demonstration Programme (SASTEP) is currently evailating demonstration-ready models, specifically in municipalities that have service delivery challenges. These net-generation toilet technologies are modular units with a hygenic interface and next generation treatment processes.
Imports of water intensive goods	**Unlikely**	The import of water-intesive goods such as agricultural crops from other countries where availability of water for irrigation is not a limiting factor. This opportunity brings with it socio-economic consequences such as associated loss of work opportunities in agriculture and downstream economic activities and implications for national food security.

2.2.2. Just Transition and water security

The Presidential Climate Commission highlighted the importance of water security and the management of water resources as an essential component of a Just Transition (Beukman and Reeler 2021). Water resilience is an essential component to building climate resilience and supporting a Just Transition. The Commission highlighted that investments in the water sector should focus on improvements of built infrastructure as well as the natural infrastructure (ecological infrastructure). Both of these are steadily deteriorating. Ecological infrastructure also provides critical reinforcement to these built systems (such as WWTWs) through services such as water provision, climate regulation, soil formation and disaster risk reduction. Water allocations also need to be carefully considered in the Just Transition.

Beukman and Reeler (2021) propose the following actions to support the Just Transition in the water sector:

- Water governance structures need to be strengthend to focus on effective policy implementation, participatory and inclusive processes and strengthened instituitions.
- 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.
- Capitilise on the labour potential involved in securing and strengthening ecological infrastructure to generate local jobs.
- Invest in strengthing and maintaining current built water infrastructure to cope with changing climate 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 the focus area for the Just Transition being Mpumalanga, recommendations such as the above, if implemented are expected to drive the adaptation to climate change and the broader downscaling of a coal-based economy to incorporate renewable energy sources in our energy supply mix.

2.3.

Relevant legislation

2.3.1. The National Water Act (No. 36 of 1998)

The National Water Act [No.36 of 1998] (NWA) provides the legal framework for the effective and sustainable management of water resources (including surface water and groundwater) by 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 NWA under Section 21 describes 11 different 'water use' activities, which include taking and storing water, reduction of stream flow, waste discharges and disposals, altering of watercourses, abstraction of underground water, recreation, and any controlled activities which detrimentally impact water resources. Section 26 regulates water use activities, design, construction, and operation of any waterworks, including the registration of respective personnel. This is particularly relevant to alternative water supply projects, including water reuse.

Generally, a water use must be licensed unless it is listed in Schedule I, is an Existing Lawful Use (ELU), is permissible under a General Authorisation (GA), or if the need for a Water Use Licence (WUL) is waived.

2.3.1.1. Categories of legal water use

The NWA classifies any lawful water use under four categories:

2.3.1.1.1. Schedule 1

Generally, applies to low volume (reasonable) water use with low impact activities, consistent with domestic use (non-commercial uses), recreational use, livestock watering, and for emergencies. This water use is permissible and does not require licensing or registration[8].

[8] Although in some cases the local municipality may require registration.

Residents may use groundwater on their properties for reasonable domestic use without a licence[9]. However, water use entitlement under Schedule 1 does not supersede and is subject to any limitation by any other law, ordinance, **by-law** (section 3.2), or regulation set by the responsible authority in that area, e.g. municipality and provincial government.

2.3.1.1.2. Existing Lawful Use

Legal water use obtained under the Water Act (No. 54 of 1956) two years prior to the commencement of NWA is considered as ELU and is subject to terms and registration under the NWA. However, such users must prove with relevant records that their water use existed before 1998, and this must be verified and validated by the DWS.

2.3.1.1.3. General authorisation

General Authorisations (GAs) replace the need for a licence in terms of Section 21 of the NWA as outlined in a Government Notice (GN) and is site specific. There is a GN for each water use activity which sets the limits and circumstances suitable for the issuance of a GA (NWA 1998)[10].

Businesses involved in water use activities that are neither registerable under Schedule 1 nor under ELU must register the use(s) under a GA or apply for a WUL. The free registration of a GA through DWS typically takes a few weeks.

2.3.1.1.4. Water use licence (WUL)

A WUL applies if the water use activities cannot be covered under Schedule 1, ELU, or GA in accordance to Section 21 of the NWA. A WUL application may take up to 300 working days. The government has committed to ensuring that for the following sectors, a WUL is issued within a shorter timeframe: 60 days for agriculture, 80 to 95 days for infrastructure projects from state-owned enterprises and municipalities, and 120 days for mining.

2.3.2. The National Building Regulations and Building Standards Act (No. 103 of 1977)

In terms of design and construction, water systems must be consistent with the National Building Regulations (NBRs) under the National Building Regulations and Building Standards Act (No. 103 of 1977), which governs all building and construction work in South Africa.

At present, the NBRs do not include provisions relating to water efficiency or alternative water supply; however, a few years ago the Department of Trade, Industry and Competition (DTIC) initiated the process to include these aspects. It is unclear how long this process will take.

2.3.3. National Environmental Management: Waste Act (No. 59 of 2008)

The national norms and standards under the Act prohibit the landfill disposal of:

- Liquid waste with a moisture content >40%, angle of repose <5°, becomes free flowing when transported or at ≤60 °C (banned since 2019);
- Brine or waste with a high salt content (>5%) and a leachable concentration for total dissolved solids of >100 000 mg/l (ban effective from 2021).

2.3.4. Other key national legislation and standards

Other key national laws and regulations that may be relevant to projects in the water sector are listed in **Table 7**.

[9] Municipalities may still require registration of boreholes or well points — see Section 3.2.3.

[10] For the list of site specific GAs, see https://cer.org.za/virtual-library/legislation/national/water/national-water-act-1998

Table 7. Other key national legislation and standards relevant to projects in the water sector

Authority	Document	Application
Department of Water and Sanitation	Water Services Act (108 of 1997)	Relevant to the regulation of water and sanitation services provided by municipalities and water service authorities.
	Guidelines for the utilisation and disposal of wastewater sludge (2008)	These guidelines include a number of options for managing sludge. They are published to assist municipalities with proper management and safe disposal options, from composting and thermal treatment to the manufacturing of bricks. Methodologies to reduce or remove the inherent pathogens present in the sludge are also included in the guidelines.
	National Water and Sanitation Masterplan (2019)	While not an act or legislation, it is an important guiding document to inform the development of the water sector according to national priorities.
	Municipal Priority Action Plan (MPAP) Mpumalanga (2020)	Aims to identify and resolve key vulnerabilities at municipalities to enable them meeting the National Medium Term Strategic Framework (MTSF) target of 90% reliable water services.
Department of Forestry, Fisheries and the Environment (DFFE)	National Environmental Management Act (107 of 1998)	Relevant to environmental authorisations.
	National Environmental Management: Air Quality Act (39 of 2004)	Of relevance to the thermal treatment of sludge.
	National Environmental Management: Integrated Coastal Management Act (24 of 2008)	Of relevance to the discharge of brine to the ocean.
	Norms and Standards for the Organic Waste Treatment (GN1984 of 2022)	These Norms and Standards set minimum requirements for a wide range of organic waste treatment activities processing more than 10 tonnes per day. This red tape reduction regulation subsequently replaces the need for undertaking a highly onerous, time consuming and costly Waste Management Licence process, which includes undertaking an associated Environmental Impact Assessment. One of these requirements is that applicable activities must register activities with the relevant provincial waste authorities. These Norms and Standards should be seen as a progressive step and reduce regulatory barriers for organic waste beneficiation.
Department of Trade, Industry and Competition (DTIC)	Industrial Policy Action Plan (IPAP) 2018/19 — 2020/21	Highlights water and sanitation as a key sectoral focus area.
South African Bureau of Standards (SABS)	South African National Standard for Drinking Water (SANS 241: 2015)	Specifies the general safety and performance requirements for potable water.
	South African National Standards (SANS 30500: 2019) for non-sewered sanitation systems (NSSS)	Specifies the general safety and performance requirements for design and testing as well as sustainability considerations for NSSS.

Authority	Document	Application
National Treasury	Preferential Procurement Policy Framework Act (No. 5 of 2000)	Makes provision for the DTIC to designate certain areas for local production and content. Local content designation is assessed according to the SABS through the technical specification number SATS 1286:2011 and SANS 1286:2017.
	Municipal Finance Management Act (No. 56 of 2003)	The Municipal Finance Management Act [No. 56 of 2003] (MFMA) aims to modernise budget, accounting and financial management practices by placing local government finances on a sustainable footing in order to maximise the capacity of municipalities to deliver services to communities. It also aims to put in place a sound financial governance framework by clarifying and separating the roles and responsibilities of the council, mayor and officials.
	Local Government : Municipal Systems Act (No. 32 of 2000)	Provides for the core principles, mechanisms and processes that are necessary to enable municipalities to move progressively towards the social and economic uplift of local communities, and ensure universal access to essential services that are affordable to all.
Department of Agriculture, Land Reform and Rural Development	Fertilisers, Farm Feeds, Seeds and Remedies Act (No. 36 of 1947)	Makes provision for registration and regulates the importation of composts, fertilisers, farm feeds, sterilising plants, and certain remedies.

Further information can be obtained from the responsible authorities indicated.

Recent key policy and legislative developments relevant to the Mpumalanga Province water landscape include (DWS Annual Report, 2020):

1. **Mine Water Management:** This policy seeks to balance the mining sector's economic development with the protection and sustainable use of water resources. This policy will provide a coherent and integrated South African approach by building on existing strengths; addressing barriers and seizing identified mine water management opportunities including AMD.

2. **Integrated Water Quality Management:** This policy seeks to develop an intergovernmental water quality management approach to facilitate a coherent and integrated response to address water quality challenges. This policy will strengthen the existing integrated water quality management strategy that identified priority programmes the water and sanitation value chain.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3.

EMERGING OPPORTUNITIES, DRIVERS AND BARRIERS


WIZIT
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취급시 주의사항
검정기관
고양시
유효기간
19년 04월
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S/N:092311009583 (yymm) 1904/2009
yesco
1544-3131
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This section highlights business and investment opportunities, together with associated drivers and barriers. In the municipal water market in Mpumalanga, key opportunities relate to (1) upgrades for public wastewater treatment bulk infrastructure and (2) beneficiation or alternative disposal of wastewater sludges, while the private sector opportunity relates to packaged plants for wastewater treatment.

This presents an investment and business opportunity for technology and service providers. Municipalities can invest in these technologies and/or services independently and/or through funding from financiers. The main opportunities are listed in **Table 8** and indicate the key market segments to which they apply.

Biorock installed a waste water treatment plant for SAPPI in Barberton ©Biorock

Table 8. Summary of market opportunities in the Mpumalanga water sector

Market	Market Size Indicators	Main Opportunities	Key Market Segments
Municipal	R957 million in investment required according to the Green Drop VROOM* Index to restore the WWTWs in the province to a functional state.	Various market opportunities related to the WWTWs including operations and maintenance, contracting and equipment supply.	Focussed on municipalities having the highest efficiencies in terms of capital spending, asset renewal and spending on repairs and maintenance.
	Landfilling of wastewater sludge costs municipalities in the Mpumalanga province an estimated R30 million per annum.	Wastewater sludge beneficiation[11] including handling, transpotation and off-take agreements.	
Private sector	The cost of individual faciliaties would be specific to the commercial and industrial development, but the current projected economic growth rate of Mpumalanga is 0.4% per annum between 2019 and 2024.	The installation of package plants to treat wastewater instead of diverting the wastewater to the already constrained treatment works and areas lacking wastewater infrastructure.	Commercial and industrial businesses as well as (new) private residential developments.

*VROOM – Very Rough Order or Magntitude. This is a estimation of the investment required to upgrade the current treatment works to a functional state.

[11] Processing of wastewater sludge into value-added products, resource recovery opportunity for example biogass production, fertilisers or soil conditioners and/or biochar, etc

3.1.

Municipal Market

3.1.1. Market overview

Globally, utilities dominate the water and sanitation market which was sized at US$580 billion (67%) in 2016 followed by the industrial sector at 15% or US$130 billion (TIPS 2018). Table 4 shows that the total planned public sector funding for water and sanitation in South Africa is ~R44 billion. This represents a considerable opportunity for investors and technology providers to supply services and technologies to the municipal market. In addition to the R44 billion set out above, a further ~R45 billion is required by DWS in terms of capital requirements for infrastructure projects. This funding shortfall represents an opportunity for investors to provide innovative project financing. There are however some barriers that need to be adressed for innovative financing programmes to commence.

The Mpumalanga Province has three district municipalities and 17 local municipalities. All 17 local municipalities have been given the status of WSA. Only four municipalities (24%) were able to submit credible financial statements for auditing for the 2020/2021 MFMA audit. Municipalities continued to rely on the audit process (reported in the MFMA 2020/2021) to identify misstatements, as can be seen from those that received an unqualified audit opinion only after correcting misstatements identified during their audit. These seven municipalities are: Thaba Chweu local municipality, Chief Albert Luthuli local municipality, Bushbuckridge local municipality, Thembisile Hani local municipality, Mkhondo local municipality, Mbombela local municipality, Nkomazi local municipality. Steve Tshwete LM received an unqualified audit without findings (see Table 9 for details.)

The Department of Water and Sanitation launched a HydroNET Water Control Room pilot in Mbombela, Mpumalanga on 4 May 2022. The HydroNET is a system which will be used by the country's WMAs to have access to weather and water information. This will ensure that the parties will make good decisions based on the weather and climate to sustainably manage South Africa's precious water resources. The Department of Water and Sanitation, in collaboration with the South African Weather Services, HydroLogic, eLEAF, the Dutch water authorities and the Inkomati-Usuthu Catchment Management Agency (IUCMA) launched this pilot to demonstrate the benefits of the HydroNET Water Control Room for South Africa (DWS, 2022).

3.1.2. Opportunities

Significant investments are needed into the restoration of existing infrastructure, as well as for providing additional capacity for both water resources infrastructure (for which national government is responsible) and the water services infrastructure (for which municipalities are responsible). The capacity of the municipal sector to support the financing of these investments is insufficient, as a result of low water tariffs, high levels of non-revenue water and low revenue collection (DPWI 2021).

Two main opportunities were identified for investment in the municipal market: **wastewater infrastructure** as well as beneficiating **wastewater treatment sludge**. These are also two key opportunities identified in the DWS **Municipal Priority Action Plan (MPAP)** where WSAs such Msukaligwa, Lekwa, Govan Mbeki, Emalahleni, Steve Tshwete, Themibisile Hani, Thaba Chweu and City of Mbombela are identified as priority municipalities by the inter-ministerial task team to address key challenges such as project preparation, procurement and management (Balzer 2020).

[12] https://www.hydronet.co.za/

3.1.2.1. Public sector wastewater infrastructure

The publication of the 2022 Green Drop report highligted the state of the wastewater treatment works in the Mpumalanga province. None of the WWTWs received the Green Drop[13] rating with the majority of the WWTWs being categorised as non-compliant. Some of the key reasons for WWTWs being categorised as non compliant include failing infrastructure, lack of maintenance and lack of skilled operating personnel on site. Opportunities for investment are presented through infrastructure refurbishment, repair, replacement, maintenance and expansion, and the beneficial use of sludge, nutrients, biogas, and other energy resources.

The Mpumalanga province has 76 municipal-owned WWTWs. The province is also serviced by 14 WWTWs owned by the national Department of Public Works, resulting in 90 wastetreatment works being monitored by DWS. Twelve (12) of the 17 WSAs improved on their 2013 scores, whilst five of the 17 WSAs received lower Green Drop scores compared to 2013 baselines (**Figure 9**). Steve Tshwete is the best performing WSA in the province with three contenders for Green Drop certification, with one of the sites achieving a technical site score[14] of 90% (Komati). Nkomazi municipality achieved an excellent overall progress from 32% in 2013 to a municipal score of 75% in 2021, followed by 74% for Mbombela-Umjindi (and its WSP Silulumanzi, for selected systems).

Thirty-three WWTWs were identified to be in a critical state, compared to 41 in 2013. The WWTWs are managed by eight of the 17 municipalities. Considering the performance of the WSAs in the province, the overall Green Drop performance 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. 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.

[13] 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.

[14] Technical site score refers to Green Drop score for that specific treatment works and not the municipality as a whole.

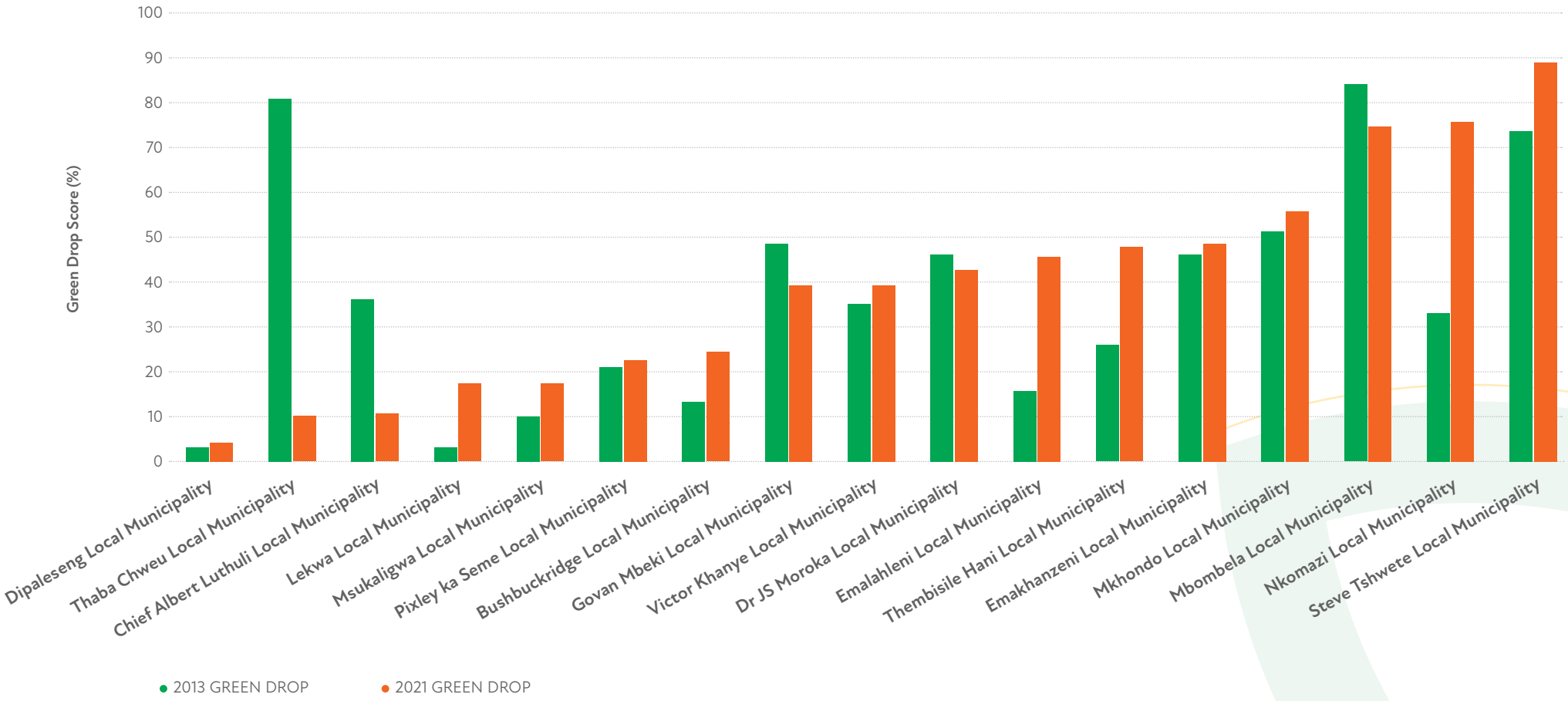

Figure 9. Municipal Green Drop scores for 2013 and 2022 (Green Drop 2022)

The Very Rough Order of Measurement (VROOM) model was incorporated in the 2022 Green Drop Reports. It 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. The VROOM estimations and key areas of investment for each municipality in Mpumalanga are presented in **Table 9**.

Table 9. VROOM cost estimation and key investment areas for wastewater works at municipalities in Mpumalanga (Green Drop 2022)

Municipality	Audit Findings	Green Drop Score (%)	VROOM Estimate (R'000)	Key Investment Areas
Dipaleseng Local Municipality	Disclaimer of opinion	4	R1 050	• Comissioning delays in the upgrading of the treatment works. • The sewage is not being treated currently.
Thaba Chweu Local Municipality	Unqualified – Emphasis of matter items	10	R107 280	**Lydenburg WWTW** • Plant not operational for more than a year. • All electrical and mechanical equipment dysfunctional. • All pump stations dysfunctional. • Vandalism. **Sabie WWTW** • Flood erosion requires urgent repair. • No chlorine gas tank. • Flow meters dysfunctional. • Sludge drying beds require refurbishment. • Disinfection dosing system ineffective.
Chief Albert Luthuli Local Municipality	Unqualified – Emphasis of matter items	11	R49 170	• Urgent action is required for the supply and refurbishment of mechanical equipment. • Equipment required: additional Return Activated Sludge (RAS) pump, aerators, Secondary Sedimentation Tanks (SSTs), chlorine dosing equipment, flowmeters and sludge drying beds.
Lekwa Local Municipality	Disclaimer of opinion	17	R11 155	• Flowmeters not operational. • Chlroination, drying beds, sludge recycle pumps and sewer pump stations dysfunctional.
Msukaligwa Local Municipality	Qualified	17	R50 065	• Grit classifier to be refurbished. • Aerators, recycle pumps 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.
Pixley ka Seme Local Municipality	Qualified	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 plant.

Municipality	Audit Findings	Green Drop Score (%)	VROOM Estimate (R'000)	Key Investment Areas
Bushbuckridge Local Municipality	Unqualified – Emphasis of matter items	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	39	R7 376	• Biofilter module not operational due to current refurbishment. • Faulty sludge pumps leads – 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	39	R112 704	• Flow meter to be installed. • Disinfection. • Chlorine contact channel. • Overflow balancing tank.
Dr JS Moroka Local Municipality	Disclaimer of opinion	42	R50 000	• Key equipement required: electrical cables, disinfection, clarification, aeration and recycle pumps.
Emalahleni Local Municipality	Qualified	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.
Thembisile Hani Local Municipality	Unqualified – Emphasis of matter items	47	R250	• Repair needed for automated screen. • Chlorine stock shortages.
Emakhanzeni Local Municipality	Adverse opinion	48	R6 930	• Mechanical screen to be refurbished. • Replacement of flowmeters. • Aerators to be replaced or refurbished. • SST rotating bridge not operational. • Reedbeds to be replanted or by-passed.

Municipality	Audit Findings	Green Drop Score (%)	VROOM Estimate (R'000)	Key Investment Areas
Mkhondo Local Municipality	Unqualified – Emphasis of matter items	55	R17 940	• PST briged and automated desludge valves to be refurbished. • Aerators not operational. • Recycle pumps not operational. • SSTs are blocked with sludge and weir baffle plate requires adjustment.
Mbombela Local Municipality	Unqualified – Emphasis of matter items	74	R351 268	• Screening and grit removal. • Activated Sludge Plant (ASP) module decommissioned. • Secondary clarification not effective. • Chlorination not effective.
Nkomazi Local Municipality	Unqualified – Emphasis of matter items	75	R23 157	• Restoring functionality of the flow metering, aeration, secondary clarification and process monitoring and operation.
Steve Tshwete Local Municipality	Unqualified – No findings	88	R112 704	• Gas chlorination system.
TOTAL			R957 659 300	

Disclaimer of opinion: The auditee provided insufficient evidence in the form of documentation on which to base an audit opinion. The lack of sufficient evidence is not confined to specific amounts, or represents a substantial portion of the information contained in the financial statements.
Adverse opinion: The financial statements contain material misstatements that are not confined to specific amounts, or the misstatements represent a substantial portion of the financial statements.
Qualified: The financial statements contain material misstatements in specific amounts, or there is insufficient evidence for us to conclude that specific amounts included in the financial statements are not materially misstated.
Unqualified – Emphasis of matter items: The financial statements contain no material misstatements. Unless we express a clean audit outcome, findings have been raised on either reporting on predetermined objectives or non-compliance with legislation, or both these aspects.
Unqualified – No findings: The financial statements are free from material misstatements (in other words, a financially unqualified audit opinion) and there are no material findings on reporting on performance objectives or non-compliance with legislation.
https://www.agsa.co.za/AuditInformation/AuditTerminology.aspx

3.1.2.2. Sludge beneficiation

An associated opportunity that could potentially arise when a WWTW is upgraded and fully functional is **sludge beneficiation**, discussed in more detail below.

The costs associated with managing wastewater sludge can represent 40% to 60% of total WWTWs' operating costs, depending on the size of the plant and initial wastewater characteristics. Despite the potential for energy recovery (e.g. via biogas generation) and resource recovery from wastewater sludge, the residual sludge (digestate) still requires disposal.

The opportunity to utilise biogas to offset the energy requirements of the WWTWs requires the implementation of combined heat and power (CHP) technology, and in many cases requires refurbishment of the existing anaerobic digesters and/or the dewatering section of the process. This is an opportunity that could potentially arise when WWTWs are upgraded and fully operational leading to consistence quality of **sludge for further beneficiation**. Municipalities have an opportunity to invest in sludge beneficiation technologies and/or services. This opportunity is further supported by the need to achieve energy security and sustainable agriculture (organic fertiliser)[15].

In terms of sludge compliance status, there are no active sludge reuse projects in place. The 2022 Green Drop Report also indicated that:

- 17 of the 76 plants (22%) classify their biosolids according to the WRC Sludge Guidelines – these plants are in Govan Mbeki, Steve Tshwete and Mbombela-Umjindi municipalities.
- 1 of the 76 plants (1.3%) monitors sludge streams – Kingstonvale in Mbombela only.
- 3 of 76 plants (4%) have Sludge Management Plans in place – Mkhondo (in part) and Kingstonvale In Mbombela.
- 19 of 76 plants (25%) dispose of their sludge via agricultural purposes and landfill.

The various treatment technologies used on the WWTWs are presented in **Figure 10**.

[15] https://www.greencape.co.za/content/industry-brief-sludge-beneficiation/

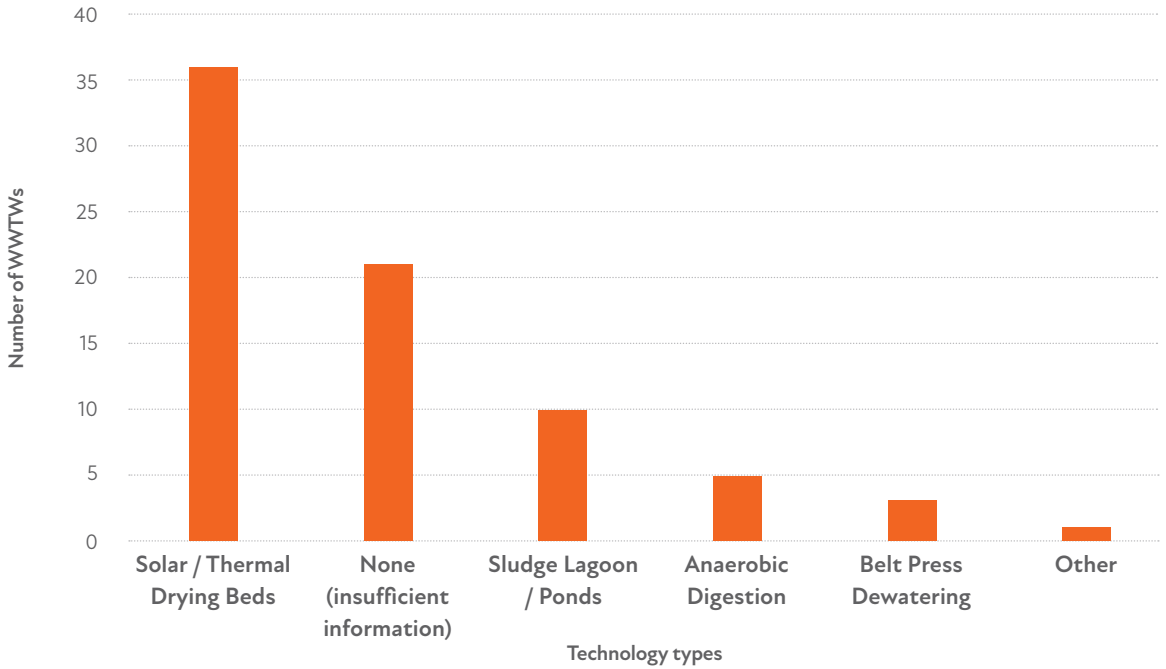

Figure 10. Treatment technologies used for sludge handling at the WWTWs in Mpumalanga (Green Drop 2022)

Total estimated daily sludge production of all the WWTWs combined in the province is 91 ton/day. This translates to R30 million per annum should all of the sludge be disposed of via landfill considering that the nearest hazardous landfill is the City of Tshwane. There are business and investment opportunities relating to sludge management in the form of supplying technologies, sludge management services and funding municipal projects for sludge disposal.

Beneficiation of sludge into value added products such as bricks, bio-energy (biogas), and organic fertiliser etc., supports sustainable development. 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 potential for private off-take agreements.

3.1.3. Drivers

There are several drivers of the investment opportunities in wastewater infrastructure and associated sludge handling. These general drivers are discussed first, followed by specific drivers related to the individual opportunities.

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 effective treatment critical. DWS took over the WSA of some municipalities nationally, as enabled by Section 63(2) of the Water Services Act of 1997, to assume responsibilities for a specific duration and fix wastewater challenges.

COGTA has intervened to assist with the issues of sewer spillage in various municipalities (namely Lekwa, Govan Mbeki and Thaba Chweu municipalities) and they will be assisting municipalities in terms of project preparation, master planning, asset care, revenue enhancement and spatial restructuring.

Mobilising private sector funding

The Public-Private Growth Initiative (PPGI)[16] is providing further support through the District Development Model (DDM) approach in mobilising private sector funding. Public-Private Partnerships (PPPs) are often viewed as funding avenues to contribute towards investment in infrastructureand more efficient service delivery.

The Mbombela Public Private Partnership Water Concession[17] is one of only two long-term water concessions that have been implemented to combine major capital investment with operations and maintenance and retail water service management. USAID's WASH-FIN published an in-depth brief discussing the key learnings from the Concession. The brief can be viewed here.

The Mbombela Concession is set to expire in 2029, and the City of Mbombela has begun investigating options for water service provision in the future. It is unlikely that a similar concession model will be considered an attractive option; so the City is encouraged to explore a wide range of delivery options, including newer private sector participation models such as performance-based contracting, an incentivised form of service contract.

Implementation of key development plans

Provincially, key development plans are being implemented, including the following: (1) Mpumalanga Vision 2030 Strategic Implementation Framework, (2) Mpumalanga Economic Growth and Development Path, and (3) Mpumalanga Spatial Development Framework, all highlighting key priority infrastructure projects. At national level the commitment to infrastructure projects was demonstrated by the establishment of the National Water Resource Infrastructure Agency (NWRIA) in 2022.

Demand for good quality water and service delivery protests

Furthermore, there is an increased demand for good quality raw water for downstream users particulary rural residents and neighbouring countries. The need for access to good quality water, among others, has led to an increase in basic service delivery protests. According to StatsSA (2019), water and wastewater services related protest events countrywide increased from 528 in 2017 to 737 events in 2018. According to the South African Police Service, over 900 service delivery protests were recorded in the course of six months between August 2020 and January 2021. While many of these service delivery protests, demanding the adequate provision of water and wastewater services (among other demands), were the driving force for project prioritisation, some also gave rise to malicious damage to infrsatructure, placing significant strain on the already limited municipal budgets and infrastructure backlog. According to the 2021 World Economic Forum (WEF) Global Risk Report (GRR), water crises and social instability were ranked jointly as the third highest risk for conducting business in South Africa.

Additional revenue stream of sludge beneficiation

Other drivers for investment associated infrastructure projects is the untapped business opportunity and potential revenue stream for municipalities of sludge beneficiation, and the the availabity of local innovative solutions to sludge beneficiation that are ready for deployment.

3.1.4. Barriers

Although public sector water and wastewater projects have been prioritised by National Treasury, financing opportunities are increasing and smart cities make financial sense, there are also significant barriers, as set out below.

Lack of technical skills in municipalities

A lack of technical skills in municipalities to develop feasibility studies and bankable projects and to structure appropriate contracts reduces the potential to access funding. Investors and banks are looking for projects to fund, but cannot risk supporting a poorly investigated project. Municipal expenditure on repairs and maintenance is also lagging due to shortages in skills and capacity (NW&SMP, 2019).

[16] PPGI is a voluntary special purpose platform established to build co-operation and collaboration between the private sector and government towards the stimulation of inclusive growth. It enjoys participation and support from government, the private sector, and leaders in over 20 economic sectors.

[17] A "concession" is a particular type of PPP wherein the private party charges users for the service provided, usually through user fees tariffs, rather than receiving payment (fees) from the public partner.

Successful infrastructure projects can be realised with the existing municipal capacity by starting with small, manageable steps, such as tenders for installing monitoring devices and collecting data to develop an understanding of the status quo. Such an understanding is important for developing a baseline from which to determine the financial returns of projects.

Municipal finances

Nationally, municipalities together with water boards currently owe the DWS ~R9.8 billion. Municipalities alone owe Eskom and water boards more than R25.37 billion and R13.29 billion, respectively (AGSA, 2020/2021). Municipal-scale projects are capital intensive, and an inability to access funding can be a major constraint. According to the 2020/21 auditor general's report, irregular, fruitless, wasteful, and unauthorised expenditure totalled R34.58 billion across all municipalities nationally. Only a small number of municipalities have the capacity and financial standing to access private sector financing or enable infrastructure projects via PPPs. To attract investors, it is important for municipal authorities to have robust and audited financials; strong corporate governance and accountability; obtain a credit rating and seek financial advice on how to restructure their balance sheets.

Limited grant and municipal funding

In areas where the majority of residents are indigent and not able to pay for basic services, municipalities rely on the limited grant funding for new infrastructure, renewal, refurbishment and/or maintenance (potential driver). South Africa's 257 municipalities registered 3.5 million indigent households (~22%) in 2018, and 59% of households did not pay for their water and wastewater services (up from 50.8% in 2009) (StatsSA 2018). The proportion of residents needing indigent support is projected to increase due to the deteriorated state of the national economy associated with the COVID-19 pandemic and further constrains on the economy including a surge in inflation driven primarily by the war in Ukraine.

Lack of revenue collection

The lack of revenue collection leaves municipalities highly dependent on limited grant funding and may lead to their insolvency. As of 31 March 2021, all municipalities are owed an aggregated amount of R231 billion by consumers, with metropolitan municipalities being owed R115 billion (National Treasury, 2021). In 2019, metropolitan, district, and local municipalities had a working capital ratio of 1.27, 1.01 and 0.76, respectively (StatsSA 2019b).

This indicated that metropolitan municipalities are generally in a better position to settle short-term debt compared with district and local municipalities. The unreliability of revenue collection also binds municipalities to poor credit ratings and limits their ability to access loans which in the case of water related services, leaves them dependent on only their water services revenue and grant funding. Given the limited grant funding and own revenue, municipalities have to find innovative funding streams in order to accelerate the eradication of water and wastewater infrastructure renewal backlogs (~R332 billion nationally) and fulfil their development plans. There is a capital funding gap for all water and wastewater infrastructure of ~R33.3 billion per annum as shown in **Table 4** (NW&SMP, 2019).

Municipality procurement policy and processes

Municipal procurement processes can be lengthy, tenders are often poorly specified, and legislation MFMA is restrictive to unsolicited bids. Unsolicited bids are permitted, however the process is lengthy as it is considered a way to prevent corruption, fraud and municiaplities being sold the wrong technology.

Barriers to market entry for new technologies

Furthermore, the procurement processes make it difficult for municipalities to trial and invest in new (unproven) technologies. While the mitigation impact may be indirect, the funding of refurbishment or upgrade of a treatment plant can significantly reduce carbon emissions through improved energy efficiency by new equipment. Energy efficiency can reduce carbon emissions three fold in comparison to leaving wastewater untreated, and prevent the carbon release to the atmosphere through the stabilisation of sludge to capture biogas. However, more research and demonstration of water and wastewater treatment technologies that can reduce the carbon footprint of water and wastewater treatment works is required. This will open avenues for support from climate finance initiatives.

3.2.

Industrial market in Mpumalanga

3.2.1. Market overview

Coal mining within the province is mainly concentrated in the local municipalities of eMalahleni, Steve Tshwete and Govan Mbeki (Strambo, 2019). Mining companies often offer services that are normally provided by local governments to their employees, such as water and sanitation, as well as housing. Additionally, they frequently fund water and sanitation services as part of their corporate social investment. South Africa relies heavily on coal to generate ~92% of its electricity and to produce roughly 20% of its liquid fuels (Department of Energy 2015; Strambo 2019). This results in Eskom and the chemical firm Sasol using 85% of the coal in the local market, by volume. Coal is also one of South Africa's largest exports by value, accounting for R61 billion (Minerals Council 2018). In 2016, it was estimated that water use in coal mining totalled to 53.8 million cubic meters per annum, a large portion ending up as wastewater. The estimated water use in coal-power generation is ~3 184 L per MWh.

Decentralised treatment works are identified as the central investment opportunity within the Mpumalanga industrial water sector. A sub-set of this opportunity includes **wastewater management**.

3.2.2. Opportunities

3.2.2.1. Decentralised water treatment works

Decentralised water treatment technologies is a key area of development within the industrial water sector. Technology options that are easily deployable and that can be used to retrofit current treatment works are preferred to greenfield capital projects as this is considered to have a lower cost impact and is less onerous to implement.

As indicated, the industrial sector is mainly dominated by coal mining and power generation. It is estimated that a total of 431 L of water is used to produce one ton (volumetric) of coal (CER 2018). This includes water used for extraction, dust control and evaporation, but excludes water for coal washing. Water is also required to generate electricity, as indicated in **Table 9**. It is also highlighted in **Table 9** that the national power utility, Eskom, spends R280 million per annum on water treatment costs. These figures highlight the magntitude of opportunity within the industrial water sector in the Mpumalanga province.

Table 10. Water volumes, water costs and treatment costs for the 2017/2018 financial year at Eskom power stations located in the Mpumalanga Province (Eskom 2017)

Power Station	Generation Capacity (MW)	Water Volumes (Million m^3)	Water Cost (R million)	Water Cost (R/m^3)	Water Treatment Costs (R million)
Kriel	3 000	34.2	305	8.9	39
Kendal	4 116	5.7	72	12.6	38
Tutuka	3 654	34.2	205	6	86
Duvha	3 600	22	79	3.6	13
Matla	3 600	37.5	253	6.7	35
Arnot	2 352	25.5	134	5.3	40
Majuba	4 110	22.1	72	3.3	35
Kusile	4 800	2.055	40	19.5	2
Camden*	1 510	17.9	116	6.5	7
Grootvlei*	1 200	9	29	3.2	24
Komati*	940	15.1	101	6.7	19
Hendrina*	2 000	19 .5	122	6.2	17
TOTAL	–	–	–	–	280

*These power stations were selected to be repurposed but are currently still operational.

3.2.2.2. Non-sewered sanitation solutions

Alternative sanitation solutions were also identified as a sub-set of wastewater management. As indicated earlier, mines often take on the responsibilities of local governments to provide water and sanitation for local mining communities. However, in recent years these communities have grown to the extent that the wastewater treatment works are operating far beyond their capacity. Again, mines in particular, are not looking to invest in capital projects but rather to consider moving to alternative non-sewered sanitation solutions.

3.2.3. Drivers

The major driver to decentralised water treatment works are **supply risks** due to a risk of insufficient supply as well as deteriorating water quality. This is mainly due to the pressure placed on the Vaal River Catchment due to the Lesotho Highlands Project being delayed by 8 years. Additional drivers include:

High O&M costs for current treatment technologies: Current treatment works have high operations and maintenance costs and companies are always looking for measures to implement that could potentially reduce these costs and decrease the risk of theft and vandalism.

Environmetal, 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.

Improved reliability: Successful deployment of wastewater treatment plants has created a low-risk perception for companies considering these technologies. Additionally, technology providers are now offering to take responsibility for restoring the implemented technology should it malfunction, which further reduces the risk of implementation.

Key residential and commercial developments in the province

The province is also host to the planned Nkosi Smart City which will include over 3 000 residential housing units and apartments, RDP housing units, bonded housing units, urban farms, preschools, three primary and two secondary schools, a TVET college, an agricultural training centre, and a provincial hospital and clinic. The city will also be made up of a retail centre, fresh-produce market, entertainment venues and restaurants. Project developer Dovetail Properties said that on completion, the development will take the form of an 'agricity', with urban housing located among small-scale urban farming plots. The farming projects are expected to create employment opportunities for unemployed people in the area, with an estimated 15 000 jobs expected to be created. Power to the new city will be partially supplied by a solar farm and a biomass renewable energy plant. The city will not only be a central business district for the region, but also an agricultural hub of macadamias, citrus and cash crops, eventually totalling about 5 000 hectares. Given the already constrained wastewater treatment works in the province, this presents an opportunity for the province to showcase the use of decentralised wastewater treatment works and the application thereof. It is unclear whether this has been considered.

3.2.4. Barriers

Increased operational complexity: Advanced water projects often increase the operational complexity to beyond the operations and management (O&M) 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 for innovative procurement models that place the operational responsibilities on the technology and service providers.

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


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4.

FUNDING AND INCENTIVES

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Wastewater management (brine) is an emerging opportunity in the mining and power generation sectors in Mpumalanga.

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 project-level 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 R62.2 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[18].

Government funding and incentives database

An updated document focused on South African government funding and incentives is available to view and download online[19]. 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[20] 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[21] 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.

[18] https://www.green-cape.co.za/content/focusarea/green-finance-databases
[19] https://www.greencape.co.za/assets/Uploads/Government-Funding-and-Incentive-Booklet.pdf
[20] https://www.finfindeasy.co.za/
[21] https://alliedcrowds.com/

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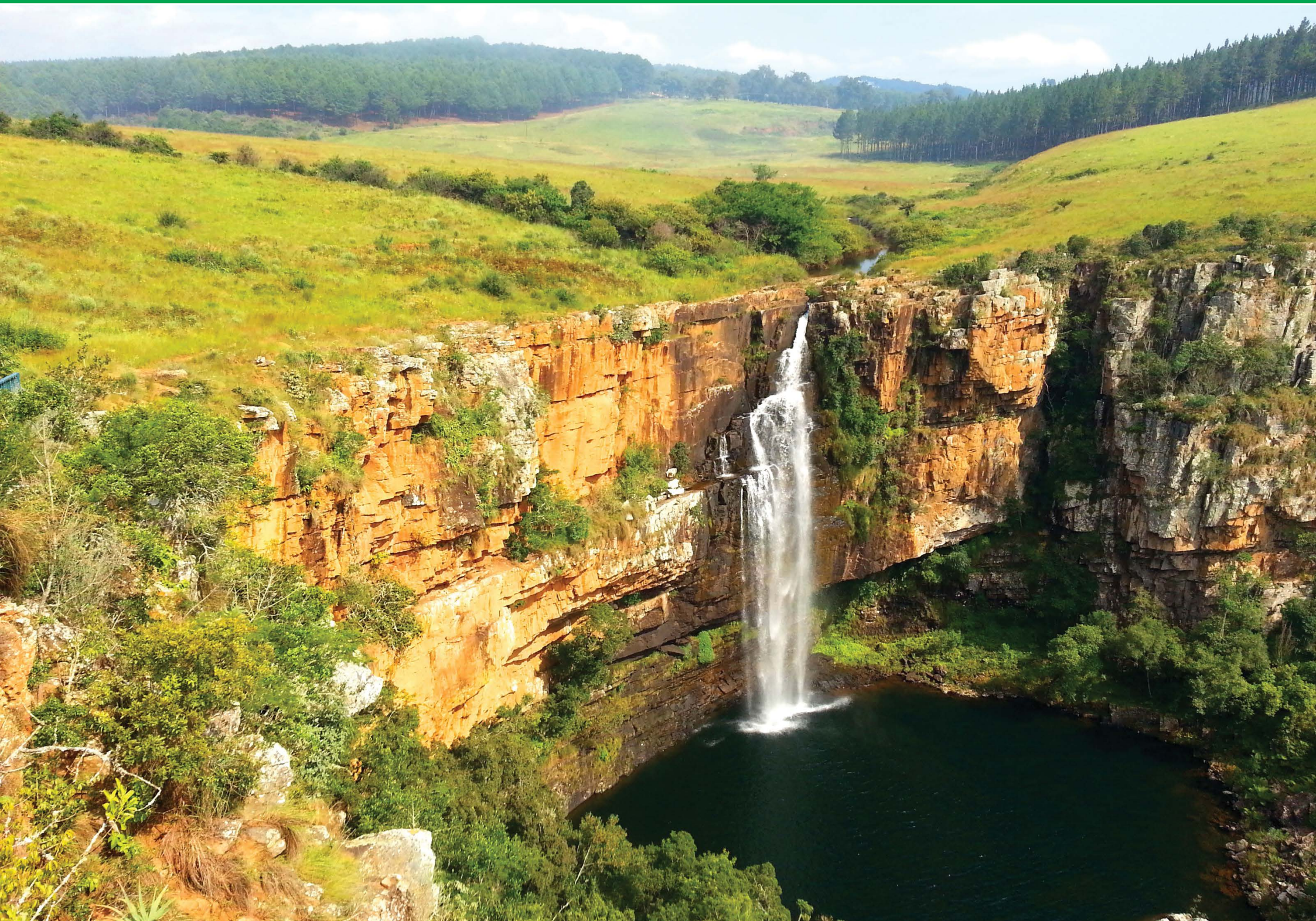

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