



South Africa **Yearbook** 2018/19

Water and Sanitation

The Department of Water and Sanitation's (DWS) legislative mandate seeks to ensure that the country's water resources are protected, managed, used, developed, conserved and controlled in a sustainable manner for the benefit of all people and the environment.

The DWS is mandated to develop a knowledge base and implement effective policies, procedures and integrated planning strategies both for water resources and services.

This entails adhering to the requirements of water-related policies and legislation, including constitutional requirements, that are critical in delivering on the right of access to sufficient food and water, transforming the economy and eradicating poverty.

Legislation

The Constitution of the Republic of South Africa, 1996 enshrines the basic human right to have access to sufficient water as well as a safe and healthy environment.

Government fulfils these rights through the DWS, assisted by specific legislation:

- The National Water Act, 1998 (Act 36 of 1998) ensures that South Africa's water resources are protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all people.
- The Water Services Act, 1997 (Act 108 of 1997), prescribes the legislative duty of municipalities as water-service authorities to provide water supply and sanitation according to national standards and norms. It also regulates water boards as important water service providers and gives the executive authority and responsibility to the Minister of Water and Sanitation to support and strengthen the capacity of municipalities to manage their own affairs, exercise their powers and perform their functions.
- The Water Services Act of 1997 places an obligation on the Minister to maintain a National Water Services Information System and to monitor the performance of all water services institutions.
- The Water Research Act, 1971 (Act 34 of 1971), provides for the promotion of water-related research through a Water Research Commission (WRC) and a Water Research Fund.

- The National Environmental Management Act (Nema), 1998 (Act 107 of 1998), makes provision for cooperative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state.
- The National Water Policy is underpinned by three fundamental principles for managing water resources: equity, (environmental) sustainability and efficiency.

Sanitation provision is governed by the Strategic Framework on Water Services (2003) and the Water Services Act of 1997.

All water users who do not receive their water from a service provider, local authority, water board, irrigation board, government water scheme or other bulk supplier, and who use water for irrigation, mining purposes, industrial use, feedlots or in terms of general authorisation, have a statutory obligation to register. This includes the use of surface and groundwater.

Other uses that must be registered include:

- diversion of rivers and streams
- discharge of waste or water containing waste
- storage, which includes any person or body storing water for any purpose from surface run-off, groundwater or fountain flow in excess of 10 000 m³ or where the water area at full supply level exceeds one hectare (ha) in total on land owned or occupied by that person or body, and who is not in possession of a permit or permission
- local authorities and other bulk suppliers with their own water sources and purification works
- controlled activities such as irrigating with waste, power generation with water, atmospheric modification or recharging of aquifers.

An assessment of the environmental requirements of the rivers and streams concerned is conducted before a licence can be issued.

To promote sustainable and equitable water resource management, the department has developed and continues to update a range of strategies for water management.

Chapter 4 of the National Development Plan (NDP) envisages a South Africa that recognises the importance of secure and

equitable access to water and sanitation as catalysts for socioeconomic development. In line with this vision, over the medium term, the DWS will focus on developing and investing in water infrastructure, improving planning in and regulation of the water sector, and monitoring and protecting South Africa's water resources.

Budget and funding

The department's budget allocation for the 2018/19 financial year was R15.5 billion. The Water Infrastructure Development programme is the largest spending area in the budget. Transfers and subsidies increase at an average annual rate of 4.8%, from R8.9 billion in 2018/19 to R10.3 billion in 2021/22. These transfers are mainly to water boards for the provision of regional bulk infrastructure, the Water Trading Entity, the regional bulk infrastructure grant and the water services infrastructure grant. Payments for capital assets comprise an estimated 12.2 billion of the department's total budget over the period ahead. However, these payments decrease at an average annual rate of 2.3%, from R4.5 billion in 2018/19 to R4.2 billion in 2021/22, due to a one-off allocation of R1.3 billion in 2018/19 for drought relief. Spending on compensation of employees accounts for R6 billion of the department's total budget, increasing at an average annual rate of 9.9%, from R1.6 billion in 2018/19 to R2.1 billion in 2021/22. This increase is due to the filling of critical positions such as engineers and programme managers in the Water Infrastructure Development programme.

Over the medium term, the DWS will continue to focus on water infrastructure, including raw water infrastructure, such as dams and canals, bulk infrastructure, such as water treatment works and water services infrastructure such as reservoirs and pipelines to households.

Developing and investing in water infrastructure

Appropriate infrastructure is essential to delivering key water-related services for socio-economic development. In recognising this, 81.1% (R42 billion) of the department's spending over the medium term is earmarked for water infrastructure. Investment in bulk and reticulation infrastructure for water and sanitation

is expected to lead to an increase in expenditure on transfers to municipalities at an average annual rate of 4.3%, from R5.7 billion in 2018/19 to R6.5 billion in 2021/22, in the Water Infrastructure Development programme.

Over the medium term, transfers to the Water Trading Entity are expected to fund short-term and long-term interventions in: the acid mine drainage project, which purifies mine water and uses it to augment the yield of the Vaal River system to ensure water security and environmental sustainability; the Olifants River water resources development project (phase 2D); the Mokolo and Crocodile River water augmentation project (phase 2A); the raising of Clanwilliam Dam; the Groot Letaba River water development project; the raising of Tzaneen Dam; the Mdloti River development project; and the raising of Hazelmere Dam. The entity will also subsidise the capital requirements, operations and maintenance of infrastructure for water resources. As a result, transfers to the entity are expected to increase at an average annual rate of 4%, from R2.1 billion in 2018/19 to R2.3 billion in 2021/22.

Raw water infrastructure

The DWS is responsible for the design, construction, commissioning and rehabilitation of raw water infrastructure, including dams and bulk distribution systems.

Three raw water projects are expected to be completed over the Medium Term Expenditure Framework (MTEF) period at an estimated total cost of R6.1 billion.

Spending in the subprogramme is still set to increase at an average annual rate of 10.5% from 2015/16 to 2018/19.

Regional Bulk Infrastructure Grant

Regional bulk infrastructure is defined as the infrastructure required to connect water on a macro or subregional scale, over vast distances, with internal bulk and reticulation systems or any bulk infrastructure that may have an impact on water resources in terms of quality and quantity. The DWS is responsible and accountable for the management of funding, which is administered by the National Treasury.

The grant provides for the development of new infrastructure, and the refurbishment, upgrading and replacement of ageing

infrastructure that services extensive areas across municipal boundaries.

Through this grant and the water services infrastructure grant, four mega, 34 large and 295 small regional bulk water and sanitation projects are expected to be completed over the MTEF period. An amount R6.6 billion over the period will be made available to local governments through the grant; and R11.8 billion to municipalities through the water services infrastructure grant. A further R11.9 billion over the medium term will be made available through these grants for payments for capital assets.

Water services infrastructure

To improve household access to water and sanitation, the DWS will provide funding and institutional support to municipalities and other implementing agents to complete 182 small water and wastewater services projects (project cost is less than R250 million) over the MTEF period.

The funding is provided through the water services infrastructure grant, which will receive R12.3 billion over the MTEF period.

The grant transfers funds to municipalities to provide for the construction of new and the rehabilitation of existing water and sanitation infrastructure. It also implements water services infrastructure schemes on behalf of municipalities and transfers infrastructure to water service institutions once construction is completed. The grant allocation prioritises the 27 poorest district municipalities.

These projects include the provision of water from tankers, boreholes, standpipes and pipelines, and the refurbishment of water treatment works.

Sanitation services

To ensure that the remaining sanitation buckets in formal areas are replaced with adequate sanitation services by the end of 2018/19, an amount of R1.4 billion has been set aside to deal with the outstanding internal reticulation and bulk infrastructure.

Of the 11 844 existing bucket sanitation backlog systems in formal settlements that were targeted to be replaced in 2018/19, 642 were replaced in the first half of the financial year. This slow achievement was due to bulk infrastructure not being available.

Integrated planning and regulatory oversight

To complement infrastructure delivery, the DWS develops and implements integrated planning strategies and effective policies and procedures, and maintains data management systems.

Over the medium term, the department plans to finalise and implement the water and sanitation master plan, which will serve as a roadmap for the integrated planning and implementation of water and sanitation projects across the water value chain. Activities related to the water and sanitation master plan are carried out in the Water Planning and Information Management programme, which is the fastest growing programme in the department, increasing at an average annual rate of 18.2%, from R663.6 million in 2018/19 to R1.1 billion in 2021/22.

Monitoring and protecting water resources

To ensure that water resources are allocated equitably for socioeconomic development, the department aims to finalise 80% of authorised water use licence applications within 300 days of receipt over the medium term. It also plans to assess 963 wastewater systems per year over the MTEF period, in line with the green drop regulatory standards; and 1 010 water supply systems in 2021/22, in line with blue drop regulatory standards. As a result, allocations to the Water Sector Regulation programme are expected to increase at an average annual rate of 14.4%, from R303 million in 2018/19 to R453.3 million in 2021/22.

Policies and strategies

National Water Resource Strategy (NWRS)

The NWRS-2 sets out the vision and strategic actions for effective water management. These included the security of water supply, environmental degradation, and pollution of resources.

The NWRS2 outlines the key challenges, constraints and opportunities in water resource management and proposes new approaches that ensure a collective and adequate response for the benefit of all people in South Africa.

The strategy also responds to the priorities set by government in the NDP and National Water Act of 1998 imperatives that support sustainable development.

It is centred on three key objectives:

- Water supports development and the elimination of poverty and inequality. The strategy recognises that the manner in which water was allocated in the past was unequal and favoured certain sections of the population. The intention, therefore, is to redress past imbalances in the manner in which water was allocated, ensuring that:
- Water contributes to the economy and job creation.
- Water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner.

The NWRS2 also focuses on water conservation and the management of water demand as key priorities.

Raw Water Pricing Strategy

There have been continued efforts to reform and realign the water value chain so that it can achieve government's objectives since 1994.

These include ensuring equitable access to water and sanitation, the sustainable use of water for social and economic benefit, and ensuring the sustainability of water resources and water-services delivery.

As part of this process, the DWS is looking at pricing, financing and economic regulation reforms in the water sector. This project will review the raw water pricing strategy, develop infrastructure funding models and recommend an appropriate model and institutional arrangements for an economic regulator for water.

It is generally agreed that pricing and economic regulation play a key role in the provisioning of infrastructure by assuring necessary investments to support socio-economic growth and ensuring that services are widely available and accessible and priced at levels that support current and future needs.

The project will contribute to the following:

- the revision of the Raw Water Pricing Strategy to ensure equitable and appropriate raw water tariffs that will enable sustainable operation and management of raw water infrastructure and will fund catchment management
- funding/financing models for water resources infrastructure
- the establishment of an economic regulator for the entire water value chain.

The project is strategic in nature and will enable the DWS to have sound water-pricing policies, cost-reflective tariffs for the entire water value chain in South Africa and a good funding framework for infrastructure. The project is divided into three work streams, each to be led by the DWS together with different institutions to provide support.

National Groundwater Strategy

Groundwater is a strategic resource in many parts of South Africa, especially in rural areas.

It also plays an important role in the supply of water to small towns and villages in the drier parts of the country.

There is considerable potential for additional development of groundwater resources to augment existing resources.

The need for improved groundwater management to ensure sustainable and efficient use of the resource was recognised in NWRS-1 and led to the formulation of a National Groundwater Strategy through which strategic actions were undertaken.

Reuse Strategy

The DWS has developed a water reuse strategy to encourage informed decisions relating to water reuse.

Reuse could be increased significantly with return flows in coastal cities, where it would otherwise drain into the sea.

In coastal cities, water reuse and desalination compete as two options for water conservation.

Reuse is becoming increasingly acceptable and feasible owing to increasing shortages, improved purification technology and decreasing treatment costs. Membrane technologies, also used for desalination of seawater, have become more affordable and have improved.

The reuse of treated wastewater would be managed to ensure public health safety.

Infrastructure upgrades and bilateral agreements

The DWS made good progress with the preparatory work of the Lesotho Highlands Water Project (LHWP), which was expected to begin in 2019.

The Polihali dam, the Polihali-Katse transfer tunnel and other infrastructural aspects of the LHWP Phase 2 should be

completed by 2024. Once Phase 2 has been completed, the amount of water supplied to South Africa through the LHWP will progressively increase from 780 million m³ to about 1.27 billion m³ a year over the following 20 years.

There is progress in the Mokolo and Crocodile River pipeline project, which will transfer water through a 46-km pipeline and pump station from the Mokolo Dam to the Lephale area. Phase 1 of the Mokolo and Crocodile River (West) Water Augmentation Project (MCWAP), which will transfer water through a 46-km pipeline and pump station from the Mokolo Dam to the Lephale area, is complete. A second pipeline will be constructed as Phase 2A of the MCWAP to transfer water from the Crocodile River (West) to the Lephale area.

The raising of the Hazelmere Dam wall will incorporate a Piano Key Weir, which is cutting-edge technology in dam-building. The additional water that will become available from this project is aimed at ensuring the supply of water and supporting the development of human settlements, King Shaka Airport and the Dube Trade Port. The construction of the dam wall is completed and the capacity of dam can be increased to 120% on impoundment of the previous dam level which shall be beneficial to water users. The overall completion %age is at 93%.

The DWS is proceeding with the planning of the Mzimvubu Water Project, which entails the development of a multipurpose dam (the Ntabelanga) to supply new irrigation development, and the Laleni Dam for hydropower generation. The department has initiated the raising of the Tzaneen Dam and construction of the new N'wamitwa Dam for the Groot Letaba River Water Development Project in Limpopo. The total estimated cost of the project is R4.2 billion.

Rainwater harvesting

The department is formulating the Rain Water Harvesting (RWH) Strategy as an adaptation to climate change. Climate change poses significant social, economic and environmental risks especially in developing countries. This then necessitates the implementation of high impact climate change response measures that will realise considerable mitigation, adaptation and broader socio-economic benefits. It is in this context

that DWS, in partnership with DEA, is developing a national rainwater harvesting strategy to provide a road-map for enhanced planning, development and scaled-up implementation of rainwater harvesting as a key component of South Africa's water resources and efforts to enhance climate resilience. The strategy will provide guidance for the implementation of a series of action programmes towards the mainstreaming of RWH in South Africa. This National RWH Strategy will also help serve as the guiding tool for district and local municipalities to effectively and economically put RWH into practice.

The DWS supports a national rainwater harvesting programme, which has a narrow but important focus on the construction of above and below-ground rainwater storage tanks by rural households for food gardens and other productive water uses.

Several municipalities now use roof rainwater tanks for domestic purposes. These have been found to be particularly effective when used in conjunction with other water supply options.

Though there are no hard figures yet on how many cubic millimetres per year rainwater harvesting can contribute, it is an option that can be implemented in a short timeframe.

Rainwater harvesting gives people who live in areas where reticulation has not as yet been implemented access to water. The programme targets rural communities through the installation of tanks and awareness campaigns.

A resource guideline has been developed to assist municipalities that are providing rainwater harvesting systems to communities as an interim service or to reduce demand on their water supply systems with best practices. In some areas Rainwater Harvesting Systems are provided as a drought relief but what the department wants to do with this programme is to advise municipalities to plan for alternative water sources or the "water mix" since municipalities seem to rely on surface water for water services and a lot of water schemes are failing because of dependency on a single source. It is the same source that is affected by issues of water allocation reform (not enough water for water services and other uses), climate change and droughts. The rainwater harvesting guideline is in the process of being advocated in the 2018/19 financial year.

Desalination strategy

The department has developed a supporting desalination strategy, which also includes desalination as a technology for treating water other than seawater for water reuse. Desalination of seawater could potentially provide an unlimited resource of fresh water. However, the rising cost of energy may be a deterrent.

As with other infrastructure projects with potential environmental impacts, the planning for a desalination plant will have to undergo an environmental impact assessment in compliance with the Nema of 1998.

The DWS will ensure that desalination is considered as an option for meeting future water requirements, in particular in coastal cities where there is sufficient electricity for desalination.

The target is not only to implement desalination in several locations in South Africa, but also to become an international knowledge centre in this particular field.

Role players Consolidated water boards

The primary activity of water boards is to provide water services (bulk potable and bulk wastewater) to other water services institutions within their respective service areas.

They may perform other activities under conditions set out in the Water Services Act of 1997. In certain situations, the Minister of Water Affairs may direct water boards to amend their business plans to meet all the requirements of the Water Services Act of 1997.

There are nine water boards that provide bulk potable water services to the municipalities in which they operate, and to other water service institutions and major customers within designated service areas. Water boards vary considerably in size, activities, customer mix, revenue base and capacity.

Most of the older and more established water boards, such as Rand Water, Umgeni Water and Magalies Water, operate in areas where there are significant urban development nodes, whereas other boards operate in more demographically diverse areas, with a combination of urban and rural customers. In addition to providing bulk treated water to municipalities, in some cases, the boards also provide retail water and sanitation services on behalf of municipalities.

The focus of the water boards over the medium term will continue to be on the extraction and purification of raw water into potable bulk water that will be supplied to their various clients, which include municipalities, industries and mines. To this extent, the nine water boards expect to provide 7.7 trillion litres of water over the period. The boards will also concentrate on the development of infrastructure, job creation and wastewater treatment services in their areas of jurisdiction.

In terms of extracting and purifying raw water into potable bulk water, Rand Water's bulk activities account for 67.4% (R37.3 billion) of the total spending, while Umgeni Water's bulk activities account for 8.7% (R4.8 billion). These water boards continue to be the largest in terms of the supply of volumes of water and overall expenditure. Expenditure on bulk activities is expected to increase at an average annual rate of 10.9%, from R14.9 billion in 2018/19 to R20.4 billion in 2021/22, mainly due to the increasing costs of energy to pump water and chemicals for purifying water, as well as labour costs and the price of raw water.

Over the medium term, the water boards are expected to derive R87.4 billion of their revenue from water sales. Total revenue is expected to increase at an average annual rate of 11%, from R24.1 billion in 2018/19 to R33 billion in 2021/22. Other non-tax revenue and interest, dividends, and rent on land account for the remaining revenue over the medium term.

Rand Water

The entity's core mandate is to abstract raw water, which is then treated, transported, stored and finally delivered as potable water to municipalities and to some mines and industries around Gauteng.

The entity's supply of water also extends to areas in Limpopo, North West, Mpumalanga and northern Free State, serving between 16 million and 19 million people. An estimated 98% of its water is abstracted from the Vaal River system.

The provision of bulk water is expected to account for R37.3 billion of the entity's total expenditure over the medium term. Expenditure relating to the provision of bulk water is largely dependent on the costs of energy and chemicals, which is expected to increase faster than inflation. As such, spending on goods and services increases at an average annual rate of 11.3%, from R9.2 billion in 2018/19

to R12.7 billion in 2021/22. This increase is expected to drive an increase in expenditure on bulk water at an average annual rate of 11.9%, from R9.8 billion in 2018/19 to R13.8 billion in 2021/22, as the entity expects to deliver 1.6 trillion litres of potable water to water service providers and authorities each year over the MTEF period. The entity's work on phases 1 and 2 of its Zuikerbosch pumping station 5 augmentation scheme is expected to cost R1.7 billion over the medium term. The phases involve the extension of existing infrastructure to cater for increased demand.

Spending on compensation of employees accounts for an estimated R7 billion of total expenditure over the period, increasing at an average annual rate of 8.3% from R2 billion in 2018/19 to R2.5 billion in 2021/22. This is mainly due to the entity increasing its number of personnel by 252 by 2021/22. Most of the new personnel will be employed at the unskilled and semi-skilled levels at the Zuikerbosch pumping station 5. Rand Water derives revenue mainly from water sales and the provision of professional advisory services to municipalities. Total revenue is expected to increase at an average annual rate of 11.4%, from R15.3 billion in 2018/19 to R21.1 billion in 2021/22, as a result of an expected increase in tariffs from R9.35 per kilolitre in 2018/19 to R12.25 per kilolitre in 2021/22.

Trans-Caledon Tunnel Authority (TCTA)

The TCTA is responsible for the development of bulk raw-water infrastructure. 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 the provision of financial advisory services (structuring and raising project finance, managing debt and setting tariffs), project implementation services, and other technical support to the department and water boards.

The authority is also responsible for debt and risk management services. It ensures that strategic projects related to integrated water resources and infrastructure are efficiently and sustainably financed and implemented on behalf of the department. Over the medium term, the authority will prioritise the augmentation and protection of water supply in the Vaal River system through phase 2 of the LHWP, the long-term solution to acid mine drainage in Gauteng and phase 2A of the Mokolo and Crocodile River water

augmentation project. As construction on these projects will commence over the medium term, spending on goods and services is expected to increase at an average annual rate of 24.8%, from R4.1 billion in 2018/19 to R8.1 billion in 2021/22.

Phase 2A of the Mokolo and Crocodile River water augmentation project is aimed at providing additional water for domestic use, power generation, and coal mining in the Waterberg region in Limpopo. Construction of the main waterworks is expected to commence in 2020/21, driving an expected increase in expenditure at an average annual rate of 82.6%, from R436.5 million in 2018/19 to R2.7 billion in 2021/22.

The authority will also continue to manage debt on the Vaal River system, the Berg water project, the Vaal River eastern subsystem augmentation project, the Komati water scheme augmentation project, phase 2 of the Mooi-Mgeni transfer scheme and the Mokolo and Crocodile River water augmentation project. The authority's overall debt is expected to decrease at an average annual rate of 1.8%, from R26.7 billion in 2018/19 to R25.3 billion in 2021/22. This decrease is linked to the expected redemption of debt and the lack of significant new debt being acquired due to a conservative budgeting approach to capital expenditure.

Umgeni Water

Umgeni Water works with the DWS to build regional bulk water infrastructure that will enable it to provide bulk water and sanitation services, and serve water services institutions in KwaZulu-Natal. The entity supplies water to approximately six million consumers.

The entity's focus over the medium term will continue to be on the provision of bulk water services, which requires the development and maintenance of regional bulk infrastructure in its service areas across KwaZulu-Natal, with the eThekweni metropolitan area being its largest area of distribution. Spending in the bulk activities programme on activities related to the abstraction, treatment and distribution of bulk water is expected to account for 49.9% of the board's total expenditure, increasing at an average annual rate of 10.7%, from R1.3 billion in 2018/19 to R1.8 billion in 2021/22. As a result, spending on goods and services constitutes a projected 56.2% (R5.3 billion) of the board's total expenditure. Spending in this regard is expected to increase at an average annual rate of

5.9%, from R1.5 billion in 2018/19 to R1.8 billion in 2021/22, due to increases in production costs.

Spending in the administration programme is expected to amount to R4.4 billion over the MTEF period, increasing at an average annual rate of 8.5%, from R1.1 billion in 2018/19 to R1.5 billion in 2020/21. Capital expenditure will mainly be directed towards the rehabilitation, renovation and refurbishment of infrastructure on flagship projects such as phase 1 of the Mkhomazi water project, the Lower Mkhomazi bulk water scheme and the Durban Heights wastewater treatment plant. These investments are expected to amount to capital expenditure of R7.1 billion over the MTEF period, increasing at an average annual rate of 7.8%, from R1.7 billion in 2018/19 to R2.1 billion in 2021/22.

The entity expects to sell 1.5 trillion litres of water over the MTEF period, accounting for R13.3 billion of its projected revenue over the period. This revenue is expected to increase at an average annual rate of 13%, from R3.4 billion in 2018/19 to R4.9 billion in 2021/22. This is driven mainly by the projected increase in the volume of water sold, from 451 729 thousand kilolitres in 2018/19 to 495 413 thousand kilolitres in 2021/22, and a projected increase in tariffs from R5.04 per kilolitre in 2018/19 to R5.93 per kilolitre in 2021/22.

Water Trading Entity (WTE)

The WTE was established in 1983 to separate the sale of raw water and related services from appropriated funds in the department. It was converted into a trading entity in terms of the Public Finance Management Act, 1999 (Act 1 of 1999) in 2008 to manage the recovery of usage costs to support the long-term sustainability of South Africa's water resources. The entity's core activities involve the construction of new water resources and the rehabilitation and refurbishment of existing ones. Functions related to resources management include the management of water quality, water conservation, and the allocation of water through catchment management agencies to ensure sustainable water supply for both domestic and industrial use. The entity is further mandated to manage water resources, which includes the management of water quality, conservation, and the allocation of water through catchment management agencies.

Over the medium term, the WTE will continue to focus on developing and maintaining raw water infrastructure and managing water resources, while improving its operational and financial sustainability. An estimated R22.9 billion of the entity's total expenditure over the medium term is in the financing of and investment in raw water infrastructure programme. Spending in the programme increases at an average annual rate of 10.6%, from R6.2 billion in 2018/19 to R8.4 billion in 2021/22.

Spending in the bulk water supply to strategic users programme accounts for an estimated R7.5 billion of total expenditure, increasing at an average annual rate of 10.6%, from R2 billion in 2018/19 to R2.8 billion in 2021/22. The entity also plans to rehabilitate 27 km of conveyance systems related to the Vlaktefontein, Boskop, Vaalharts, Ncora, Pongolapoort, Nzhelele and Lindleyspoort canals; and complete 80% of planned maintenance projects in each year over the MTEF period. As a result, spending in the operations, maintenance and refurbishment of national water resources schemes programme is expected to increase at an average annual rate of 10.6%, from R1.6 billion in 2018/19 to R2.1 billion in 2021/22.

In ensuring the efficient management of water resources, the entity will continue to ensure compliance with dam safety regulations by completing an estimated 159 dam safety rehabilitation projects over the medium term. These projects include raising the walls of Clanwilliam Dam and Tzaneen Dam; and other projects involving pollution control, resource measurement and monitoring, water conservation, water demand management and water allocation. As such, spending in the implementation of water resource management activities programme increases at an average annual rate of 10.6%, from R805.1 million in 2018/19 to R1.1 billion in 2021/22.

To improve its operational and financial sustainability, the entity plans to maintain its period for collecting outstanding debt at 100 days each year of the MTEF period. This will enable it to make timely payments to the TCTA to repay debts for the construction of new raw water infrastructure projects; and the maintenance of ongoing and completed raw water projects such as the long-term solution to acid mine drainage, the Lesotho Highlands water project, and phase 2 of the Mokolo and Crocodile River water augmentation project.

The entity expects to generate 81.8% of its revenue over the medium term from the sale of raw water. This is expected to increase at an average annual rate of 10.7%, from R11 billion in 2018/19 to R14.9 billion in 2021/22, due to a projected increase in sales. Remaining revenue is derived from departmental transfers amounting to R6.6 billion, increasing at an average annual rate of 4%, from R2 billion in 2018/19 to R2.3 billion in 2021/22. Funds from these transfers are used to subsidise the entity's operations, its functions pertaining to the management of water resources, and the construction and maintenance of water infrastructure for which costs cannot be recuperated through tariffs.

Other role players

The Breede-Gouritz Catchment Management Agency plays a key role in the use, protection and development of water resources in the Breede-Gouritz water management area. The agency's total budget for 2018/19 is estimated to be R65.8 million.

The Inkomati-Usuthu Catchment Management Agency plays a key role in the use, protection, and development of water resources in the Inkomati-Usuthu water management area. The agency's total budget for 2018/19 is estimated to be R123.5 million.

The Water Research Commission's mandate is to conduct research on water by determining needs and priorities for research, stimulating and funding water research, promoting the effective transfer of information and technology, and enhancing knowledge and capacity building in the water sector. Research is informed by government policies, needs and international trends. The commission's total budget for 2018/19 was R326 million.

The Komati River Basin Water Authority was established in terms of a treaty between South Africa and Eswatini relating to the water resources of the Komati River Basin. The basin primarily comprises the Driekoppies Dam in South Africa, commissioned in 1997, and the Maguga Dam in Eswatini, commissioned in 2002. The authority is governed by the Joint Water Commission, whose members are officials from the governments of Eswatini and South Africa.

The WRC was established in terms of the Water Research Act of 1971 and is listed as a public entity. The commission's

mandate is to conduct research on water by determining needs and priorities for research, stimulating and funding water research, promoting the effective transfer of information and technology, and enhancing knowledge and capacity-building in the water sector. Research is informed by government policies, needs and international trends.

Resources

South Africa's water resources are, in global terms, scarce and extremely limited.

The precipitation per year for Africa is 22 300 km³, of which the evaporation rate is 80% and the runoff rate is 20%. Southern Africa only has 12.25% of the total water in Africa, making it a highly arid region.

Rainfall is, however, relatively higher in the northern and eastern parts of southern Africa (the Democratic Republic of Congo, Zambia and Mozambique) with the drier parts of the region including Namibia, Botswana and South Africa.

South Africa has a mean annual rainfall of approximately 500 mm, compared to the world's average of 860 mm. It is characterised by low, variably distributed rainfall as well as high evaporation rates, resulting in the uneven distribution of run-off across the country.

The country experiences severe and prolonged hydrological droughts, which may last as long as 10 years at a time. The quality of water in South Africa is also negatively impacted by dissolved salts from host rocks in certain areas such as Namaqualand in the Northern Cape.

The surface water potential of the major drainage systems in South Africa are dominated by the Orange and the Limpopo river basins, which are shared with neighbouring countries.

Over 60% of the country's river flow comes from 20% of the land area. To overcome the uneven spread of water resources and to manage floods and drought, more than two thirds of the country's mean annual rainfall is currently stored in dams.

The country's water security is mainly reliant on fresh surface water, with ground water and return flows underused.

However, the freshwater available for use is currently at its limit, and alternative sources such as ground water needs to be further exploited. In addition, the country shares four

major rivers with six neighbouring states, namely Zimbabwe, Botswana, Mozambique, Swaziland, Lesotho and Namibia. Therefore, international agreements on water sharing are in place on all of these river basins.

There is a well-developed infrastructure, with more than 4 395 registered dams in South Africa, including 350 dams belonging to the department, and a number of large-scale inter-basin water transfer schemes. Water services infrastructure covers more than 35 000 km of bulk pipelines and 200 000 km of reticulation systems that are managed by 152 water service authorities and providers.

However, this existing infrastructure needs maintenance and the country is already experiencing challenges with lack of focus on sustainable asset management. The schemes also require efficient and effective operations, for which specialised skills and capabilities at all levels are needed. Major challenges are experienced regarding the capabilities of water services authorities to effectively manage the schemes on a sustainable basis. This issue needs to be dealt with decisively through a review of the mandates and policies in relation to the management of water infrastructure, and available capacity.

Work is also required in terms of rolling out the establishment of appropriate institutions, such as regional water utilities, as well as to better leverage private sector support. Non-revenue water is also a challenge to be dealt with.

Medium to long-term capital investment plans must be based on up-to-date reconciliation of changing water requirements and water availability from surface water, groundwater, reuse, desalination of seawater and rainwater harvesting sources.

The main contributors to water quality problems and environmental concerns are mining (acidity and increased metals content), urban development (salinity, nutrients and microbiological), industries (chemicals and toxins) and agriculture (sediment, nutrients, agro-chemicals and salinity through irrigation return flows). Untreated or poorly treated wastewater is severely affecting the quality of water in many areas, as well as negatively impacting on the environment.

Climate change is expected to exacerbate the already substantial pressure on freshwater and estuarine ecosystems by altering rainfall patterns and the more frequent or intense

occurrence of events such changes in flow patterns, droughts and storms.

South Africa's water ecosystems are not in a healthy state. Of the 223 river ecosystem types, 60% are threatened, with 25% of these critically endangered. Less than 15% of river ecosystems are located within protected areas, of which many of which are threatened and degraded by upstream human activities. Of 792 wetland ecosystems, 65% have been identified as threatened and 48% as critically endangered.

A further key factor impacting on water quality is the treatment of wastewater. Maintenance of these systems is the responsibility of local government and is highly impacted by a lack of resources and requisite skills to manage and maintain the systems to the required standards, resulting in untreated effluent flowing into river systems, with detrimental effects on the ecosystems.

Acid mine drainage has also been reported from a number of areas in South Africa, including the Witwatersrand Gold Fields, the Mpumalanga and KwaZulu-Natal Coal Fields and the O'Kiep Copper District.

The DWS must continue to support and lead improvements in water quality and environmental protection across the value chain through a range of interventions, including the assessment of water supply and wastewater treatment systems and the close monitoring of non-compliant systems in terms of the Water Services Act of 1997.

Dams must be evaluated in terms of dam safety regulations, and water management institutions must be monitored to ensure they in turn effectively monitor affiliated water users. Non-compliance will continue to be investigated and punitive action taken where applicable and possible.

In addition, the DWS must continue to monitor the level of compliance of mines against their water use entitlements. In this regard, the mine water management policy is in the process of being finalised and approved. Once in place, the intention is to implement the environmental levy on mines.

South Africa's challenge into the future is to ensure that there is fair and equitable redistribution of water resources across the various sectors. This should take into account the country's socio-political and economic transformation agenda. As the country has a limited resource base, with competing

sectoral interests, trade-offs must be made in prioritising uses, affordability and sustainability.

South Africa is still heavily reliant on surface water and its further development with more than two-thirds of the country's mean annual runoff already stored in dams. Where additional water is still available, such as in the uThukela, Mzimvubu and Pongola basins, it is located in areas far from the existing centres of demand. It is thus important for South Africa to focus its water resource planning in the following areas:

- Ground water currently reflects only 9% use and is underused, undervalued and not well managed. With about 3 500 million m³ of groundwater estimated to be available for further development, much scope exists to exploit the potential of ground water as a freshwater source.
- At 14%, water reuse is already a major component of the water mix, albeit mostly indirectly. Direct reuse, especially in the coastal areas, must be further encouraged
- There is also large scope for increasing desalination, which is currently providing less than 1% of the country's water needs. Inland measures are in place to desalinate acid mine water and brackish water resources, while coastal areas have an opportunity to desalinate seawater.

From the above, the DWS is committed to improve integrated water resource management to ensure continued water security. This includes optimising dam storage and transfer systems, effectively managing the water resources mix and exploring various options for the reconciliation of water availability with demand.

The already constrained water resources is further impacted by the current prolonged dry spell coinciding with the drought legacy conditions in a number of provinces. The predictions of climate forecasting models indicates that dry spell effects could last for up to seven years. Therefore, the construction of additional bulk water storage capacity, such as the Lesotho Highlands Phase 2 project and others, are critical to ensuring water security in the long term.

Approximately 9.3% of available potable is water lost through leakage. This is water that the country cannot afford to lose, especially within the current prolonged drought. In the short term, the DWS's mitigation measures include the implementation

of the “war on leaks” programme that will train youth to repair leaking taps and pipes in their communities.

In addition, an allocation of R350 million has been made to drought-related projects in the short term. Infrastructure would also be upgraded, rainwater harvested and water desalination projects would be expedited.

Through various communication campaigns, the consumers within the various sectors within agriculture, domestic, industrial, power and mining would be encouraged to limit their water consumption patterns especially during this drought period.

Dams and water schemes

In an attempt to respond adequately to demand and anticipate future demand, South Africa has built numerous large and medium-sized dams, and developed sophisticated inter-basin transfer schemes. The country now has more than 350 government-owned dams countrywide. They range in storage capacity from a volume of 5 500 million m³ of water down to 0.2 million m³.

Most water consumption can be attributed to drinking, irrigation, electricity, mining processes and industrial processes.

The DWS follows an integrated approach to managing South Africa’s water resources. Proposed new water schemes have to comply with the NWRS, requiring that water demand management programmes be implemented before embarking on new infrastructure development.

Strict environmental impact assessments must also be performed in accordance with laws and regulations administered by the Department of Environmental Affairs, while the guidelines issued by the World Commission on Dams must also be followed.

Bulk infrastructure is a critical element of water services infrastructure and an integrated part of water services management.

Groundwater resources

An estimated 80 000 to 100 000 boreholes are being drilled annually.

The National Groundwater Archive is a web-enabled database system that allows capturing, viewing, modifying and extraction (dissemination) of groundwater related data.

The DWS has a legal obligation to ensure that water resources (including groundwater) are protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner.

The National Water Act of 1998 requires the establishment of national monitoring and information systems as the availability of information about water resources is regarded as critical to the main purpose of the Act.

The need for groundwater data and information continues to increase to assist in planning to provide water to people, monitoring, drought relief and climate change

Groundwater, despite its relatively small contribution to bulk water supply, represents an important and strategic water resource in South Africa, since it services between 52% and 82% of community water-supply schemes in the Eastern Cape, Limpopo, Northern Cape, North West and KwaZulu-Natal.

The lack of perennial streams in the semi-desert to desert parts means that two thirds of South Africa’s surface area depend largely on groundwater.

Although irrigation is the largest user, the supply to more than 300 towns and smaller settlements is very important.

Through government’s commitment towards meeting the basic water needs of communities, groundwater has become a strategic resource for village water supply in the wetter parts of the country, because of its cost-effectiveness in a widely scattered small-scale user situation.

Groundwater also contributes considerably to river flow. This requires reserving a significant share of groundwater resources to protect aquatic ecosystems in terms of the National Water Act of 1998. The maximum quantity of groundwater that can be developed economically is about 6 000 million m³ a year, while some 4 000 million m³ of groundwater (mainly in the dry season) contributes to surface water flow annually.

Southern Africa also has large hidden underground water reserves, with 12 to 15 aquifer systems, of which three are considered very important for the future.

In South Africa, a substantial resource lies in a massive dolomite aquifer system that covers a vast area, extending from Springs and Brakpan, east of Johannesburg to Lenasia, south of the city; Zuurbekom, Carltonville and Magaliesberg on the West Rand; Kuruman in the Northern Cape and even as far as parts of Botswana.

The Witwatersrand mining basin’s aquifer storage capacity is about the size of Lake Kariba.

Managing and developing water resources

To facilitate the management of water resources, the country has been divided into 19 catchment-based water management areas, of which 11 share international rivers.

Sufficient water resources have been developed and are available to ensure that all requirements for water can reasonably be met, without impairing the socio-economic development of the country.

Where feasible, special management techniques may be applied to improve water quality to appropriate standards for particular uses. The quality of groundwater varies according to hydrogeological conditions and anthropogenic impact. However, most major aquifer systems contain potable water.

To underscore its commitment to the pursuit of universal access to water, the DWS is investing in new infrastructure and maintaining and rehabilitating dysfunctional systems to ensure operational efficiency.

This is particularly relevant to developing water infrastructure to meet the specific needs of different rural communities. Closely related to rural development is the need for mainstream support to local government to sustain the infrastructure underpinning efficient service delivery to communities.

Managing water quality and wastewater

To ensure compliance with minimum water quality norms and standards, the DWS started the annual Blue Drop and Green Drop assessments to guarantee that water and wastewater systems are managed according to set norms and standards.

The department has set a target of 99% compliance with drinking water quality standards and 80% compliance with wastewater effluent standards.

This incentive-based regulation system aims to improve the quality of municipal drinking water quality and management of wastewater.

Because of the scale and magnitude of resources needed for the national certification programme, the Green Drop and Blue Drop programmes take place every second year, alternating with each other. In a programme's "gap" year, progress in the wastewater sector is tracked and reported via the assessment of the cumulative risk status of treatment systems.

The DWS was honoured to receive international recognition in terms of Environmental Engineering Excellence for the Blue Drop and Green Drop Certification programmes from the American Academy for Environmental Engineers. This academy is affiliated to the International Water Association.

Programmes and initiatives

Integrated Water Resources Management (IWRM)

The DWS, with the assistance of the Royal Danish government, initiated a programme in 2000 to pilot IWRM approaches in three water management areas of South Africa: Crocodile West-Marico (mainly in North West), Mvoti-uMzimkulu (KwaZulu-Natal) and Olifants-Doorn (mainly in the Western Cape).

These water management areas were selected as they represent a cross-section of water resources conditions as well as water-use conditions and user interests.

The IWRM requires intensive planning to ensure efficient, equitable and sustainable management of water resources and for coping with conflicting demands.

Back to Basics Programme

While the Back to Basics Programme is focused on 27 district municipalities, the Presidential Infrastructure Coordinating Commission (PICC) has given the DWS the task to intervene when there are problems.

These interventions shall be on a case-by-case basis in accordance with legislation to safeguard the well-being of communities.

In partnership with the Eastern Cape and North West provincial governments, respectively, the DWS intervened

in municipalities that have been placed under administration. These include the Makana Local Municipality in the Eastern Cape, as well as the Madibeng Local Municipality and Ngaka Modiri Molema District Municipality in North West.

An important element of these interventions has been the successful use of the water boards of Amatola, Magalies and Sedibeng, respectively, to supplement the capacity of the department to improve operational performance and build new infrastructure where necessary.

In Limpopo, the DWS has appointed the Lepelle Northern Water as an implementing agent for the Mopani District Municipality Revitalisation Programme, which includes various water treatment works, wastewater treatment works, boreholes and pipelines.

In Bushbuckridge, Mpumalanga, through Rand Water, the DWS executed an emergency intervention to solve operational problems that were causing water shortages and also accelerating the implementation of water reticulation infrastructure.

In each of the identified municipalities, qualified and experienced personnel are being deployed to work on, and implement, a road map for a "Water Secure and Safe Sanitation Future", using budgets pooled from national and provincial governments and from the affected municipalities.

The Water and Sanitation Revolution

The key strategic priorities for the water and sanitation revolution are:

- water resource management
- water infrastructure development
- water and sanitation services
- policy regulation.

The key pillars of this revolution are:

- water conservation and demand management that involves the use of innovation and regulation to reclaim water already developed and available for use, and
- improving the water mix involves the increased use of a variety of water sources in addition to the country's current reliance on surface water.

Water Tribunal

The Water Tribunal was established in 1998 to hear appeals against directives and decisions made by responsible authorities or water management agencies about matters covered by the National Water Act of 1998, such as the issuing of licences to use water. It is an independent body and can hold hearings anywhere in the country.

The WRC and the Judicial Services Commission recommend people to be included as members of the Water Tribunal, and the Minister of Water Affairs appoints them. The members have to be familiar with water management, engineering, law and other related matters, and they are given administrative support by the DWS.

Strategic Water Partners Network – South Africa (SWPN-SA)

SWPN-SA is one of South Africa's most innovative public-private civil-society sector partnerships, making progress that would not have been possible.

The efforts of the SWPN-SA are integral to the NWRS, which the DWS released in 2012.

A cornerstone of the SWPN-SA is developing innovation that leverages the strength and expertise of the DWS, the South African private sector, civil society and expert organisations.

Ncorha Water Treatment Works

The Ncorha Water Treatment Works forms part of the Government Infrastructure Development Programme, which is aimed at providing services to communities and transform the economic landscape of the country.

The value of the project is R64 million and was funded by the DWS. It is estimated to benefit 18 429 families from 208 villages in the four surrounding municipalities. In addition, the project has created 188 jobs, with local people, the youth and women being major beneficiaries.

The upgrading of the water treatment works, construction of reservoirs and pumpstations is complete.

Lushushwane Water Project

The Lusushwane Bulk Water Supply project is aimed at

providing water to the rural communities of the Chief Albert Luthuli Local Municipality. The project will benefit at least 16 285 people in the vicinity.

The project, from Phase 1 to Phase 3, is funded by the DWS with the Gert Sibande District Municipality as the implementation agent. The scheme, in all its phases, is estimated to the value of around R90 151 000. On completion, it will benefit local communities including Bettysgoed, Smithfield, Oshoek, Lochiel, Robinsdale, Aankomst, Pampoen, Houtbosch and Hartbeeskop.

The objective of this project is to provide adequate and sustainable water supply to the existing and future demand within Lushushwane over the 20-year horizon estimate to increase to 5.014 households (21.934 people), through refurbishment, upgrading and construction of new infrastructure.

Phase 1 of 3 was completed in December 2017, however will only be commissioned once phase 2 of 3 is completed. Phase 2 & 3 are currently under construction and were expected to be completed by December 2019.

The area is currently being supplied from the existing 1.8MI/day river scheme and boreholes (hand and electrified boreholes) and once all phases are completed, the scheme will be able to meet the current demand of 2.9MI/d. Subsequent to the completion of all phases, the scheme will be transferred to the Chief Albert Luthuli Local Municipality as the beneficiary, thus to be responsible for the operations and maintenance of the scheme.

National Water Resources Infrastructure (NWRI) Programme

The NWRI ensures reliable supply of water from bulk raw-water resources infrastructure. The programme sources funding to implement, operate and maintain bulk raw-water resources infrastructure efficiently and effectively by strategically managing risks and assets.

Strategic Integrated Projects (SIPs)

SIP 18, which was approved by the PICC, aims to address water supply and sanitation backlogs to millions of households.

The PICC's 18 SIPs are divided into geographic, energy, spatial and social infrastructure development projects. These projects – headed by different departments – cover more than 150 specific infrastructure interventions in rail, road and ports, dams, irrigation systems, sanitation and electricity.

This programme is a 10-year plan that will address the estimated backlog of adequate water to 1.4 million households and that of basic sanitation to 2.1 million households.

SIP 18 is expected to fast-track the issuing of water licences, expand the capacity of the water system, speed up build programmes, address backlog projects and rehabilitate and upgrade existing water and sanitation infrastructure.

The project, which will also focus on priority small towns and rural areas where water service delivery is a problem, is also expected to create jobs, raise the quality of service delivery of water around the country and extend water supply to areas that are either underserved or unserved.

The department identified several projects that will be used to drive SIP 18, including the Sedibeng Regional Sewer Scheme, which is a R5-billion project to be implemented in the area.

Rand Water's BG3 pipeline, which is sub-Saharan Africa's largest water pipeline, running from the Vaal Dam to its Zoekfontein Plant, 8.6 km away, was launched in June 2013. The pipeline will increase water distribution in this district and surrounding areas.

The BG3 pipeline runs adjacent to Rand Water's existing BG1 and BG2 pipelines that supply water to Gauteng and parts of the neighbouring Free State, Mpumalanga and North West.

Once in commission, the BG3 pipeline will allow for Rand Water's two pipelines (BG1 and BG2) to be shut down for refurbishment and maintenance. The BG3 pipeline will augment raw-water capacity to Zuikerbosch by up to 2 100 megalitres per day, which will accommodate the region's projected growth in water demand to 2030.

The Komati Water Scheme Augmentation Project was designed to resolve the water supply problems to Eskom's Duvha and Matla power stations in Mpumalanga.

The Komati Water Scheme Augmentation Project augments

the Komati Water Scheme from the Vaal Eastern Subsystem to help Eskom overcome its water supply challenges.

The interaction of the water resources of the Komati, Usutu and Vaal River systems provides a higher assurance of water supply to all Eskom's thermal power stations and other water users in Mpumalanga. The Komati Water Scheme Augmentation Project will be able to deliver an additional 57 million m³ of water a year to the Komati Water Scheme. On the department's instruction, the TCTA is financing and implementing the project which is part of SIP 18.

Dam Safety Rehabilitation Programme

The Dam Safety Rehabilitation Programme ensures the continued structural and operational safety of the dams owned by the DWS.

Support for resource-poor farmers

In accordance with the National Water Act of 1998 as well as regulations on financial assistance to resource-poor farmers, the Minister may allocate assistance to those farmers who fulfil requirements.

To ensure that water resources are protected, the regulations explicitly state that financial assistance may be granted and used only for activities that ensure water is protected, used, developed, conserved and managed in a sustainable and equitable manner.

Water Allocation Reform

The Water Allocation Reform Programme's objectives are to ensure equitable access to water, eradicate poverty and promote social and economical development.

The programme's priorities are to meet the water needs of historically disadvantaged people, ensure their participation in water resources management and promote the beneficial and efficient use of water in the public interest.

Licences are required for storage and use of water, among other things. To facilitate the availability of water for historically disadvantaged people, attention is also given to the allocation of water following principles of equity and sustainability.

Women in Water

The Women in Water Project aims to strengthen the active participation of rural women in water resource management. Women identify water-related challenges in their communities and conceptualise ideas to address them. They are registered for Women in Water awards. The national winners receive cash prizes which are used for further project development and implementation.

Learning Academy

There is a shortage of skills in the water and sanitation sector. The DWS, as the custodian of South Africa's water resources, through its Learning Academy External Bursary Scheme, provides bursaries yearly to aid in closing this gap. The DWS welcomes all applicants who would like to pursue careers that are in line with the department's core business.

The DWS scheme boasts an all-inclusive package recognised in South Africa as being highly competitive. The DWS External Bursary Scheme aims to attract exceptional young and innovative talent to the department.

Students pursuing the following fields of study are eligible to apply: Analytic Chemistry, Aquatic Sciences, Biochemistry, Biological Sciences, Water and Sanitation, Geographical Information Systems, Civil/Electrical/Mechanical Engineering, Water Resource Management, Environmental Law/Management/Science, Water Utilisation, Cartography, Geo-chemistry, Geo-hydrology, Geology, Hydrology, Limnology, Microbiology, Surveying and Water Care.

The purpose of the learning academy is to:

- investigate technical and scarce skills development needs within the department
- address technical and scarce skills gaps in the overall water supply value chain
- address scarce skills gaps in specific technical areas of the department
- plan and build capacity for medium and long-term needs of the department and the water and sanitation sector
- develop and implement structured training for engineering and scientific graduate trainees
- develop and propose interventions (regarding mentoring,

skills and knowledge transfer, and professional registration processes) with the Engineering Council of South Africa, the South African Council for Natural and Scientific Professions and the Surveying Council of South Africa in line with the Occupations Specific Dispensation.

In 2018, the academy had an intake of 40 learners in 22 universities across the country. There were eight interns and 44 graduate trainees who were mentored by technical managers within the department.

The department also recruited 10 000 learners for training on combating water leaks in communities. The learners were scheduled to complete their training in September 2018.

Management of water conservation and demand

Although South Africa has been classified as a water-scarce country, water from the source to the consumer is often lost as a result of inappropriate and inadequate asset management.

Lack of education on the part of the consumer also leads to inefficiency in the day-to-day use of water. The loss of water depletes the country's resources and reduces revenue to water services authorities.

The municipalities' revenue is lost due to leaking pipes, illegal connections and poor billing systems.

In terms of the water-use efficiency programme, 68 municipalities were supported in implementing water conservation and water demand measures to reduce water loss by 519 million m³. Measures to improve efficient water use in the catchment areas were also undertaken and the volume of water loss was reduced to 32 million m³.

Water leaks account for nearly 36% of the nation's unaccounted for water and costs the country about R7 billion annually.

Realising that South Africa is a water-scarce country, the DWS is also putting in place medium to long-term interventions that are intended to reduce the risks for water scarcity in the future.

These include:

- rainwater harvesting (drinking water, water for livestock, water for irrigation)
- integrating groundwater and surface water use in the future

- desalination at a large scale
- invest in innovative water-saving solutions, such as the Drop-the-Block campaign
- incorporating all municipal and privately owned dams into the management system or the future
- implementing further transfer schemes to improve drought resilience
- building additional storage capacity
- rolling out large-scale reuse of water (recycling of effluent, focus on coastal towns where treated effluent is disposed of via sea outfalls and not taken into account in return flows).

Enhanced Local Government Support Approach

A rapid response unit in the department addresses poor performance of water and wastewater systems, which has resulted in community protests in some cases.

The unit deals with proactive and reactive non-compliance cases of municipal service delivery. The unit's specialists enable the department to intervene directly in high-risk operational situations, where the lives of citizens and the environment are under threat because of water and wastewater treatment failures.

Freshwater Programme

Recognising the value and threatened status of South Africa's freshwater biodiversity, and the need to build competence and leadership in this area, the South African National Biodiversity Institute (SANBI) has established a programme focusing on freshwater biodiversity.

The programme aims to grow and consolidate freshwater activities within SANBI.

The Freshwater Programme focuses on supporting collaborative freshwater initiatives. These include Working for Wetlands, the National Wetland Inventory, National Freshwater Ecosystems Priority Areas Project, a wetlands mitigation banking scheme with the Grasslands Programme and coal-mining industry, and water-related payments for ecosystem services pilot projects.

Key to the programme's operation will be the further development of strategic relationships with other organisations

with shared objectives. It includes managing the Working for Wetlands Programme on behalf of the departments of Water and Sanitation, Environmental Affairs, and Agriculture, Forestry and Fisheries. Working for Wetlands champions the protection, rehabilitation and sustainable use of South Africa's wetlands through cooperative governance and partnerships.

Monitoring programmes

River flow is monitored at 1 200 flow-gauging stations and some 260 major reservoirs. The evaporation and rainfall station network has 360 stations.

The oldest flow-gauging station still operating in South Africa is on the Mooi River near Potchefstroom in North West.

There are 21 operational rainfall stations in the mountains of the Western Cape and five in the Mpumalanga escarpment. Observations are relayed through a cellular short message system.

Water levels are monitored at some 1 000 observation boreholes across South Africa. Particular attention is given to monitoring in dolomitic areas. In addition, a small network of rain gauges monitors rainwater quality.

The importance of qualitative information on South Africa's water resources has led to an increased drive towards creating a national water-quality monitoring network.

The formal protection, restoration and rehabilitation of wetlands is strengthened through improved land-use planning, land and development management policies, as well as operational and regulatory means at national, provincial and local level.

Adopting of ecosystem-based approaches and implementing the open-space planning and management programmes adds impetus to the protection of these systems and associated services, especially at local government level.

It requires integrated approaches and the involvement of multiple sectors, particularly those dealing with human settlements, development and planning.

The DWS is also designing programmes to assess and report on the radiological (radioactivity) and toxicological quality status of the country's water resources.

National Chemical Monitoring Programme (NCMP)

The NCMP assesses and reports on the chemical status of water resources in South Africa. The main water-quality challenges for domestic water users are high levels of dissolved salts and, in some places, high fluoride concentration. The other challenges facing irrigated agriculture are the high sodium-absorption ratio, high electrical conductivity, high pH and high levels of chloride.

Another global challenge affecting South Africa is eutrophication or excessive plant (including algae) growth in dams. This is because of high levels of nutrient input from point sources of pollution and diffuse sources of pollution from catchments.

Annual reports indicate that 50% of dams in South Africa are seriously affected (hypertrophic), while the rest range in quality from good (oligotrophic) to poor (mesotrophic).

Another problem is the sporadic outbreak of cholera and other water-borne diseases, mainly because of poor sanitation and hygiene at household level. The Eastern Cape and KwaZulu-Natal are prone to cholera outbreaks.

River Eco-status Monitoring Programme (REMP)

The REMP evolved from the River Health Programme. It is a component of the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP).

The REMP focuses on the monitoring of the ecological conditions in river ecosystems as they are reflected by the system drivers and biological responses (instream and riparian).

Integrated Water Quality Management Strategy

The pollution of South Africa's water resources, both surface and underground water, not only adversely affects human and environmental health but has severe consequences for the economy and social well-being. In response to the country's need to take an improved integrated approach to Water Quality Management (WQM), the DWS recently developed an integrated WQM Strategy. This strategy sets forth a number of strategic objectives, each supported by key actions, which collectively aim to ensure that "government, in partnership with private sector and civil society, secures water that is fit for use, for all, forever!" These actions range from the need to strengthen institutions to the need to improve monitoring and information

management and to strengthen our regulation of activities that degrade water quality.

Managing water resources under a changing climate

With climate change, water resources that are already under pressure due to increasing water demand, will be under even greater stress in the future. Already, physical evidence suggests that there are changes in historical rain patterns and intensities, as observed in the increasing temperature and drought trends. Water distribution in South Africa is spatially skewed, with decreasing rainfall and increasing evaporation from east to west. Even though rainfall trends cannot be clearly defined, it can be said with high confidence that potential impacts of climate change in South Africa on water availability will be negative. Just with increasing temperatures alone without considering other climatic and non-climatic factors, evaporation rates will increase and that will affect water availability. Climate change impacts on the water sector will thus; amplify the current existing conditions.

The DWS has made good progress in trying to understand the impacts of climate change on the different water management areas through conducting Risk and Vulnerability Assessment Studies, and accordingly suggested adaptation strategies as appropriate. These studies reveal that, for example, catchments in the eastern side of the country, for example, Mzimvubu-Tsitsikamma water management area, rainfall has shown an increasing trend and the area is also projected to experience increasing rain days both in the intermediate and distant futures. This however comes with other challenges such as severe erosion and siltation. Evaporation rates in most cases have been shown to exceed precipitation, becoming relatively higher in areas where it rains less, for example, in the Lower Vaal and Lower Orange catchments. What needs to be considered even further is not only the direct impacts of climate change on the water sector, but secondary impacts on other water dependent sectors, such as Agriculture, Mining and Energy. As such, any adverse impacts of climate change, may negatively affect progress towards development in a number of economic sectors in the country.

National Water and Sanitation Master Plan

The development of the National Water and Sanitation Master Plan (NW&SMP) aims at mobilising the commitment and efforts of all role players and stakeholders in the water and sanitation sector towards collectively achieving the desired future state of the sector, as defined by the government's vision, goals and targets until 2030 (NDP, SDGs, MTSFs and other key drivers). It will provide a critical overview of the present state in the sector and the key challenges it is currently facing, together with a consolidated plan of actions required to enable the achievement of the set targets.

The plan of actions will include a detailed schedule of consolidated and prioritised interventions, actions, investments, projects and initiatives. For each action, the plan will define specific intermediate and final targets, the parties responsible for their achievement, the deadlines for delivery and the estimated costs or other required resources. The achievements will be monitored and evaluated annually by a dedicated project management unit managed by the DWS. The NW&SMP will be a living document, which will be updated bi-annually to reflect the dynamics in the sector.

The NW&SMP will act as the implementation tool for the Water and Sanitation Resources and Services Strategy and the two documents will be aligned. The draft NW&SMP was tabled for approval by Cabinet during the 2018/19 financial year.

National Aquatic Ecosystem Health Monitoring (NAEHM) Programme

The NAEHMP is a national programme managed by Resource Quality Services with support from the WRC, CSIR and various regional and provincial authorities.

It is responsible for managing aquatic ecosystems. It focuses on the biological attributes of a river that serve as indicators of its ecological health. The NAEHMP's main objectives are to:

- generate a national perspective of the health of aquatic ecosystems in South Africa
- develop the capacity and information base required to enable the DWS and other role players to report on the status of and trends in the ecological health of South Africa's river systems, in an objective and scientifically sound manner

- generate information products and audit-management strategies that could assist in distinguishing between aquatic ecosystems exposed to sustainable use and those experiencing ecological deterioration.

The NAEHMP comprises three separate monitoring programmes namely:

- The River EcoStatus Monitoring Programme (REMP): This is the oldest component of the NAEHMP. It focuses on the monitoring of ecological conditions of river ecosystems as it is reflected by the system drivers and biological responses. The basis of the REMP is the establishment of a reference condition derived from best available information. Present conditions (Ecological Category) for the different indicators are determined as a %age change from reference. The REMP is built upon the use of particular models incorporating existing approved EcoStatus models. The assessment can be done on a sub quaternary or site level and includes the use of the Index of Habitat Integrity, Fish Response Assessment Index, Macroinvertebrate Response Assessment Index, Vegetation Response Assessment Index and Integrated Ecstatus. Monitoring is conducted on a quarterly basis and technical reports produced annually.

Currently a number of provinces are only partially implementing the REMP focussing mostly on the Macroinvertebrates and habitat components but the programme is fully implemented in the Inkomati-Usuthu as well as the Breede-Gouritz, Berg-Olifants and Pongola-Mtamvuna Water Management Areas. Information obtained through the REMP is also used in monitoring the biological and Habitat components of the Resource Quality Objectives.

- The National Estuaries Monitoring Programme (NEsMP): This purpose of this programme is the monitoring of water quality, physic-chemical and biological aspects for determining long-term trends and changes in the condition of South African estuaries. The NEsMP coordinates national monitoring efforts and provide support in the form of sampling equipment, training, data management and information dissemination, while collaborating institutions collect physic-chemical data and water samples.
- The National Wetland Monitoring Programme: The

programme's design is based on minimising duplication of effort while maximising the value of outputs of wetland assessment and monitoring, finding suitable methods for prioritizing wetland to be assessed and monitored, adaptive management and maximum engagement and participation by stakeholders. It has not been implemented yet, but aims to assess & monitor the extent of wetlands, the threats to and the change in the present ecological state and ecosystem services provided by, wetlands in South Africa. It is a "state-of-wetland" reporting programme, designed to demonstrate trends in the state or integrity (biological, physical & chemical components of its ecosystem & their interactions) of wetlands over time.

National Toxicity Monitoring Programme

The National Toxicity Monitoring Programme reports on the status of dichloro-diphenyl-trichloroethane and other persistent organic pollutants. This information is reported internationally to the Stockholm Convention through the Department of Environmental Affairs.

The National Toxicity Monitoring Programme was designed to assess the status of water resource through measuring the concentration of a selection of priority pollutants at a number of "hot spots" and also assessing the toxicity of the water to some aquatic organisms through direct measurement of effect. The priority pollutant selection is aligned to the extent possible with South Africa's responsibility for reporting under the Stockholm Convention. The geographic distribution of monitoring points is still largely determined by fiscal and operational constraints. It currently focuses on the upper reaches of the Crocodile (West)-Marico- and Olifants River catchments. The combination of chemical and biotic assessment in conjunction with the other national monitoring programmes also supports strategic and operational decision making by identifying areas of impairment of fitness for use. The first 5 years of monitoring indicated that the persistent priority pollutant concentrations were generally low but that mild seasonal toxicity occurs, possibly in conjunction with agricultural activity. It also tends to confirm that the major human exposure route of DDT (used in malaria vector control) is unlikely to be through the water. Future development includes extending analyses to riverine sediments.

Education and awareness

Youth development and National Water Week

Sub-Directorate Youth Development is responsible for the co-ordination of youth development programmes within the DWS and the Water and Sanitation sector. The activities of the conducted by the unit are guided by the Youth Accord, National Youth Policy vision 2020 which concentrate on the integrated approach towards job creation, skills development and Entrepreneurship. A Youth Development strategy has been developed as a guiding document towards meeting the commitments made in the AMCOW Youth Development Strategy.

The National Water Week is an awareness week campaign by the DWS. It serves as a powerful campaign mechanism reiterating the value of water, the need for sustainable management of this scarce resource and the role water plays in eradicating poverty and underdevelopment in South Africa.

The campaign seeks to continue building on the ongoing awareness creation within the broader South African community.

This awareness creation is coupled with the responsibility that every citizen must take in ensuring the integrity of South Africa's water resources and its efficient use.

The linkages between water services, supply, resource management, poverty eradication, social and economic development were emphasised in a number of innovative ways. The campaign is influenced by local needs and international sectoral trends.

The 2019 National Water Week took place from 18 to 24 March under the theme "Leaving no one behind; Water for All". The theme seeks to inform policy and decision-makers, inside and outside the water community, how improvements in water resources management as well as access to water supply and sanitation services, are essential to overcoming poverty and addressing various other social and economic inequities.

Regional and international cooperation and initiatives

In line with the DWS's regional and international responsibilities in the water sector, the department entered into collaborative relationships with countries such as Lesotho, Namibia, Botswana, Zimbabwe, the Democratic Republic of Congo, Eswatini in the region.

- Mozambique and Eswatini on the Inkomati and Maputo rivers
- Botswana, Lesotho and Namibia on the establishment of the Orange Senqu River Commission
- Botswana, Zimbabwe and Mozambique on the establishment of the Limpopo Watercourse Commission
- Lesotho on the LHWP
- Eswatini on the Komati River Development Project.

These agreements improve South Africa's bilateral and multilateral relations in the African Union. All the countries involved benefit, while sharing development costs.

South Africa shares four of its major river systems with six immediate neighbouring countries, namely Botswana, Lesotho, Mozambique, Namibia, Eswatini and Zimbabwe.

In the area of shared river basins, South Africa continued participating in joint water commissions to form part of Africa bilaterals with Botswana on Joint Permanent Cooperation and with Mozambique regarding the breach of the Usuthu River, where a feasibility study was completed.

South Africa also formed global relations with countries such as Iran, China, Denmark, Russia, Mexico, South Korea, Australia, Germany, the Netherlands and Japan.

Acid Mine Drainage

Water and Sanitation launched the Eastern Acid Mine Drainage Treatment Plant, which ensures that the rising water levels in the abandoned Grootvlei mine do not contaminate groundwater.

The Eastern Basin Plant in Springs is one of the largest of its kind in the world, treating approximately 110 megalitres per day.

The plant is among the three main basins in the Witwatersrand Goldfields. These include the western basin in the Krugersdorp area, central basin in the Germiston area and the eastern basin in the Springs area. Both western and central basins have been launched and are running smoothly.

The first long-term solution to acid mine drainage was launched at the Central Basin Acid Mine Drainage Treatment Plant in Germiston in 2016. This was the commencement of several integrated projects aimed at providing a long-term solution to acid mine drainage as well as a water secure future for the economic hub of Gauteng.

The DWS launched the Eastern Acid Mine Drainage Treatment Plant, which ensures that the rising water levels in the abandoned East Rand mines do not contaminate the water resources and create other risks to society.

The Eastern Basin Plant in Springs is one of the largest of its kind in the world, treating approximately 110 megalitres per day.

The Eastern Basin Plant is located in one of the three main basins in the Witwatersrand Goldfields. These include the Western Basin in the Krugersdorp area, Central Basin in the Germiston area and the Eastern Basin in the Springs to Nigel areas. Both the Western and Central Basins were commissioned previously and are running smoothly.

In early 2018, the DWS explored options to further process water from the acid mine drainage treatment plants so that it can be directed towards advantageous socio-economic uses. A host of parallel initiatives are also underway to maximise efforts in mine water management in a manner that is sustainable and beneficial to all in the water sector.