



# 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 by regulating and supporting the delivery of effective water supply and sanitation. 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.

The DWS's strategic goals are to:

- be an efficient, effective and development-oriented sector leader by increasing the skills pool by implementing commitments contained in the sector skills plan of capacity building
- improve water-resources management by finalising the institutional framework and formalising regional entities to provide regional bulk-water infrastructure and support municipalities.
- improve the internal control environment, thus improving water resources and services information and implementing programmes that support job creation.
- provide equitable and sustainable raw water by finalising and implementing strategies that guide future priorities for water management in the country
- implement programmes to improve the efficiency of water use and oversee water infrastructure programmes that would benefit other sectors
- ensure the provision of equitable and sustainable water services of acceptable quantity and quality by regulating the quality and quantity of water services, and ensuring interim water supply in the 24 priority district municipalities.

The DWS set aside R352,4 million to help alleviate the situation in 10 drought-stricken areas of KwaZulu-Natal. Poor rainfall in most parts of the province caused river and dam levels in the region to drop. Subsequently, the KwaZulu-Natal Provincial Government declared the province a disaster area.

The DWS formed a partnership with the Department of Cooperative Governance and Traditional Affairs (CoGTA) in an effort to minimise the impact of the drought. The two departments have, together with water boards in the province, established a disaster management committee to coordinate their relief efforts.

The allocated money would be used to:

- implement water restrictions that have been imposed by some municipalities
- provide water tankers at Hazelmere

- procure generators
- fast-tracking Weza Water System water-use licence

• refurbishing ailing boreholes at UMzinyathi. Long-term measures include the augmentation of the South Coast Pipeline in the UGU District, the fast-tracking of the upgrading of Kwabani Dam, and the improvement of the Lower Thukela weir-extraction capacity. Also, feasibility studies will be done with a view to building a desalination plant north of Durban.

In February 2015, 35 Cuban water specialists arrived in the country to work in various fields of water, following an agreement between South African and Cuban governments.

This followed an agreement on cooperation in the fields of water resources management and water supply that was signed in Johannesburg by the two governments in September 2013.

In October 2014, the Deputy Minister of the DWS went to Cuba to ratify the agreement and to appoint the 35 incumbents. The specialists have been contracted to work in South Africa for two years, with the possibility of extending their stay by another year.

Among the recruits were:

- civil engineers
- electrical engineers
- mechanical engineers
- irrigation and drainage specialists
- hydraulic engineers.

The recruitment of the engineers was an elaborate process, which also involved the participation of a South African organisation of engineers that helped the department in the selection. The specialists work from the department's head office in Pretoria and in rural areas of South Africa where there are skills shortages. The experts were recruited at a middle management level. In terms of the remuneration levels of government, this would cost the Government less than half a million rand per person a year. Part of the recruitment programme involves capacity building and the experts will train and develop young engineers and technicians, which the DWS already produces through two learning academies at the department and Rand Water. The DWS diverse interventions to augment the skills gap in the water sector. In terms of the agreement, the specialists would work in the following areas:

- geo-hydrology and engineering services in rural areas and other disadvantaged areas where such services are inadequate
- exploitation of available water resources
- infrastructure for water supply capacity building through training and support of local staff

- water management and its supply.

The DWS made good progress with the preparatory work of the Lesotho Highlands Water Project Phase-2, that includes the advance infrastructure in preparation for the construction of the Polihali Dam. Water delivery from the scheme is planned to commence by 2022. The cost to implement this project is estimated at R11,2 billion.

There is also 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 Lephalale 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 also support the development of human settlements, the King Shaka Airport and the Dube Trade Port.

The raising of the Clanwilliam Dam will commence in October 2015 at an estimated cost of R2,5 billion. The raising of the dam will also include dam safety measures to ensure the stability of the embankment. The construction of the N7 re-alignment started in August 2014 and is scheduled for completion in March 2017. Three quarters of the extra water that will be available from this project will be reserved to resource poor farmers.

The DWS is proceeding with the planning of the Mzimvubu Water Project, which entails the development of a multipurpose dam, (the Ntabelanga Dam) to supply new irrigation development, and the Laleni Dam for hydropower generation, the project will also provide domestic and industrial water requirements in the Eastern Cape.

The department has initiated the raising of the Tzaneen Dam and construction of new N'wamitwa Dam for the Groot Letaba River Water Development Project in Limpopo. The

The Lesotho Highlands Water Project is a win-win situation as it provides much needed water to South Africa and creates infrastructure development and energy generation in Lesotho. In operation for over 20 years, the Lesotho Highlands Water Project supplies South Africa with about 780 million m<sup>3</sup> of water a year. Phase one of the project, which was funded by the World Bank, was completed in 2004. It has provided Lesotho with a number of benefits, including that the country will obtain guaranteed royalties revenues.

When fully operational, phase two of the project will substantially increase the volume of water supplied to South Africa. The agreement on phase two of the project between the two countries was signed in August 2011 and South Africa ratified it in 2012 while Lesotho finalised its ratification process in 2013.

total estimated cost of the project is R4,2 billion with a projected completion date of 2019.

## Legislation

The DWS published the draft regulations requiring that the abstraction of water for irrigation purposes be limited, monitored, measured and recorded for public comment.

In terms of the National Water Act, 1998 (Act 36 of 1998), the Minister of Water and Sanitation must publish regulations in terms of Section 26 of the Act, which requires that the abstraction of water for irrigation of crops should be limited, monitored, measured and recorded.

The regulations will limit the abstraction rate, prescribe procedures, give powers to authorities and define offences. These regulations are necessary for effective monitoring and enforcement of compliance to the limits and conditions of water use authorisation.

The Minister drafted and published a notice in terms of Section 69 of the Act on 12 December 2014, after consultations with various stakeholders in the water sector.

South Africa's Constitution and Bill of Rights enshrine the basic human right to have access to sufficient water and a safe and healthy environment.

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

- The National Water Act 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

Benefits from the Lesotho Highlands Water Project are:

- 102 km of paved roads
- 265 km of gravel roads
- 1 133 km of roads rehabilitated to grade 1 standard
- 11 bridges built including three bridges between Lesotho and South Africa in Maseru, Mapotsoe and Caledonspoor
- 299 km of power lines
- staff housing for an estimated 300 workers
- hydro-electricity generation estimated at 72 MW
- the Metolong Dam, to which South Africa contributed R50 million, also meets the water needs of the Kingdom of Lesotho and Lesotho gained a village and an information centre at Metolong
- high-quality water transfers and job opportunities
- improved infrastructure in Clarens, Fouriesburg, Ficksburg and Ladybrand in the form of new border crossings and improved amenities, community halls, clinics, houses and improved rail facilities such as in Ficksburg
- the project provides Lesotho with a source of income in exchange for the provision of water to Gauteng where the majority of industrial and mining activity occurs in South Africa, as well as to generate hydro-electric power for Lesotho
- South African companies have a significant presence in Lesotho and are involved in various sectors such as housing, food and beverages, construction, retail, hotels and leisure, banking, and medical services.

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.

The department is responsible for policy development, regulation and oversight of sanitation provision.

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 m<sup>3</sup> 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 resources management, the department has developed and continues to update a range of strategies for water management.

## Policies and strategies National Water Resource Strategy (NWRS)

The NWRS2 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.

This strategy moves towards the achievement and attainment of an inclusive sustainable and equitable economy.

The NWRS2 ensures that the management of national water resources contributes towards achieving South Africa's growth, development and socio-economic priorities in an equitable and sustainable manner over the next five to 10 years.

The strategy also responds to the priorities set by government in the National Development Plan (NDP) and National Water Act 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.
- 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.

In June 2014, the Lesotho Highlands Development Authority announced the expected completion of phase two of the Lesotho Highlands Project to be by mid-2023. The second phase of the major infrastructure project is expected to cost around R11,2 billion and will see the construction of Polihali Dam, a tunnel and several developments around it.

The project is a joint-programme between South Africa and Lesotho. Components such as the environmental studies, mitigation plans, resettlements and compensations were completed by the end of 2014. Some 2 500 workers were expected in the area at the height of the project. A township will be established and an existing lodge will be developed to meet the accommodation demand.

According to research published by the WRC, non-revenue water for urban supply systems was at 36,8% over the past six years, equal to 1 580 M<sup>3</sup> a year.

## Water for Growth and Development (WfGD)

The WfGD Framework points to the relationship between the availability of water and the many forms of economic activity that depend on the available supply of water of specific levels of quality.

The department's position is that the country's economic growth target cannot be achieved at the expense of the ecological sustainability of water resources or meeting people's needs.

It wishes to respond to the needs of the different economic sectors and this is best achieved when water supply and the impact of use are factored in during planning.

Rather than being an add-on or afterthought, the department's position is that the need for water has to be mainstreamed and placed at the nucleus of all planning decisions in the public and private sector.

For water to support economic growth without compromising primary needs or ecological sustainability requires adequate integrated strategic planning.

Although the WfGD framework was approved by Cabinet, it was never gazetted.

The revised NWRS-2, however, has incorporated aspects of the WfGD that pertain to water resource management as key core strategies.

## Raw Water Pricing Strategy

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

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 waste water would be managed to ensure public health safety.

### Water Bilateral Agreement

In December 2014, the Minister of Water and Sanitation went to Zimbabwe to attend the signing ceremony of the Certified Agreement on the Cooperation on Water Resources Management and the Establishment and Functioning of The Joint Water Commission between South Africa and Zimbabwe.

A joint agreement was reached to undertake a technical study to evaluate the possible water resource developments and transfer options of water from Zimbabwe to South Africa.

The two countries agreed to construct a pipeline that will draw water from Zambezi River to Cowdray Park in Bulawayo, then to South Africa.

This process saw the two countries enter into an agreement of cooperation on water resources management and the establishment of the Joint Water Commission (JWC).

The function of the established Joint Study Management Committee (JSMC) is to coordinate the implementation of the project.

The objective of the JSMC is to act on behalf of the parties in all matters relating to the oversight and management of the study, submit a report with recommendations to the parties upon finalisation of each phase of the study, and develop the terms of reference for each phase of the study.

### Rainwater harvesting

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.

## 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 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.

## Budget and funding

The total budget for the DWS for the 2014/15 financial year was R12, 480 billion.

The department's spending focus was on providing regional bulk infrastructure for water and wastewater treatment works, which link water sources to local government infrastructure.

In addition, the department will also transfer R2,6 billion in 2014/15, R3,7 billion in 2015/16 and R4 billion in 2016/17 to the Water Trading Entity through the Water Infrastructure Management programmes.

The budget was allocated as follows:

- R1, 026 billion to administration.
- R597,8 million to water sector management
- R2, 919 billion to water resource infrastructure
- R121,5 million to water sector regulation
- R7, 782 billion to the regional implementation programme
- R32, 5 million was allocated to international water cooperation.

The department is also developing a strategic sourcing and localisation strategy to focus on local content and is collaborated with the Department of Trade and Industry, National Treasury and the Economic Development Department.

## Role players

### Water boards

The primary activity of water boards is to provide water services (bulk potable and bulk waste water) 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 in South Africa.

### Catchment management agencies (CMAs)

The main responsibilities of CMAs are to manage water resources at catchment level in collaboration with local stakeholders, with specific focus on involving local communities in the decision-making processes, in terms of meeting basic human needs, promoting equitable access to water, and facilitating social and economic development.

In essence, CMAs are service-delivery agencies and are listed in the Public Finance Management Act, 1999 (Act 1 of 1999). There are nine CMAs in South Africa.

### Water-user associations (WUAs)

WUAs are cooperative associations of individual water users who wish to undertake water-related activities at local level for their mutual benefit. They operate in terms of a formal constitution as set out in Schedule 5 of the National Water Act of 1998.

### Water Research Commission

The WRC has a vital role in water research by establishing needs and priorities, stimulating and funding research, promoting the transfer of information and technology, and enhancing knowledge and capacity building in the water sector.

The commission provides support to the water sector and all its relevant institutions and partners.

Over the medium term, it will focus on water resources management, water-linked ecosystems, water use and waste management, and water use in agriculture.

Water is core to achieving the Department of Science and Technology's (DST) Global Change Grand Challenge, as well as broader national targets relating to the green economy.

The DST and the WRC are to develop the roadmap, to provide a 10-year platform for research, development and innovation in the water and wastewater sectors of South Africa.

This includes providing a platform for the country to compete with leading countries in water technology, increase the numbers of technology-based small and medium-sized enterprises operating in the water sector and increase access to water and sanitation in rural communities.

### Water Trading Entity (WTE)

The DWS is responsible for the regulation of water use in South Africa by ensuring that water is allocated equitably and used beneficially in the public interest, and is also required to create a register of all water users in the country.

The National Water Act of 1998 makes provision for cost recovery on services rendered by the department to water users. It is against this background that the department created the WTE within its administration.

The main function of the WTE is development, operation and maintenance of specific water resources infrastructure and managing water resources in specific water management areas.

### Trans-Caledon Tunnel Authority (TCTA)

The TCTA is a State-owned entity (SOE) specialising in project financing, implementation and liability management.

It is responsible for the development of bulk raw-water infrastructure. It also provides an integrated treasury management and financial advisory service to the DWS, water boards, municipalities and other entities that are linked to bulk raw-water infrastructure. The TCTA is primarily responsible for off-budget projects.

### Komati River Basin Water Authority

The Komati Basin Water Authority was established in terms of a treaty between South Africa and Swaziland. The aim of the authority is to manage the water resources of the Komati River basin sustainably. The authority is responsible for financing, developing, operating and maintaining the water resources infrastructure in the basin, comprising the Driekoppies Dam in South Africa and the Maguga Dam in Swaziland.

### Water Tribunal

The Water Tribunal was established in 1998 to hear appeals against directives and decisions made by responsible authorities, CMAs 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 partner-

In February 2014, a new research chair, sponsored by the East Rand Water Care Company (ERWAT), will focus on new innovations in water research, as well as improving the skills of researchers, engineers and technical personnel in water treatment and management. The ERWAT chair in Wastewater Management will be hosted by Stellenbosch University's Water Institute (SUWI). Professor Gideon Wolfaardt, who returned from Canada where he held a Canada Research Chair in Environmental Interfaces and Biofilms since 2004, is the first research professor to hold the chair. The focus of the new ERWAT chair will be on scientific and technical advances in wastewater management, water quality, water use and demand, as well as fostering partnerships to improve the water research and management skills of scientists, engineers and technical personnel.

ships, 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.

## Resources

South Africa's water resources are, in global terms, scarce and extremely limited. The total flow of all the rivers in the country is about 49 200 million m<sup>3</sup> a year. Groundwater plays a pivotal role, especially in rural water supplies.

The country's climate varies from desert and semi-desert in the west to sub-humid along the eastern coastal area, with an average rainfall of about 450 mm per year. This is well below the world average of about 860 mm per year, while evaporation is comparatively high.

Water resources are unevenly spread across South Africa. The variable rainfall distribution and characteristics give rise to an uneven run-off and distribution of water resources, with more than 60% of the river flow arising from only 20% of the land area.

To compensate for the uneven spread of water resources and to manage floods and droughts, more than two-thirds of the country's mean annual run-off are stored in dams. Most of the economically available yield from surface water resources has been fully developed and used, and opportunities for developing new and economic dams are few.

South Africa's inland water resources include 22 major rivers, 165 large dams, more than 4 000 medium and small dams on public and private land, and hundreds of small rivers.

However, owing to the predominantly hard-rock nature of South Africa's geology, there are few major groundwater aquifers that can be used on a large scale.

The poor spatial distribution of rainfall means that the natural availability of water is also highly uneven. This is compounded by the strong seasonality of rainfall over virtually the entire country, and the high within-season variability of rainfall, and consequently, of run-off.

As a result, stream flow in South Africa's rivers is at relatively low levels most of the time, with sporadic high flows occurring – characteristics that limit the proportion of stream flow, which can be relied upon to be available for use, and which also have implications for water-related disasters such as floods and droughts.

To aggravate the situation, most urban and industrial development, as well as some dense rural settlements, have been established in remote locations away from large watercourses.

As a result, the requirements for water already far exceed its natural availability in several river basins. Widespread and often large-scale transfers of water across catchment areas have, therefore, been implemented.

Provided that South Africa's water resources are judiciously managed and wisely allocated and used, sufficient water of appropriate quality will be available to sustain a strong economy, high social standards and healthy aquatic ecosystems for many generations.

South Africa depends mainly on surface-water resources for urban, industrial and irrigation water supplies in the country. In general, surface-water resources are highly developed in many parts of South Africa.

Groundwater is also extensively used, particularly in the rural and more arid areas, contributing to some 60% of newly serviced households since 1994.

In the northern parts of the country, both surface and groundwater resources are nearly fully developed and used. Some over-exploitation occurs in localised areas, with little undeveloped resource potential remaining. The reverse applies to the well-watered south-eastern region of the country, which still has significant undeveloped and under-used resources.

The total mean annual run-off of water in South Africa under natural (undeveloped) conditions is estimated at a little over 49 200 million m<sup>3</sup> per year, including about 4 800 million m<sup>3</sup> per year of water originating in Lesotho, and about 700 million m<sup>3</sup> a year originating in Swaziland, which naturally drain into South Africa.

Agricultural irrigation represents close to 60% of the country's total water requirements, while urban requirements constitute about 25% as the second-largest user sector. The remaining 15% is shared by the other sectors (all standardised to 98% assurance of supply).

The total net abstraction of water from surface water resources amounts to about 10 200 million m<sup>3</sup> per year for the whole of South Africa, after allowing for the reuse of return flows.

A further 8% is estimated to be lost through evaporation from storage and conveyance along rivers, and 6% through land-use activities. As a national average, about 66% of the natural river flow (mean annual run-off) therefore still remains in the country's rivers.

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.

## 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 500 government-owned dams countrywide. They range in storage capacity from a volume of 5 500 million m<sup>3</sup> of water down to 0,2 million m<sup>3</sup> of water.

South Africa uses about 10 200 million m<sup>3</sup> of water per year from its major dams. 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.

Government has implemented key projects to augment South Africa's water resources, such as:



- The TCTA has procured funding to implement the Mokolo and Crocodile River West Water Augmentation Project's first two phases at a cost of about R2 billion, to deliver water to Eskom's new Medupi power station and other industries in the area, as well as domestic water to the Lephalale Local Municipality. The first water delivery was in 2014.
- The Bloemendal Bulk Water Project helps to address issues of water-borne diseases and water shortages in Delmas, in the Victor Khanye Local Municipality. The bulk-water project is part of the government's drive to bring services to the people of the country. The project is designed to supply 25 Ml/d (potable water) and is sufficient to meet water demand in the service area up to 2026. The new project incorporates a 10 Ml reservoir located at mid-point of the new pipeline and is designed to improve system operation as well.
- The Spring Grove Dam in Mooi River, KwaZulu-Natal supplies water to the eThekweni Metropolitan Municipality and the uMgungundlovu District, Msunduzi Local, Ugu Local, Sisonke and iLembe local municipalities.
- In March 2014, the completed phases of the Inyaka Integrated Water Supply Scheme in Bushbuckridge, aimed at supplying water to 15 additional villages in the Bushbuckridge local municipality in Mpumalanga, was unveiled. These 15 villages are additional to the 58 that were supplied from the treatment works prior to the completion of phases three and four of the project. It will serve a population of around 850 000 people. A total of 423 jobs were created of who 76 were women and 270 people were trained in the process. The Thulamahashe line, which has a demand for 32Ml/d, would receive supply from the Inyaka Water Treatment Works. The Thulamahashe Bulk Pipeline will eventually supply 44 villages from the area of Dwarsloop to Hlalakahle around Gottenburg. The reticulation work was completed by the end of May 2014 to service the remaining villages.
- In April 2014, President Zuma turned the first sod of the R12,45-billion Mzimvubu Water Project in Tsolo Junction. The Mzimvubu project will include the construction of two dams: one in Ntabelanga on the Tsitsa River, which will be used for domestic and agricultural water supply requirements. The Ntabelanga dam will store about 490 million m<sup>3</sup> of water. Once completed, it will become the 10th largest dam in South Africa. The other dam to be built is the Laleni dam, which will be used for hydro power generation. The dam

has the potential to generate 35 MW of base power, or up to 180 MW of peaking power when operated jointly with Ntabelanga dam. About 18,5 km of power lines will be erected to feed the power onto the national power grid.

- The Pilanesberg Bulk Water Supply Scheme, which will benefit 57 villages in the Moses Kotane and Rustenburg Local Municipalities was launched in April 2014. The multimillion rand project is good news for job creation, as it will also support the local mining industry.

### Groundwater resources

Groundwater, despite its relatively small contribution to bulk-water supply (13%), 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.

Owing to the lack of perennial streams in the semi-desert to desert parts, 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 estimated at about 6 000 million m<sup>3</sup> a year, while some 4 000 million m<sup>3</sup> of groundwater (mainly in the dry season) contributes to surface-water flow annually.

### 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-quality 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 waste water.

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 department 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.

## Blue Drop Programme

South Africa's drinking-water quality matches best international practice and follows the guidelines set out by the World Health Organisation. As it involves a benchmark score of 95%, the Blue Drop certification is the recognition of exceptional performance, and should not be equated to a pass mark. It credits exceptional drinking-water quality.

## Green Drop Programme

The Green Drop certification measures the performance of waste-water treatment works.

The 2013 Green Drop Report indicated that 41% of the 914 water supply systems assessed require attention. Similarly, 55% (or 821) waste-water treatment works require serious, critical and urgent refurbishment.

On-site sanitation systems provided in mostly rural areas have been found to be relatively robust, with inadequate provision for pit emptying.

## Programmes and initiatives "No Drop" assessments

To reduce leakages from the water supply networks and boost the efficiency of water use the DWS implemented "No Drop" assessments across all municipalities in South Africa.

The report assessment programme would be rolled out to municipalities from October to March 2014, with the results of the first assessments to be published in the *Blue Drop/No Drop Report* in 2014.

Thereafter, the results, which would provide the public and the water sector with audited and verified information on water use, water loss and efficiency of water used and managed within a municipality, would be released every two years.

The supply-demand curve shows that South Africa will face a supply-demand deficit of around 17% representing 3,8 billion kilolitres of water by 2030.

Ageing infrastructure, inadequate maintenance and repairs to existing infrastructure, slow responses to water leaks and bursts, shortcomings in technical competency in municipalities and a culture of water wastage challenge the water sector.

Data from 132 municipalities – 75% of the total volume of municipal water supply – revealed that the level of nonrevenue water reached 36,7%, of which 25,4% was considered to be losses via physical leakages.

The War on Leaks campaign has the express aim of putting a stop to water leaks in households, schools, clinics and other public buildings. From March 2014, different municipalities across the country implemented the project, a move that will go a long way to help government save money, as water leaks amount to R7 billion a year. Apart saving water by eliminating unnecessary wastage, a big spin off of the project was job creation. The project saw about 200 youths trained in basic plumbing, which in return created job opportunities for them. The youth fixed leaking pipes in households, schools and public buildings.

## 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 to 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.

## Brits Water Treatment Works

The DWS, working together with the Madibeng Local Municipality, set aside R381 million to address water challenges in Majakaneng through the upgrade of the Brits Water Treatment Works (BWTW) which also supplies the Majakaneng area.

The upgrade of the BWTW includes the replacement of sand filters, which was completed in July 2014 by Magalies Water. The works will ensure that the BWTW has an additional production capacity of 20MI/d. Work is underway at the BWTW with civil works (Phase 1), which will be implemented by DWS Construction Unit as contractors and two professional service providers have been appointed for electrical and mechanical works.

The Phase 1 of the BWTW is expected to be completed by August 2015 and Phase 2, which includes mechanical and electrical, will follow thereafter, while the entire upgrade of the BWTW is expected to be completed by 2017/18.

In the short-term, DWS allocated R1,1 million to the Madibeng local municipality to address the water challenges in Majakaneng, which are mainly attributed to vandalism and leakages in the water supply system.

The Madibeng Local Municipality embarked on leak detection exercises and filling the reservoirs. The municipality commenced with distribution of water to identify and repair visible leaks. This required isolation of certain sections of Majakaneng and it was expected not all sections to have water.

DWS and Madibeng Local Municipality will continue to work together to deal with the water leakages, which cause low water pressure in Majakaneng and as a result some areas experienced water shortages.

In August 2014, the Colesberg Waste Water Treatment Works in the Umsobomvu Local

Municipality was launched. The plant, which was completed last year, was built at a cost of R23 million to purify sewage from the local communities. The communities of Colesberg in the Northern Cape, welcomed the announcement that water shortages and lack of proper sanitation will soon be a thing of the past, as the Minister of Water and Sanitation announced multimillion rand water projects for the region. The water projects will include upgrading the old water infrastructure, which was initially designed to supply water to small communities. Colesberg is known for the low levels of rain it experiences, thus its dependence primarily on the flow of the Orange River that runs through it.

## National Water Resources Infrastructure (NWRI) Programme

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

Some augmentation projects were identified and prioritised for implementation by 2014. These includes:

- emergency works in Mopani
- construction of the Nwamitwa Dam in the Groot Letaba Water Augmentation Project
- raising the Tzaneen Dam in the Groot Letaba Water Augmentation Project
- the Mdloti River Development and raising of Hazelmere Dam
- the Mokolo from Crocodile River (West) Water Augmentation Project Phase 1
- the Nandoni Pipeline Project
- raising the Clanwilliam Dam in the Olifants-Doorn River Water Resources Project
- phase two of the Olifants River Water Resources Development Project
- the Komati Water Augmentation Project
- phase two of the Mooi-Mgeni Transfer Scheme
- the Vaal River Eastern Sub-System Augmentation Project.

The NWRI Maintenance Programme ensures the availability of water for domestic use.

The following progress was made:

- nine out of 25 national dams were rehabilitated
- seven of 28 water conveyance projects were completed, measures were put in place to expedite the process to meet the 2014 targets
- following the process of verification to determine safety, health and environment, about 91 dams with a safety risk were classified
- a total of 195 dams were identified for safety risks.

## Regional Bulk Infrastructure Grant Programme

Regional bulk infrastructure is defined as the infrastructure required to connect water on a macro or sub-regional 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 department is responsible and accountable for the management of funding, which is administered by the National Treasury.

Over 16 000 households will benefit from the R52 million Makapanstad and Mathibestad Bulk Water Project, which aims to address water shortages in villages in the Moretele Local Municipality in North West.

Upon completion, the project will address water shortages in the villages of Kwa-Mmatlwaela, Tladistad, Leeukraal, Kgomo-Kgomo, Kontante, Moretele, Makapanstad, Phomolong, Potoane, Prieska, Mathibestad, Thulwe and Opperman.

The Mathibestad and Makapanstad Bulk Water Project is funded through the Provincial Infrastructure Grant and Municipal Infrastructure Grant.

## Strategic integrated projects (SIPs)

SIP 18 aims to address water supply and sanitation backlogs to millions of households.

SIP 18 was approved by the Presidential Infrastructure Coordinating Commission (PICC).

The PICC's 18 SIPs, which 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, 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, which is 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 2100 M<sup>3</sup>/d, which will accommodate the region's projected growth in water demand to 2030.

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

The KWSAP augments the Komati Water Scheme from the Vaal Eastern Subsystem to help Eskom overcome its water supply challenges. The Matla power station reservoir will in turn also provide water to Kusile power station, which is under construction.

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 KWSAP will be able to deliver an additional 57 million m<sup>3</sup> of water a year to the Komati Water Scheme. On the department's instruction, the TCTA is financing and implementing the project. The project 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.

The municipalities of Mohokare, Letsemeng, Tokologo, Dihlabeng, Phumelela and the Sterkfontein Dam Water Scheme are included in Strategic Infrastructure Project 18 of the PICC.

Various strategic projects of the DWS include:

- The Bulk Water Schemes in the Xhariep District, namely Phase 2 of the Jagersfontein/Fauresmith and Rouxville/Smithfield/Zastron projects. Regional Bulk Water Schemes in the Masilonyana and Tokologo local municipalities

In December 2014, the Department of Water and Sanitation implemented a refurbishment project at the Standerton Water Treatment Works to improve the water quality and quantity of the plant, to improve service to the Lekwa Local Municipality.



in the Lejweleputswa district and the Moqhaka Local Municipality in the Fezile Dabi district.

- Regional Bulk Water Schemes in the Setsoto, Dihlabeng and Phumelela local municipalities, the Sterkfontein Dam Scheme and the Nketoana Regional Water Scheme Augmentation in the Thabo Mofutsanyana district.
- Significant progress with the refurbishment of water and wastewater treatment works, including those at Bethlehem and Saulspoort, Ficksburg, Vredefort, Heilbron, the Matjhabeng and Moqhaka local municipalities.
- the upgrade of the Jacobsdal raw-water pipeline
- refurbishment at the Clocolan pump station
- upgrade of Ficksburg sewerage network
- refurbishment of the waste-water treatment works of Wepener.

The Mangaung Metropolitan Municipality embarked on an extensive programme aimed at eradicating ventilated improved pit toilets (VIP) and pit latrines, specifically in Botshabelo and Thaba Nchu. In addition, an extensive programme aimed at extending the bulk water and sewer purification plants will be implemented.

The De Hoop Dam in Limpopo was officially opened in March 2014; the Komati Water Augment Project, which provides Eskom's Duva and Matla power stations Spring Grove Dam in KwaZulu-Natal was completed in 2014.

In North West, the first phase of the R1,2 billion Pilaesberg scheme was implemented in May 2013, in partnership with the mines to provide a further 100 Mℓ of water for the benefit of local municipalities and mines. About 700 direct jobs were created, while new mining developments will open up 6 000 indirect permanent jobs.

In the Free State, R156 million was spent on two new pipeline projects that will supply additional water to the Botshabelo and Thaba Nchu municipalities as well as Mangaung Metropolitan Municipality during 2014.

The department was processing draft reforms to the National Water Act of 1998 while a review of the NWRS had been successful.

### Support for resource-poor farmers

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

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.

### Rainwater harvesting

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

### 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.

### Youth water Summit

The department hosted its sixth annual Youth Water Summit in 2014. The purpose of the summit was to motivate youth to study maths, science, and technology.

More than 600 delegates from all nine provinces attended, including children, educators, sponsors, and partners.

At the end of the summit, an awards ceremony was held where bursaries, laptops and prize money were given away fully equipped media classroom worth R2 million was won by Qumba Junior Secondary School in the Eastern Cape.

Since the inception of this programme, 46 media classrooms have been won and this has made a big difference in rural communities where the gap between the poor and the rich is being bridged.

The winners of the South African Youth Water Prize went on to represent the country during the World Water Week event in Stockholm, Sweden between 31 August and 5 September 2014.

### 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

The DWS was swamped by requests from ambitious, determined and young qualified engineers who wanted to work for the water sector and be part of efforts to enhance the quality of the resource delivered to the needy citizens.

One of the main areas in DWS that experiences a dire shortage of skills and expertise is the engineering function. The academy has made huge strides in attracting young engineers to the department.

By 2014, 57 engineers have been offered an opportunity to participate in the Professional Development Programme. Three of these engineers have managed to register as professional Engineers, while others are on various levels to meet the required 11 outcomes of the Engineering Council of South Africa (ECSA).

To boost the programme, 20 newly qualified engineers joined the Learning Academy (LA) in January 2015. They completed the Department of Public Service and Administration's compulsory induction programme. They received training at the DWS Roodeplaat Training Centre, and reported for duty at their various base stations from 2 February 2015.

The function of DWS is of great strategic importance to the South African society. The level of productivity within DWS and the water sector as a whole has a direct effect on the South African economy.

The LA is an internal structure, which was initiated in 2007 as a response to a shortage of specific skills needed to boost the production of the department (and that of the water sector in general) through its technical and scarce-skills development programme. This technical structure represents an investment for sustaining the quality of DWS human resources, raising the level of technical and scarce skills and thereby ensuring that, in the long term, the department remains competitive as it delivers on its mandate.

The LA is designed to meet specific organisational requirements and lead a sustained campaign to secure a steady supply of high-level skills in water-related science, engineering, and various technical disciplines.

The LA supports the academic development component through bursaries and experiential training. The professional development component forms part of DWS social responsibility in that it incubates young and inexperienced graduates – offering them an opportunity to receive on-the-job training and exposure in

their areas of study, while introducing them to the DWS core business.

The purpose of the LA can be summarised as follows:

- 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 ECSA, the South African Council for Natural and Scientific Professions and the Surveying Council of South Africa in line with the Occupations Specific Dispensation.

## 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 m<sup>3</sup>. Measures to improve efficient water use in the catchment areas were also undertaken and the volume of water loss was reduced to 32 million m<sup>3</sup>.

## Enhanced Local Government Support Approach

A rapid response unit in the department addresses poor performance of water and waste-water 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 specialists within the unit 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 treatments 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 Freshwater 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.

This 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 the cellular short-message system. The data is updated daily on the department's website at [www.dws.gov.za](http://www.dws.gov.za).

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 increasing 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.

### River Health Programme (RHP)

The *River Health Report* will be used for assessing the pattern of water quality. Generally, water quality is good in the upland regions and deteriorates downstream, particularly in areas affected by mining and urban development. Because of the longitudinal nature of rivers, poor water quality may extend far downstream of the source of pollutants.

The RHP was implemented in all nine regions, comprising 48 projects.

Products of the RHP have attracted wide attention and recognition, and provide strategic water-resource management information and training material for use in schools and universities, as well as in awareness creation.

The implementation of resource-directed measures, such as ecological water requirements/reserve, the classification of water resources and setting resource quality objectives as part of water-use authorisations, also indicated a need for the massification of natural-resource management programmes.

These include Working for Water, Working for Wetlands, Working on Fire, Working for Woodlands and Working for Energy, which are key components of the management of water quantity and quality in South Africa.

The RHP is part of the National Aquatic Ecosystem Health Monitoring Programme initiated in 1994.

Based on the information obtained from the RHP, four compared to the planned two major rivers were rehabilitated namely the:

- Buffalo River in the Eastern Cape
- Luvuvhu River in Limpopo
- Hart River in the Northern Cape
- Berg River in the Western Cape.

Two more rivers, in the Eastern Cape and Limpopo, were identified as flagship projects.

## National Aquatic Ecosystem Health Monitoring Programme (NAEHMP)

The NAEHMP is responsible for managing aquatic ecosystems. It focuses on the biological attributes of a river that serve as indicators of its ecological health. The rationale for initiating a biomonitoring programme is that the classic approach of monitoring only physical and chemical water-quality attributes was inadequate for generating information on the overall health of an aquatic ecosystem. Monitoring chemical attributes alone was found to be insufficient to detect, for example, the cumulative effects on aquatic ecosystems of extended exposure to multiple stressors.

Such stressors include habitat alteration, barriers that alter stream flow, water abstraction and alien species being introduced. Aquatic communities (for example, fish, riparian vegetation and aquatic invertebrate fauna), however, are adapted to live within a certain range of environmental conditions.

If healthy and diverse biological communities inhabit it, the watercourse as a whole is considered to be ecologically resilient and healthy. However, from an RHP point of view, a healthy water resource does not guarantee the fitness of that resource for domestic, recreational, industrial and agricultural use.

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 department 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.

## National Chemical Monitoring Programme

The National Chemical Monitoring Programme 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.

## 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.

## Education and awareness

### Youth development and National Water Week

National Water Week is an awareness campaign by the DWS to highlight the value of water, the need for sustainable management of this scarce resource and the role water plays in eradicating poverty and under-development in South Africa.

The campaign continues building on ongoing awareness creation within the broader South African community.

In 2014, Water Week was observed from 17 to 23 March under the theme *Water is Life – 20 Years of Water Delivering for Social and Economic Development*.

National Water Week celebrations raises awareness of the potential for increased cooperation and the challenges facing water management in view of the increase in demand for water access, allocation and services.

The aim is to highlight water cooperation initiatives, and identify crucial issues concerning water education, water diplomacy, transboundary water management, financing cooperation, national/international legal frameworks, and the linkages with the millenium development goals.

## Regional and international cooperation and initiatives

South Africa has signed cooperative agreements with a number of countries in the southern African region with which it shares water resources, such as:

- Mozambique and Swaziland 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 Lesotho Highlands Water Project
- Swaziland 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, Swaziland 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.

As President of the African Ministers Council on Water (AMCOW), South Africa made significant contributions towards the council's work through its strong leadership in financial and staff regulations. South Africa provided leadership in the preparation of a triennial workplan, which has instilled donor confidence in AMCOW's programmes.

The DWS facilitated a workshop on water between South Africa and Japan, to share and exchange technical information and opportunities. This has led to the signing of a joint resolution between South Africa and the Japan Ministry of Land, Infrastructure, Transport and Tourism to encourage and strengthen mutual cooperation in water management.

South Africa has entered into a partnership with the World Economic Forum. The Strategic Water Partners Network was established, focusing on the water efficiency supply chain, with a focus on agriculture and water quality.

The Inga Hydro-Electric Project could become the largest hydro-electric project in the world, and is expected to generate a massive 40 000 MW of electricity – more than the current electricity generation in South Africa.



