



WATER AFFAIRS

SOUTH AFRICA
YEARBOOK

2010/11

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Water is at the heart of economic growth and social development. In the quest to identify opportunities for new areas of growth and economic participation and to set the country on a new trajectory of growth and development, the central role of water is recognised by government's Medium Term Strategic Framework 2009/10.

The Department of Water Affairs continues to focus on meeting water targets; managing South Africa's scarce water resources for long-term sustainability; improving the regulatory and institutional environment; spearheading transformation in the water sector; and supporting the development of water-resources infrastructure. Ongoing key challenges include the department's role as a sector leader for water services.

While striving to ensure that all South Africans gain access to clean water and safe sanitation, the water sector also promotes effective and efficient water-resource management to ensure sustainable economic and social development.

Government aims to put in place measures to reduce South Africa's water loss by half by 2014.

Hydrological conditions

South Africa is classified among the driest countries by world standards. It is located in a predominantly semi-arid part of the world.

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.

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.

The country's water resources are, in global terms, scarce and extremely limited. The total flow of all the rivers in the country combined amounts to about 49 200 million cubic metres (m³) per year. This is less than half of that of the Zambezi River, the closest large river to South Africa. Groundwater plays a pivotal role, especially in rural water supplies.

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 across the country 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 for most of the time, with sporadic high flows occurring – characteristics which limit the proportion of stream flow that 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 catchments have, therefore, been implemented in South Africa.

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

Over the years, water-resource development and management in South Africa have continuously evolved to meet the needs of a growing population and a vibrant economy, within the constraints imposed by nature. These developments have largely been made possible by recognising water as a national asset, thereby allowing its transportation from where it is available to where the greatest overall benefits for the nation can be achieved.

Sufficient water resources have been developed and are available to ensure that all current 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



Important dates:
World Wetlands Day: 2 February
National Water Week: 19 to 25 March
World Water Day: 22 March

and anthropogenic impact. However, most major aquifer systems contain potable-quality water.

Measures will also be introduced to ensure the most beneficial and efficient use of water in the country from a social and economic perspective.

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 the urban, industrial and irrigation water supplies in the country. In general, surface-water resources are highly developed over most 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 overexploitation occurs in localised areas, with little undeveloped resource potential remaining. The reverse applies to the well-watered south-eastern region of the country where there are still significant undeveloped and little-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 m³ per year, including about 4 800 million m³ per year of water originating from Lesotho, and about 700 million m³ per year originating from Swaziland, which naturally drain into South Africa. Agricultural irrigation represents close to 60% of the total water requirements of the country, 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 m³ per year for the whole of South Africa, after allowing for the reuse of return flows. This represents about 20% of the total mean annual run-off of 49 200 million m³ per year (all standardised to 98% assurance of supply). 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.

Water-resource management and development

The key challenge to the achievement of the mandate of the Department of Water Affairs is to manage the seemingly conflicting demands linked to this mandate: the ever increasing demand versus diminishing supplies; developing new sources of water versus maintenance of existing ones; and providing for industrial growth versus providing all South Africans, especially the underserved.

To resolve these apparent conflicts and to avoid the traditional fragmented approach (handling one aspect of water management to the exclusion of others), the department adopted the Integrated Water Resources Management (IWRM) approach, which provides a more holistic approach to water management.

The IWRM requires intensive planning to ensure efficient, equitable, and sustainable management of water resources and for coping with conflicting demands. The department developed two key strategic frameworks to guide it, namely the National Water Resource Strategy (NWRS) in South Africa of 2004, and the Water for Growth and Development Framework of 2008. The strategy seeks to achieve reconciliation between available water resources with growing requirements.

The Water for Growth and Development Framework guides actions and decisions that will ensure water security in terms of quantity and quality to support South Africa's requirements for economic growth and social development.

In 2010, the department, in close collaboration with the provinces and local government, embarked on reconciliation studies to assess the availability, use and future requirements for water, and how these can be reconciled. Scenarios of future demands were developed and measures planned to meet these future needs, taking cognisance of the possible impact of climate change.

The strategies will be continually updated and adjusted as the actual demand manifests itself. A key finding in all these strategies is that extensive programmes for the more efficient use of water will have to be implemented. Major infrastructure developments (dams and related infrastructure) are also part of these strategies.

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

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

The Department of Water Affairs recognises that a sustainable reconciliation of supply and demand for water as well as for quality and quantity requires a robust focus on regulation. Regulation in certain priority areas such as drinking-water quality and access to services has started and the department has also initiated an electronic Drinking Water Quality Management System, which provides the first national overview on the status of municipal drinking water quality and performance of wastewater treatment works (WWTWs).

As issues of water security (quality and quantity) and regulation have emerged as major concerns in the water sector, the need for the department to become visible as sector leader as well as regulator has been illuminated. The department aims to embark on a targeted skills development programme for the sector.

This will entail skills-gap analysis, integration of already existing interventions, and enhancement of partnerships with the Department of Higher Education and Training, the department's public entities and institutions of higher learning.

The department also aims to build internal capacity required to regulate the technical, economic, environmental and social aspects involved in providing water services.

Going forward, the department has developed separate strategic plans for the two institutions, namely the Main Exchequer Account and the Water Trading Entity, with effect from April 2010.

The department has identified a set of priority areas, which are aimed at contributing to the governmentwide priorities that are outlined in the Medium Term Strategic Framework document, 2009 – 2014, namely:

- Contributing to economic growth and social development:

In 2010, the Department of Water Affairs assessed the condition of all national

water-resources infrastructure and established that a backlog of R10 billion had developed. The Dam Safety Rehabilitation Programme, which commenced in 2005, will be continued, and planned rehabilitation works will be completed at 25 dams to address this backlog.

A similar programme to rehabilitate water-conveyance infrastructure was also started.

The department plans to complete seven new bulk raw-water augmentation projects to support sustained economic growth and meet growing social water needs.

Surveys done in partnership with local governments also established huge backlogs in the rehabilitation/refurbishment of the regional bulk water and sanitation infrastructure owned by municipalities.

Major dams of South Africa

Dam	Full supply capacity (10 ⁶ m ³)	River
Gariep	5341	Orange
Vanderkloof	3171	Orange
Sterkfontein	2616	Nuwejaarspruit
Nuwejaarspruit	2603	Vaal
Pongolapoort	2445	Pongola
Bloemhof	1264	Vaal
Theewaterskloof	480	Sonderend
Heyshope	451	Assegaai
Woodstock	380	Tugela
Loskop	361	Olifants
Grootdraai	354	Vaal
Kalkfontein	318	Riet
Goedertrouw	304	Mhlautze
Albert Falls	288	Mgeni
Brandvlei	284	Brandvlei
Spioenkop	277	Tugela
Mthatha	253	Mthatha
Driekoppies	250	Lomati
Inanda	241	Mgeni
Hartbeespoort	212	Crocodile
Erfenis	207	Groot Vet
Rhenosterkop	204	Elands
Molatedi	22	Groot Marico
Ntshingwayo	198	Ngagane
Zaaihoek	192	Slang
Midmar	175	Mgeni

Source: Department of Water Affairs

The department embarked on a programme to address these backlogs.

A revision of the Water Pricing Strategy is required to improve the financial viability of government bulk raw-water business.

- Ensuring sustainable and equitable water-resources management:

The department developed dynamic planning instruments, which place a strong focus on determining future water needs and balancing these with water availability.

The application of these reconciliation strategies in different parts of the country ensures that the department is able to anticipate and address future demands without compromising any aspect of water needs.

Through its various water-status analysis programmes, the department will ensure the availability of reliable information to better support cross-sectoral planning and development initiatives.

The department will focus on: developing water-reconciliation strategies; collecting and analysing information on water resources; and improving water-use efficiency through the implementation of water conservation and demand management interventions.

The department will further strengthen compliance monitoring and enforcement capacity to deal with the illegal use of water. The Department of Water Affairs will work in partnership with the Department of Environmental Affairs to establish dedicated courts to deal with environment-related matters and also environmental prosecution forums.

- Promoting rural development:

As part of the Expanded Public Works Programme (EPWP), the Natural Resource Management Programme has been implemented as an intergovernmental programme aimed at providing job opportunities and training to unemployed people across the country.

These programmes include the following projects: Working for Water (WfW) and Working on Fire (WoF). The value-added industries are a component of WfW that is a partnership between WfW, KwaZulu-Natal Invasive Alien Species Programme and the EPWP. The programme is becoming a big initiative in its own right and it is set to expand across the country, providing work opportunities through the use of invasive alien biomass.

Water-quality management

Historically, investment by the Department of Water Affairs in securing water supplies took the form of dams, reservoirs and accompanying infrastructure. Most of the best dam sites have been developed and there is very little further potential apart from some parts of KwaZulu-Natal and the Eastern Cape.

With the emerging findings of the reconciliation strategies and potential water shortages in South Africa's largest urban centres, the department must consider other viable water supplies to serve the varying needs of each water-reliant sector. Apart from traditional augmentation schemes, other water-supply options include effluent re-use, desalination and inter-basin transfers. Demand-supply options include water-loss control and water-use efficiency.

Water quality is highly variable in rivers, wetlands, estuaries and groundwater reserves, and with uneven focus and measurement on these different systems (the strongest focus being on dams). The major threats to water quality in aquatic environments are:

- mine drainage
- eutrophication
- municipal sewage effluent
- salinisation
- agrichemicals
- toxic organic pollutants (including persistent organic pollutants, endocrine disruptors and cyan bacterial toxins)
- climate change
- water abstraction
- invasive alien plants.

Impact on aquatic ecosystems and loss of wetlands raised public concerns about the status of the quality of the country's water resources. Steps have been taken to strengthen its compliance enforcement and monitoring as a way of clamping down on water-use behaviour that has a detrimental impact on water resources.

It was also identified that a key challenge to sustained and healthy water supplies is the poor maintenance of the WWTW, and the department will work closely with core departments to ensure that adequate funding is provided for the purposes of the WWTW rehabilitation and construction. The department will also take rapid and effective action to address the threat the mine drainage poses to the immediate and long-term integrity of water quality.

Water and sanitation

The percentage of households with access

to water infrastructure above or equal to the Reconstruction and Development Programme standard increased from 61,7% in 1994 to 91,8% in March 2009. This means that South Africa has surpassed the Millennium Development Goal (MDG) of halving the proportion of people without sustainable water and is likely to achieve the 2014 goal of universal access to potable water, despite the challenge of ever-increasing number of households.

Government is deploying the municipal drinking-water management system in all water-services authorities (WSAs) to ensure that the water is of good quality across municipalities.

Government has moved closer to attaining its objective of eradicating the bucket system in formally established settlements. The target date for universal access to sanitation is 2014.

The Regional Infrastructure Bulk for Water Services is a target support programme for WSAs to supplement the financing for the development of regional bulk water infrastructure, regional bulk sanitation collection as well as regional water-treatment works and WWTW.

The following water schemes were completed and these will improve access to 222 142 people:

- Mbashe District Municipality, Eastern Cape
- Mathulini Bulk Water Scheme, KwaZulu-Natal
- Greater Mthonjaneni, KwaZulu-Natal
- Van Wyk Vlei Bulk Water Scheme, Northern Cape
- Van der Kloof/Petrusville, Northern Cape
- Makwasi Hill Bulk Water Scheme, North West.

Furthermore, the programme has created a total of 6 342 employment opportunities.

Freshwater Ecosystem Programme

The Freshwater Ecosystem Programme aims to expand and consolidate the freshwater activities within the South African National Biodiversity Institute (Sanbi).

This includes the management of the Working for Wetlands Programme on behalf of the departments of water affairs; of environmental affairs; and of agriculture, forestry and fisheries. Working for Wetlands champions the protection, rehabilitation and sustainable use of South Africa's wetlands through cooperative governance and partnerships.

Recognising the value and threatened status of South Africa's freshwater biodiversity, and the need to build competence and leadership in this area, Sanbi has established a programme focusing on freshwater biodiversity.

The Freshwater Programme will provide a home for the National Freshwater Biodiversity Collaboration, Working for Wetlands, the National Wetland Inventory and other relevant initiatives, that promote integration, coordination and synergy.

In 2010, the programme concentrated on supporting collaborative freshwater initiatives such as the National Freshwater Ecosystems Priority Areas Project, a wetland 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 was further development of strategic relationships with other organisations with shared objectives, especially the Department of Water Affairs.

Monitoring water resources

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

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

A new initiative to monitor precipitation in mountainous areas has been launched. There are 21 operational rainfall stations in the mountains of the Western Cape and five stations are operational 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.dwa.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 is in operation to monitor 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 need to be strengthened through improvements in land-use planning, land and development management policies as well as operational and regulatory means at various scales (national, provincial and local levels).

The adoption of ecosystem-based approaches and aggressive implementation of the open-space planning and management programmes will add impetus in the protection of these systems and associated services, especially at a local government level. Such implementation will require integrated approaches and the involvement of multiple sectors, particularly those dealing with human settlements, development and planning.

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 implementation of resource-directed measures (that is, ecological water requirements/reserve, the classification of water resources and the setting of resource quality objectives as part of water-use authorisations) also indicated a need for the massification of natural-resource management programmes such as WfW, Working for Wetlands, WoF, Working for Woodlands and Working for Energy as these are key components of the management of water quantity and quality in South Africa.

Compliance monitoring and enforcement is expected to improve through the use of legislation, incentives, disincentives, advocacy and research. Other specific interventions include:

- implementing the ecological water requirements/reserve
- empowering water managers to understand the water balance for water-use licence applications
- streamlining and synchronising procedures for reserve determinations, to facilitate the provision of ecological water requirements and River Health Programme (RHP) information at numerous nodes within a catchment area
- investing in capacity and data that will enable sufficiently considered decisions to be taken
- making the necessary investments in at least two catchments/subcatchments, where resource-directed measures, environmental planning and implementation are undertaken to demonstrate the value of water for growth and development and securing these across the country.

National Aquatic Ecosystem Health Monitoring Programme (NAEHMP)

The NAEHMP is responsible for managing aquatic ecosystems.

The NAEHMP 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.

These organisms' biological communities integrate, respond to and reflect the effects of chemical and physical disturbances that occur in aquatic ecosystems over extended periods, and provide a direct, holistic and integrated measure of the ecological integrity of a river.

If healthy and diverse biological communities inhabit a watercourse, the watercourse as a whole is considered to be ecologically resilient and healthy. However, from a 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 is supporting the security of its water supply by ensuring the completion of major new water projects around the country by 2014.

The new projects include the Mokolo Augmentation Project to supply water to the planned Medupi Power Station in Lephalele in Limpopo, and the Mooi-Mgeni Transfer Scheme Project, which would include the construction of the Spring Grove Dam around eThekweni/Durban and Umgungundlovu in KwaZulu-Natal.

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, and in particular the RHP, is regarded as the "flagship" for water-resource quality monitoring in South Africa. 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 National Chemical Monitoring Programme assesses and reports on the chemical status of water resources in South Africa. Based on a report produced in 2002, 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 due to 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 due to poor sanitation and hygiene at household level. The Eastern Cape and KwaZulu-Natal are especially prone to cholera outbreaks.

The Department of Water Affairs is designing water-resource monitoring programmes to assess and report on the radiological (radioactivity) and toxicological quality status of South African water resources. The National Toxicity Monitoring Programme also reports on the status of DDT (dichlorodiphenyl-trichloroethane) and other persistent organic pollutants. This information is reported internationally to the Stockholm Convention through the Department of Environmental Affairs.

The department has introduced the electronic Water-Quality Management System to WSAs.

Through the department's efforts alongside the Institute of Municipal Engineers and with the support of the South African Local Government Association (Salga), a challenging two-year project to monitor all 169 WSAs on their drinking-water quality was successfully put in place.

The result was an overall improvement in the quality of drinking water and the creation of an enabling environment to ensure the effective management of drinking water. Of those municipalities on the system, close to 95% reported that their water quality complied with the national drinking-water standard.

Another international obligation is reporting on chemical water quality through the Global Environmental Monitoring System's Water Programme. The department started bringing in the aspect of voluntary monitoring in the form of the adopt-a-river initiative.

Municipal Infrastructure Grant (MIG)

The MIG, a conditional grant from national government to local government to support investment in basic municipal infrastructure to eradicate backlogs, was implemented in April 2004.

The purpose of the MIG is to facilitate and ensure more effective and integrated service delivery by local government and the Department of Water Affairs, working with the Department of Cooperative Governance in seeking to ensure that funds are made available. (See Chapter 11: *Government system*.)

The department's support to municipalities comprises:

- planning support regarding integrated development plans (IDPs) and water-services development plans (WSDPs)
- monitoring the water-purification and waste-water treatment works' operations
- facilitating project selection, feasibility studies and service-level options
- supporting the implementation of a tariff structure and the Free Basic Water (FBW) Policy
- supporting the Section 78 process (division of powers and functions for water services between district and local municipalities) and selecting water-services providers
- training councillors and officials in water-services and water-demand management
- mobilising resources to support municipalities.

Policy and legislation

The Constitution of the Republic of South Africa, 1996, and the Bill of Rights enshrine the basic human right to have access to sufficient water and a safe and healthy environment. The two Acts that enable government to fulfil these rights through the Department of Water Affairs are the:

- Water Services Act, 1997 (Act 108 of 1997), which created a regulatory framework within which water services could be provided. Schedule Four of the Constitution vests the responsibility for water and sanitation services in local government. National government, however, is responsible for the regulatory function.
- National Water Act, 1998 (Act 36 of 1998), which aims to ensure that water resources are protected, used, developed, conserved, managed and controlled in a sustainable manner, for the benefit of everyone in South Africa.

National Water Act, 1998

The Act provides for:

- integrated management and sustainable use of surface water and groundwater
- devolution of surface and groundwater to catchment and local level
- government to play a support role through functions such as promoting awareness, providing information and building capacity.

The Act aims to control the use of water resources, protect them from being impacted on or exploited and polluted, and ensure that every person has equitable access to them.

The Act gives the Department of Water Affairs the tools to gather the information it needs to optimally manage the country's water resources. The registration of water use is one of these tools.

All water users instructed to register have the statutory obligation to do so. There are strict penalties, prescribed in the Act, for those who do not comply.

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In August 2010, the Ministry of Water Affairs announced at the Agri-SA Water Conference in Johannesburg that environmental courts would be set up to address crimes that threaten the quality and supply of water.

The department was concerned about the impact of deteriorating water quality in South Africa, as it is among the most water-scarce countries in the world.

The courts are expected to deal with all water-related crimes, but role players in the agricultural industry are also expected to contribute to protect the country's water supplies. Agricultural practices, mining and urban development are the main contributors to water pollution.

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 a general authorisation, must register. This includes the use of surface and groundwater.

Other uses of water 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 (including irrigation, domestic supply, industrial use, mining, aquaculture, fishing, water sports, aesthetic value, gardening, landscaping, golfing, etc.) 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.

The implementation of the National Pricing Strategy for Raw Water began in 2002 to ensure that, as far as possible, the costs of the management of water resources and water-supply infrastructure are borne by water users.

The majority of water users pay the water-resource charge or cost for which they are billed. However, underrecovery of costs remains considerable.

Action has been taken against a number of illegal water users across South Africa in response to growing concern about an apparent increase in the rate of illegal water use in some catchment areas.

National Water Resource Strategy

The NWRS is an assessment of the supply-demand ratio in relation to water resources, which was initiated in 2004. The assessment is conducted on a five-yearly basis in

each of South Africa's water-management areas (WMAs).

The strategy also proposes options for increasing the supply of water in each WMA. The NWRS determines how water resources will be protected, used, managed and conserved.

Elevating the status of water as a scarce and vulnerable resource requires the department to strengthen its regulatory role, provide support and guidance to relevant stakeholders, and influence the behaviour of economic sectors. In ensuring that water supply is of the appropriate quality for consumption and productive use, the department is finalising the water-classification system and regulations.

The Department of Water Affairs has a dedicated team of specialists developing a comprehensive response strategy for the water sector. The development of the strategy is necessitated by a strong call for the sector to adapt to potential effects of climate change.

Proposals from the strategy will be integrated into the revision of the NWRS and will form part of a plan to ensure that water resources are protected, developed and conserved to meet future needs. Among other things, the strategy will look at developing:

- Tools for data modelling to track emerging hydrological patterns and the impact on water resources. These instruments will provide the information to plan confidently.
- Mechanisms for early-warning systems, including predicting floods and responding to potential risks.
- Adaptation initiatives that target those catchments that are most vulnerable to climate risks based on predictions.
- Reconciliation strategies to manage demand in urban centres, where increased urbanisation and industrial development are putting pressure on water resources.
- Investment strategies to expand the necessary infrastructure for water storage and flood management.
- New technologies for water treatment to respond to chemical changes caused by high temperatures.
- Water-conservation and -demand strategies to ensure efficient water use.
- Measures to assess carbon footprints from the infrastructure and propose ways of reducing these.

Water Services Act, 1997

The Act aims to:

- set out the rights of consumers, and the rights and duties of those responsible for providing water services
- provide for the right of access to basic water supply, and the right to basic sanitation necessary to secure sufficient water and an environment not harmful to human health or well-being
- allow the Minister of Water and Environmental Affairs to set national standards (including norms and standards for tariffs) to ensure efficient, equitable and sustainable water services
- promote the effective and sustainable use of financial and natural resources
- establish effective and financially viable statutory institutions to assist local government to fulfil its obligations
- ensure the production by WSAs of WSDPs required by municipal legislation within the framework of IDPs
- provide a comprehensive framework for the oversight and regulation of water boards under the authority of the Minister of Water and Environmental Affairs
- provide a framework for the collection and publication of information about water services.

Accelerated Community Infrastructure Programme

Growing demand for water for both domestic and economic use is having a serious impact on water resources. In the Water for Growth and Development Strategy, key priority programmes that will help achieve water security in the country, have been identified.

It is in this context that the Department of Water Affairs initiated the Accelerated Community Infrastructure Programme, which was allocated R83 million in the Cape Town,



In August 2010, Cabinet mandated the establishment of a special task team to investigate how the Government should respond to reports of acid water drainage in some parts of the country.

In September 2010, the Ministry of Water and Environmental Affairs appointed a team to assess the extent of acid mine drainage in South Africa.

Acid mine water, or water contaminated with heavy metals as a result of mining activities, is reportedly affecting Gauteng, Mpumalanga, North West and the Free State. Reports suggest that this drainage poses health and economic risks for the country.

As a short-term measure, an amount of R218 million has been budgeted by the Department of Water Affairs to fit pumps to avert any situation that might arise.

eThekweni and Nelson Mandela metros. This programme is a rapid intervention that seeks to focus on four key areas:

- community water and sanitation infrastructure
- water-conservation and -demand management
- waste-water infrastructure refurbishment
- drought intervention.

This programme selectively targeted provinces where there were serious challenges relating to drought, cholera, water supply, ageing infrastructure and general shortage of water. Under this programme, the department has identified four priority areas for water conservation and demand management activities: Vaal River System and the metropolitan areas of Johannesburg, eThekweni, Nelson Mandela Bay and Cape Town.

The upper Vaal River System has been identified as the most appropriate area to address "illegal" use of water for irrigation purposes. The department is implementing measures to curb this unlawful use of water and to speed up monitoring and enforcement efforts.

The programme also provides for investment in the refurbishment of 20 waste-water treatment plants. This intervention is meant to address areas where there is potential risk of cholera, treatment plants exceeding the effluent quality units and exceeding hydraulic capacity, and treatment plants that suffer from mechanical failures or treatment plants that are in areas prone to spillages.

Water-management institutions

The National Water Act, 1998 sets the framework for the management of South Africa's water resources. This framework provides for the establishment of water-management institutions, which include catchment management agencies (CMAs) and water-user associations (WUAs).

Catchment-management agencies

Chapter 7 of the National Water Act, 1998 provides the progressive establishment of CMAs and states that the purpose of the CMAs is to delegate water-resources management to the regional catchment level and to involve local communities in decision-making processes.

The intention is for water-resource management to meet the basic human needs of present and future generations; promote

equitable access to water; redress the results of past racial and gender discrimination; and facilitate social and economic development.

The initial role of a CMA is communicated in the National Water Act, 1998 as managing water resources in a WMA; coordinating the functions of other institutions involved in water-related matters; and involving local communities in water-resource management. In essence, CMAs are service-delivery agencies and are listed in the Public Finance Management Act, 1999 (Act 1 of 1999).

Water boards

Water boards have been established to operate as water services providers, which mainly entails the provision of bulk water supply.

These boards manage water services in their supply areas, provide potable water at cost-effective prices, and act as important intermediaries between bulk infrastructure provision, water reticulation and end users.

There are 14 water boards that had been set up as financially independent institutions, in terms of Section 34(1) of the Water Services Act, 1997 and must aim to be financially viable.

These water boards include: Albany Coast Water, Ikangala Water, Overberg Water, Amatola Water, Lepelle Northern Water, Pel-ladrikt Water, Bloem Water, Magalies Water, Rand Water, Botshelo Water, Mhlathuze Water, Sedibeng Water, Bushbuckridge Water, Namakwa Water and Umgeni Water.

Water-user associations (WUAs)

According to Chapter 8, Schedule 3 of the National Water Act, 1998, all irrigation boards formed under the Water Act of 1956

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In September 2010, the Deputy Minister of Water and Environmental Affairs, Ms Rejoice Mabudafhasi, represented South Africa at the World Water Week (WWW) in Stockholm, Sweden.

The WWW, organised by the Stockholm International Water Institute, was a meeting of experts, practitioners, decision-makers and leaders from around the globe to exchange ideas, foster new thinking and develop solutions to water-related challenges.

The discussions at 2010's event covered various water and related issues with the purpose to increase awareness and stimulate action on human daily activities that impact on the environment including water, land and air.

The 2010 WWW was held under the theme *Water Quality Challenges – Prevention, Wise Use and Abatement*.

must be transformed into WUAs to provide a vehicle for localised users to manage the use of the resource in a more integrated manner.

In mid-2010, all irrigation boards were in the process of being transformed into WUAs to fall under the ambit of the National Water Act, 1998.

Of the 279 irrigation boards, 68 have been transformed into 38 WUAs. In addition, 23 new WUAs have been established and most of these are focused on supporting farmers who lack resources.

Water-related research

Being a water-stressed country, South Africa progressively needs to find innovative ways of managing water resources to ensure that the basic needs of its citizens are met, that social and economic development is not restricted by a lack of or a poor quality of water, and that sustainability of water resources and water-dependent ecosystems is achieved.

As reflected in the Water Research Commission's (WRC) mission and its various undertakings, the WRC functions as a "hub" for water-centred knowledge.

It is a networking organisation linking the nation and working through partnerships. The organisation continuously provides novel (and practical) ways of packaging and transferring knowledge into technology-based products for the water sector and the local and international community.

The WRC continues to play the leading role in building a sustainable water-related knowledge base in South Africa by:

- investing in water research and development
- building sustainable and appropriate capacity
- developing skills for the water sector
- being adept in forming strategic partnerships to achieve objectives more effectively while making optimal use of the latest global information and knowledge and other technologies available.

The Water Research Act, 1971 (Act 34 of 1971), provides for the establishment of the Water Research Fund, which derives income primarily from levies on water consumption.

In supporting the creation, dissemination and application of knowledge, the WRC focuses on five key strategic areas:

- water-resource management
- water-linked ecosystems
- water use and waste management

- water in agriculture
- water-centred knowledge.

The WRC also calls for specific mechanisms to address key strategic issues of national importance. These are dealt with in four cross-cutting domains:

- water and society
- water and the economy
- water and the environment
- water and health.

To ensure that research results are relevant to the broader objectives of water-resource management, the applicability of research in each key strategic area is maximised by addressing the relationships between water

Natural mean annual run-off and ecological reserve (million m³ per anum)

Water management	Natural mean annual run-off ⁽¹⁾	Ecological reserve ^(1,2)
Limpopo	985	156
Luvuvhu/Letaba	1 185	224
Crocodile West and Marico	855	165
Olifants	2 042	460
Inkomati ⁽³⁾	3 539	1 008
Usutu to Mhlatauze ⁽⁴⁾	4 780	1 192
Thukela	3 799	859
Upper Vaal	2 423	299
Middle Vaal	888	109
Lower Vaal	368	48
Mvoti to Umzimkulu	4 798	1 160
Mzimvubu to Keiskamma	7 241	1 122
Upper Orange	6 981	1 349
Lower Orange ⁽⁵⁾	502	69
Fish to Tsitsikamma	2 154	243
Gouritz	1 679	325
Olifants/Doring	1 108	156
Breedee	2 472	384
Berg	1 429	217
Total	49 228	9 500

1) Quantities refer to the water-management area under consideration only (water that originates or is required in that water-management area).

2) Total volume given, based on preliminary estimates, impact on yield being a portion of this.

3) Includes Komati catchment in Swaziland (mean annual run-off = 517 million m³/a).

4) Includes Pongola catchment in Swaziland (mean annual run-off = 213 million m³/a).

5) Includes contributions from Sengu and Caledon rivers in Lesotho (mean annual run-off = 4 765 billion m³/a).

Source: Department of Water Affairs

and society, the economy, health and the environment.

The WRC's key objective is supporting the development of human resources in the water sector. Involvement in research is recognised as an important vehicle for building and developing expertise among water-resource practitioners. Every research project is required to incorporate a strong element of capacity-building, especially among historically disadvantaged individuals.

The Department of Science and Technology and the National Research Foundation are partners with the Department of Water Affairs and the WRC in ensuring that approaches to water research are consistent with South Africa's broad policy on science and innovation.

Working for Water Programme

Invasive alien species are causing billions of rands of damage to South Africa's economy every year, and are one of the biggest threats to the country's biological biodiversity.

Invasive alien species are plants, animals and microbes that are introduced into countries, and then out-compete the indigenous species.

Invasive alien plants (IAPs) pose a threat not only to South Africa's biological diversity, but also to water security, the ecological functioning of natural systems and the productive use of land.

They intensify the impact of fires and floods and increase soil erosion. IAPs can divert enormous amounts of water from more productive uses and invasive aquatic plants such as the water hyacinth, agriculture, fisheries, transport, recreation and water supply.

It is estimated that between 6% and 7% of South Africa's annual water run-off is being consumed by IAPs.

Of the estimated 9 000 plants introduced to this country, 198 are classified as being invasive. It is estimated that these plants cover about 10% of the country and the problem is growing at an exponential rate.

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In July 2010, the Ministry of Water and Environmental Affairs and the Swaziland Minister of Water Affairs, Ms Tsandzile Dlamini, signed a cross-border water-supply agreement.

As water-stressed countries, South Africa and Swaziland must continue to work together to address the worsening scarcity. The agreement was the product of four years of intensive negotiations by officials, which had been preceded by extensive public consultations.

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The Department of Water Affairs held the annual WeedBuster Week Campaign spearheaded by the department's Working for Water (WfW) Programme from 4 to 12 October 2010.

The campaign aimed to consolidate awareness, support and ownership of the ongoing effort to ensure that invasive alien plants and invasive aquatic weeds control initiatives in South Africa are effective and sustainable.

The fight against IAPs is spearheaded by the WfW Programme, which is administered through the Department of Water Affairs. This programme works in partnership with local communities, to whom it provides jobs, and also with government departments, including the departments of environmental affairs; of tourism; of agriculture, forestry and fisheries; of trade and industry; and provincial departments of agriculture, conservation and environment; research foundations; and private companies.

WfW runs over 300 projects across South Africa. Scientists and field workers use a range of methods to control IAPs. These include:

- Mechanical methods: Felling, removing or burning IAPs.
- Chemical methods: Using environmentally safe herbicides.
- Biological control: Using species-specific insects and diseases from the IAP's country of origin. Some 76 biocontrol agents have been released in South Africa against 40 weed species.
- Integrated control: Combinations of the above three approaches. An integrated approach is required to prevent enormous impacts.

The core business of the programme is to contribute to the sustainable prevention and control of IAPs, thereby optimising conservation and the use of natural resources. In doing so, it addresses poverty relief and promotes economic empowerment and transformation within a public-works framework.

WfW is recognised internationally as one of the most effective programmes for addressing the problem of IAPs, combining environmental issues with social-development objectives.

WfW considers the development of people as an essential element of environmental conservation. Short-term contract jobs created through the clearing activities are undertaken, with the emphasis on endeavouring to recruit women (the target is 60%), youth (20%) and disabled (5%).

Creating an enabling environment for skills training, it is investing in the develop-

ment of communities wherever it works. Implementing HIV and AIDS projects and other socio-development initiatives are important objectives.

Flood and drought management

The South African Disaster-Management Policy and ensuing legislation brought about a major shift in focus from reactive to preventative and mitigative disaster management.

From a flood-management perspective, the South African focus has shifted from primarily structural to non-structural, accentuating the value of, for example, floodplain zoning and flood warnings.

Dams and water schemes

The central objective of managing water resources is to ensure that water is used to support equitable and sustainable social and economic transformation and development.

Dams and water schemes form an integral component of the strategy to meet these objectives. The NWRS provides details on possible major water schemes to be developed in the next 25 years, amounting to about R21 billion at 2004 price levels.

The Department of Water Affairs follows an integrated approach to managing South Africa's water resources. Proposed new water schemes need 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. The guidelines issued by the World Commission on Dams must be followed.

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In October 2010, the Ministry of Water and Environmental Affairs announced the appointment of the National Water Advisory Committee.

The committee, consisting of 15 members, is tasked with advising the Minister of Water and Environmental Affairs on all issues affecting water resources in South Africa, including giving guidance on the interventions necessary to ensure long-term water security.

The National Water Advisory Committee is appointed for three years and comprises individuals from civil-society groups, the business sector, academia and water experts.

Members are expected to provide advice to the Minister on issues related to water resources and water-service management.

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

Initiatives to identify and establish new water resources are occurring for both surface and groundwater.

Government identified key projects to augment South Africa's water resources:

- Some R195 million was allocated over 2009/10 and 2010/11 for the upgrade and refurbishment of municipal WWTWs across the country.
- Construction continues on water-distribution networks from the Nandoni and Inyaka dams for water supply to communities in Limpopo and Mpumalanga, Hluhluwe and Middle Letaba at a cost of R410 million.
- In the 2009/10 financial year, the Department of Water Affairs spent R350 million on its Dam Safety and Rehabilitation Programme and aimed to spend R850 million in the 2010/11 financial year.
- Preparations for the augmentation of water supply to the Duvha and Matla power stations commenced in August 2010.
- Planning and implementation took place for the Mokolo-Crocodile Water Augmentation Project, which aims to provide water to Eskom's Medupi Power Station and to the town of Lephalale, which cost R10,1 billion. The construction started in September 2010, and created about 500 jobs.
- Preparations were on track for the implementation of the Nwamitwa Dam in Limpopo in 2010/11 at a cost of R1,1 billion.
- The Vaal River Eastern Sub-System Augmentation Project (Vresap) in Mpumalanga provided more water specifically to Sasol and Eskom. Paid for by the users, the system was more than 95% complete in 2010 and was expected to be finalised by the end of 2010/11.
- The Komati Water Augmentation Scheme in Mpumalanga was planned for the province to provide more and better water for energy generation. By March 2010, it was awaiting environmental authorisation and contractors were pre-trained. Some 50 km of pipelines would be constructed and more than 500 jobs created over a five-year period. The project was expected to commence in the second half of the 2010/11 financial year.
- The Mooi-Mgeni Transfer Scheme in KwaZulu-Natal involves the construction

of the Spring Grove Dam for domestic water supply in eThekweni and Umgungundlovu. The project will create between 400 and 500 job opportunities over five years. The construction of a transfer pipeline from the Mooi to the Mgeni River had commenced by the end of 2010 and the first water delivery is expected in 2013.

- In Limpopo, the Olifants River Water Resource Development Project involves the construction of the De Hoop Dam, which commenced in 2007. In March 2010, there were 752 people employed by the project and by mid-2010, the dam was about 40% complete.
- In the Western Cape, plans to construct the Clanwilliam Dam were at an advanced stage. After a detailed design, construction is expected to commence towards the end of 2010/11. It anticipated that 500 jobs would be created when construction started.
- Environmental authorisation was received and the Department of Water Affairs commenced with the process to acquire the land for the raising of Hazelmer Dam in KwaZulu-Natal. The project is scheduled to take place over two years and in that period 100 jobs are expected to be created.

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 are largely

dependent on groundwater. Although irrigation is the largest user, the supply to more than 300 towns and smaller settlements is also extremely important.

Through government's commitment to 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 a considerable portion to river flow. This requires reserving a significant share of groundwater resources to protect aquatic ecosystems in terms of the National Water Act, 1998. The maximum quantity of groundwater that can be developed economically is estimated at 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.

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 (LHWP)
- Swaziland on the Komati River Development Project.

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

South Africa is increasingly seen as a leader in addressing the pressing water and sanitation challenges faced by the poor and by people living in rural areas. This view was supported during the launch of the 2006 United Nations Development Programme's *Human Development Report* in the Western Cape.


In addition to participating in the African Ministers' Council on Water (AMCOW), South Africa is active in watercourse commissions that have been established to manage the rivers it shares with Lesotho,

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In August 2010, the Deputy Minister of Water and Environmental Affairs, Ms Rejoice Mabudafhasi, launched the Luvuvhu Adopt-A-River Project in Tshishaulu, near Thohoyandou.

An amount of R800 000 was allocated for the initiative and about 100 rural women from the villages around Vhembe were identified to clean the Luvuvhu River for a year. These women would be afforded a monthly stipend and would also be trained on water-resource management.

The Adopt-A-River Project was introduced as a means of creating awareness among South Africans to take care of water. The Adopt-A-River Project was officially introduced in March 2010 during National Water Week.



Swaziland, Namibia, Mozambique, Botswana and Zimbabwe.

In December 2008, Cabinet approved the second phase of the LHWP. Construction of a 2,3-million m³ dam would start from 2011 in the Maluti mountains. The LHWP supplies about 46 million m³ water a year. The second phase will raise this to 70 million m³.

In November 2009, the Department of Water Affairs hosted the second Africa

Water Week event and seventh session of the AMCOW. During this event, South Africa, through the Department of Water Affairs, took over the chair of AMCOW for the next two years. This responsibility means that South Africa will take the lead in advocating the prioritisation of water and sanitation on the continent and mobilisation of resources to realise the basic human right of access to clean drinking water and safe sanitation.

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