Water for Growth and Development in South Africa

Version 6

1 Executive Summary

The Department of Water Affairs and Forestry (DWAF) has embarked upon a process to develop a framework that will set in motion a course of action to ensure that there is sufficient water, in both quantitative and qualitative terms, to support South Africa's path of growth and development. There must be sufficient water for the country to achieve its 6% economic growth target. At the same time, every person in South Africa must have access to potable water. These two goals must be achieved by not compromising the ecological sustainability of the resource.

The Department has also embarked upon rigorous water assessment studies referred to as Reconciliation Strategies in order to achieve the reconciliation of supply and demand for both water scarce areas as well as those experiencing relatively high levels of demand. These strategies aim to ensure the supply of water at adequate levels of assurance within the constraints of affordability and appropriate levels of service to users and protection of current and possible future water resources. Thus far, six strategies have been undertaken in the major urban centres and in July 2008, the Department commissioned reconciliation strategies for every town in the country, due to be completed by 2011.

Water scarcity has been identified in the major urban centres. These major urban areas anchor the country's economy, and the Department has reached a point where it knows that it must invest heavily in the diversification of its water mix to avert serious water shortages that could impact adversely on our economy. In addition to the traditional augmentation schemes, there are two major ways that water supplies can be augmented. These are the treatment of effluent and the desalination of sea water for productive use, thereby rendering primary water sources for the domestic use. A key principle behind assuring local water supplies is that the water supply should be as close to the end-user as possible, avoiding the unnecessary intensification of costs associated with the transportation of water.

The Department also appreciates that whilst it invests in schemes to assure water supply, it is also required to strengthen its focus on water conservation and water demand management, especially since a very basic cost analysis shows that there is a greater return on investment through water loss control and water use efficiency measures than supply-side interventions. A major source of water loss is ageing infrastructure exacerbated by poor operations and maintenance at a municipal level and analysis shows that this state of affairs is a multi-faceted problem including a lack of managerial and technical skills and funding. The Department will strengthen its efforts to support this sector in a bid to reverse this dire situation; it becomes an even more crucial intervention when one factors in the pollution of water sources due to faulty wastewater treatment works.

The notion of water for development alludes to the role of water in the alleviation of poverty and people's constitutional rights to have access to a source of safe and reliable drinking water. The Department is deeply concerned about the persistent backlogs in particular parts of the country although it has achieved the Millennium Development Goal of halving, "by the year 2015... the proportion of people who are unable to reach or to afford safe drinking water" in 2005.

The Department is also very aware of the anomalies in water distribution, where people reside adjacent to water sources and yet have no access to these. The Department will achieve the target of ensuring that every person has access to safe and reliable supply of drinking water although it has to reconsider how this can be achieved. It is the Department's recommendation that the service backlogs, which are predominantly situated in KwaZulu-Natal, Eastern Cape, Limpopo, and the North West province, are prioritised and addressed through a combination of short-term interventions such as rainwater harvesting, exploring further options of supply communities from available sources and the further

exploitation of groundwater sources, which may necessitate a policy change. Ultimately, a balance needs to be struck between large and small-scale infrastructure projects. Where a community can be serviced by existing large-scale infrastructure, this should happen with immediate effect. Where a community cannot be serviced by a large-scale infrastructure project due to the cost of such an intervention (for example, pumping water to mountain-top communities at higher altitudes), then small-scale schemes must be planned and implemented. Where large-scale infrastructure could solve local water scarcity, such as the De Hoop Dam, the necessary planning and resourcing must be undertaken and interim measures introduced to compensate for the long lead-times. The Department should also prioritise schemes in areas with resource development potential that coincide with areas with high service backlogs. It will also support sector plans where water use for growth purposes can simultaneously support water use for development purposes. The Department will seek out and support interventions that support the dual goals of water for growth and development as one goal should not be at the expense of the other.

Water for Growth points to the relationship between water availability and the forms of economic activity that are dependent on available water supply of varying levels of quality depending on the technologies being used. The Department's position is that it would like to support the country's economic growth target of 6% but this cannot be at the expense of the ecological sustainability of the resource or people's primary needs. It wishes to be responsive to the needs of the different economic sectors and this can only be achieved if these sectors factor in water implications (supply and impact of use) at the outset. Rather than being an add-on or afterthought, the Department sees the need for water to be mainstreamed and placed at the nucleus of all planning decisions, whether these be within the public or private sector. Water can only support economic growth, without compromising primary needs or ecological sustainability if, and only if, its availability is adequately factored in.

Apart from ensuring water availability for growth purposes, the Department is very mindful of water use behaviour that impacts negatively on both water resource quantity and quality. It is currently exploring a potential mix of mechanisms to change this behaviour, which include regulatory instruments, market-based instruments, self-regulation, and awareness and education, and it will match appropriate mechanisms to mitigate offending behaviour.

The Department is satisfied that it is taking the required course of action to ensure that it has the right kind of information at its disposal to make better informed and calculated decisions and trade-offs with respect to water in support of cross-sectoral planning and development initiatives. The rolling out of the Reconciliation Strategies to all parts of the country will ensure that the Department is able to anticipate and address future demand without any one area of water need – social, economic and ecological – being compromised.

1.1 High level recommendations

1.1.1 Strengthening institutional capacity

While the Reconciliation Strategies identify potential water imbalances and interventions to be taken to avert water shortages, if the Department does not have the capacity to oversee the implementation of these strategies as well as other aspects of its mandate, water shortages may be a consequence of Departmental inefficiencies and poor management rather than a deficiency of supply. The Department has embarked on a process of institutional re-alignment to ensure that the Catchment Management Agencies, and in their absence, the Regions, are able to fulfil the role of implementing agents tasked with an array of water resource management functions.

1.1.2 Mainstreaming water

It is the Department's intention to ensure that water is placed at the heart of all planning decisions taking place in the country; to ensure that any decisions taken that rely on the steady supply of water, both in quantitative and qualitative terms, adequately factor in water availability. Water can only support growth and development in the country without compromising the ecological sustainability of the resource if, and only if, water is at the nucleus of planning and decision-making, which includes but is not limited to sectoral planning. In an effort to elevate the status of water as a scarce and vulnerable resource, the Department acknowledges the importance of strengthening its regulatory role, providing support and guidance to the plethora of stakeholders, affecting and influencing the sector.

1.1.3 Diversifying the water mix

Water availability is currently based on surface water (77%), return flows (14%) and groundwater (9%). Reconciliation studies undertaken in major urban centres have revealed that in addition to these sources, desalination and effluent re-use ought to be considered given the high risk of water shortages. Desalination refers to the treatment of saltwater and effluent re-use refers to the treatment of urban and mining effluent. Both are a major source of water for coastal cities and treated effluent for major inland systems. In the long term, surface water will remain the predominant source of water but the Department expects a reduction on the dependence on this source accompanied by the increased use of groundwater and a significant increase in return flows through the treatment of urban and mining effluent. The mix at the local level will be dependent on the most affordable and appropriate source depending on water use; for example, desalination of seawater for productive uses in coastal locations is considered highly feasible provided that it is not transported inland – similarly, inland water resources should be retained for use inland.

1.1.4 Striking a balance between supply and demand-side measures

The reality is that as a country we can no longer afford water losses and therefore it is imperative that the focus on water conservation and water demand measures must be strengthened, especially as there is a greater return on investment through water loss control and water use efficiency. The Department will prioritise the establishment of the water demand funding facilitation unit to provide support to municipalities in their effort to introduce water conservation and demand management. The Department has identified that a key challenge to sustained and health water supplies is the poor maintenance of waste water treatment works (WWTW) and recommendations from the Department concern the structuring of the Municipal Infrastructure Grant (MIG) so that it is used for the purposes of WWTW rehabilitation and construction.

1.1.5 Water for Development: Addressing service backlogs

The Department is satisfied with the achievement of the Millennium Development Goals (MDGs) in respect to the halving of water and sanitation backlogs in 2005 and 2008 respectively, however, too many South Africans still do not have access to basic water and sanitation services and it therefore wishes to achieve the target of full access to basic water and sanitation services for all by 2014. It is the Department's recommendation that the service backlogs, which are predominantly situated in KwaZulu-Natal, Eastern Cape, Limpopo, and the North West province, are prioritised and addressed through a combination of short-term interventions such as rainwater harvesting and the further exploitation of groundwater sources, which may necessitate a policy change. Ultimately, a balance needs to be struck between large and small-scale infrastructure projects. Where a community can be serviced by existing large-scale infrastructure, this should happen with immediate effect – inequities in access to water will not be tolerated. Where a community cannot be serviced by a large-scale infrastructure project due to the cost of such an intervention (for example, pumping water to mountain-top communities at higher altitudes), then small-scale schemes must be planned and implemented. Where large-scale infrastructure could solve local water scarcity, such as the De Hoop Dam, the necessary planning and resourcing

must be undertaken and interim measures introduced to compensate for the long lead-times. The Department should also prioritise schemes in areas with resource development potential that coincide with areas with high service backlogs. It will also support sector plans where water use for growth purposes can simultaneously support water use for development purposes. The Department will seek out and support interventions that support the dual goals of water for growth and development as, one goal should not be at the expense of the other.

1.1.6 Water for Growth: Changing water use behaviour for the future

The Department is very mindful of water use behaviour that impacts negatively on the resource both quantitatively and qualitatively. It is currently exploring a potential mix of mechanisms to change this behaviour, which include regulatory instruments, market-based instruments, self-regulation, and awareness and education, and it will match appropriate mechanisms to mitigate offending behaviour. Currently, two sets of behaviours that it is very concerned about and which it wishes to address as a matter of urgency are the unlawful and damaging extraction from and pollution of the Vaal River system and the extent of water use inefficiencies among commercial irrigation agriculture.

The extent of unlawful water use mainly upstream of the Vaal River system, mainly by irrigators, is a major problem as it resulted in the quantity of available water being exceeded by current demands. Furthermore, the pollution of freshwater resources in this River system, mainly as a result of the impact of mining activities, also results in eutrophication (lack of oxygen in the water). The Department's position is therefore to stop unlawful use of water in the Vaal River system and curb the pollution incidents through robust compliance monitoring and enforcement.

Commercial irrigation agriculture receives 62% of allocated water and to date has been exempted from certain water charges. It is the Department's view that this sector needs to make a contribution to the operations and maintenance of state-owned irrigation infrastructure as particular consumptive behaviours in the sector suggest that water may be to cheaply priced. The Department is also considering other interventions including water allocation reform, water trading and the promotion of techniques to enhance water use efficiency by this sector.

1.1.7 Nurturing attitudinal and behavioural changes towards the value of water

The Department over the years has invested significantly in water awareness campaigns and intends to sustain these campaigns, especially targeting younger children of primary school age. The Department's philosophy is that meaningful change in people's attitudes towards water must be inculcated from a young age in order to reap the benefits of these positive attitudes in the future. However, these campaigns should not be targeted at the younger generations only as it anticipates the conceptualisation and launching of a massive national awareness campaign whose primary purpose will be to instil a sense of appreciation of the value of water among all South Africans. The impact of the campaign should be a change in attitude and behaviour towards water conservation and water use efficiency resulting in the realisation of the WfG&D's vision of 'water is life – securing our needs across generations' underpinned by the principle of 'every drop counts'.

Table of Contents

2 Introduction

The Department of Water Affairs and Forestry (DWAF) has undertaken the preparation of the Water for Growth and Development Framework (WfGD) to ensure that water is able to support both economic growth and development goals in South Africa.

It is acknowledged that water is a scarce and valuable resource, which is both a social and economic good supporting all facets of human life. This is encapsulated in the WfGD vision as **"Water is life – Securing the Nation's Needs Across Generations".**

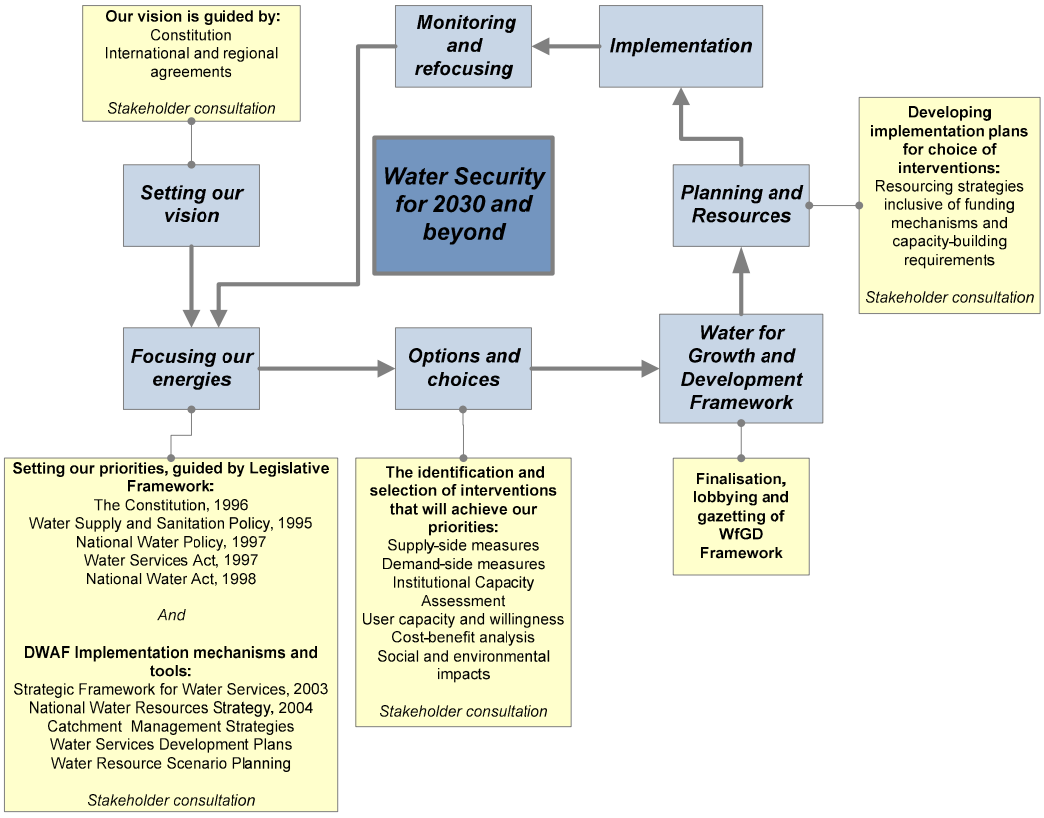
WfGD is an acknowledgement that water has a multiplicity of roles including:

- Supporting economic activities that will be required to achieve the 6% growth target,
- Providing for domestic and social needs,
- Maintaining the environment, and
- Improving the overall quality of life of people living in South Africa.

WfGD seeks to achieve a balance between supply- and demand-driven approaches. Its intention is to place water at the heart of all planning that takes place in the country; to ensure that any decisions taken that rely on the steady supply of water adequately factor in water availability. It seeks to ensure that there is sustained investment in the water sector to avert potential water crises and to ensure that water management supports the ASGISA growth targets without compromising ecological sustainability of the resource.

The process for developing the framework can be depicted in the following graph:

Figure 1 WfGD Architecture



The purpose of this document, being in the formative stages of the WfGD life cycle, is to identify trends in water-intensive sectors and the economic value of water in these sectors.

It will also identify some of the key challenges, threats and risks to water security and present current and possible future interventions to address these challenges.

3 The context

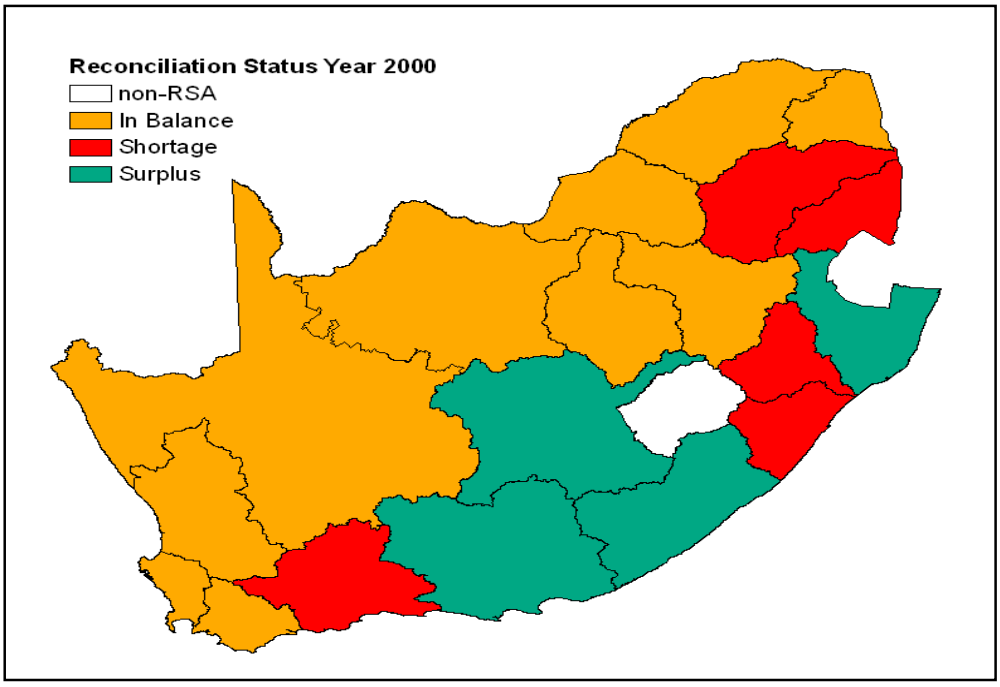
The central question that is being asked is whether South Africa has sufficient water resources to sustain both its path of economic growth and its population growth and concomitant needs. In addressing this question, the Department has taken a long term perspective and is assessing and addressing in a very detailed manner the quantity of water available versus projected demand and ways of addressing the imbalance. This is taking the form of reconciliation strategies, which have been completed for some of the country's major water supply systems, and are to be followed by reconciliation studies for every town in South Africa. By mid-2011, the Department will have an accurate picture of water demand and supply and how to achieve the required balance at a micro level.

This framework therefore seeks to look at water supply and demand from a global perspective as well as identify some of the key pressures being placed on the resource.

3.1 A global perspective of water availability

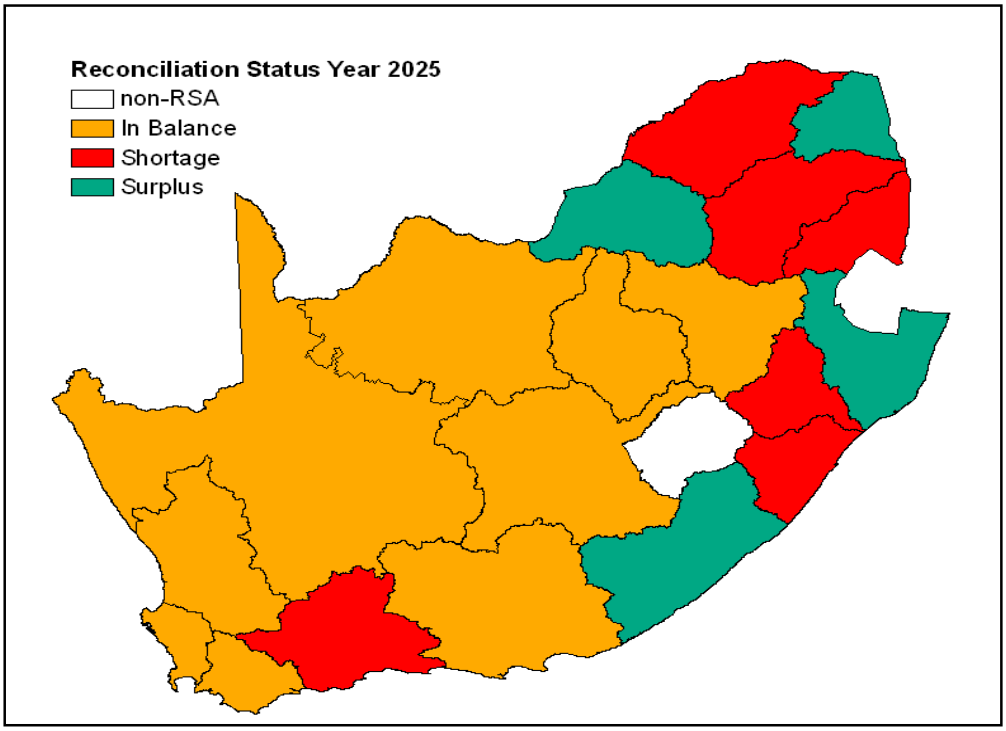
The following figure presents the water balance in 2000 and shows that a quarter (five) of the water management areas experience water shortages, a further quarter have water surpluses and the remainder are in balance.

Figure 2 Water demand/supply scenarios 2000



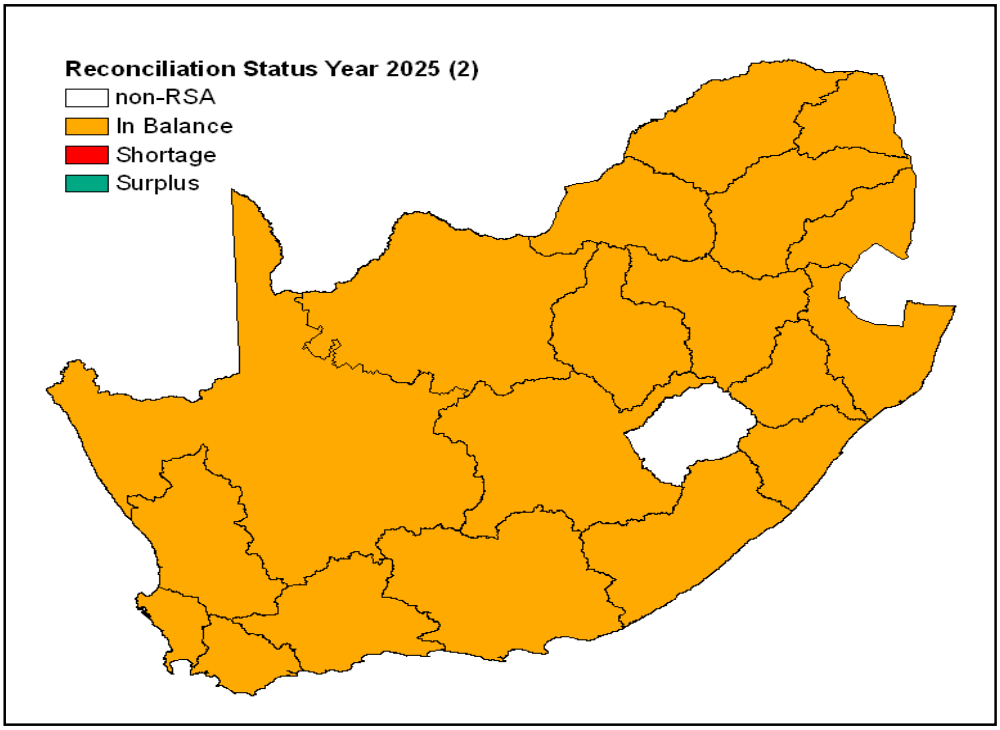
The second figure, which is a supply/demand scenario for 2025, illustrates that shortages will become more prevalent if proper attention is not given to providing more water. In general the country will be more likely to experience water shortages than surpluses.

Figure 3 Water demand/supply scenarios 2025



If reconciliation strategies are developed and implemented i.e. if we all do our work, the country's demand and supply could be in balance (Figure 4). This is what we must strive for.

Figure 4 Water demand/supply scenarios 2025



These maps highlight the positive impact that infrastructure investment has had on the security of water supply as witnessed through the construction of the Nandoni dam in the Luvubu / Letaba WMA. It also highlights the facts that the four major metropolitan areas need serious consideration, especially in light of the rapid rate of urbanisation.

It is the Department's view that sufficient water supplies can be made available to all significant urban and industrial growth points in order to support economic growth. However, given the long lead times for developing new water schemes, **co-operative planning** between water users and water management must be enhanced to ensure that this demand can be met.

3.2 Current storage

The country has had a good runoff for the last 13 years leading to satisfactory dam storage yielding an average of 81%. Dams in Limpopo, North West and the Eastern Cape are at a lower capacity, around 70%, whilst dams in the other provinces are well above the 81% average. In isolated cases, such as Middle Letaba, there are serious shortages affecting domestic demand. In spite of the good runoff, drought, which may occur at any point, may affect this source of water and is therefore not considered a reliable supply of water looking to the future. To mitigate this scenario, action needs to be taken now based on informed decisions.

3.3 Current water availability and use

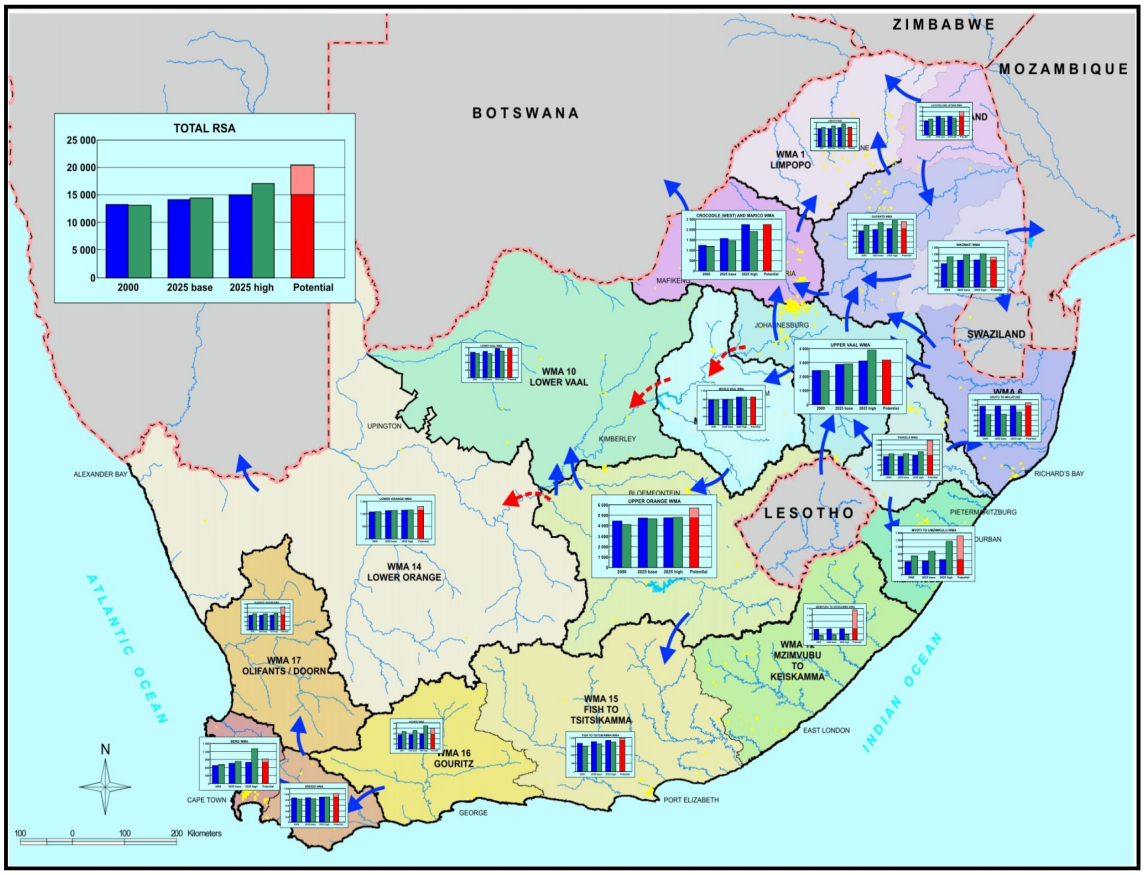
Water resources in South Africa are comprised of the following three sources in the order of magnitude: surface water (77%), return flows (14%) and groundwater (9%). There is a 98% assurance level which suggests that any peaks in future demand will result in demand exceeding supply and this is a source of vulnerability that needs to be addressed.

The following table presents the water resource allocations per water user group:

Water user/sector	Proportion of allocation
Agriculture	62%
Domestic Urban Rural	27% 23% 4%
Industrial	3.5%
Afforestation	3.0%
Mining	2.5%
Power generation	2.0%

The following graph presents water demand and availability projections for 2025 (National Water Resource Strategy, 2004). It compares water availability (blue bars), water use (green bars) and water development potential (red bars). It illustrates the fact that the potential for resource development exists mainly in the southern parts of KwaZulu-Natal and the eastern parts of the Eastern Cape but beyond these areas there is limited potential for further resource development.

Figure 5 Water availability vs use



3.4 Current storage

The country has had a good runoff for the last 13 years leading to satisfactory dam storage yielding an average of 81%. Dams in Limpopo, North West and the Eastern Cape are at a lower capacity, around 70%, whilst dams in the other provinces are well above the 81% average. In isolated cases, such as Middle Letaba, there are serious shortages affecting domestic demand.

In spite of the good runoff, drought, which may occur at any point, may affect this source of water and therefore should not be an exclusive supply of water and other appropriate sources must be explored. Furthermore, there are concerns about the lifespan of the dams, the need to extend their existing capacity to promote the shift from single to multi-purpose use as well as the need for additional dam capacity.

3.5 Current and future domestic water supply and backlogs

Current population projections estimate that the population will grow to 53 million people in 2025[i]. An implication from a water demand perspective is that domestic share of water use will shift from the current 27% to between 30 to 35% of the total national use. There are two primary concerns with respect to the water supplies: the first is keeping abreast with population and economic growth trends, which have particular spatial dimensions and the second is to address the historical basic water and sanitation service backlogs.

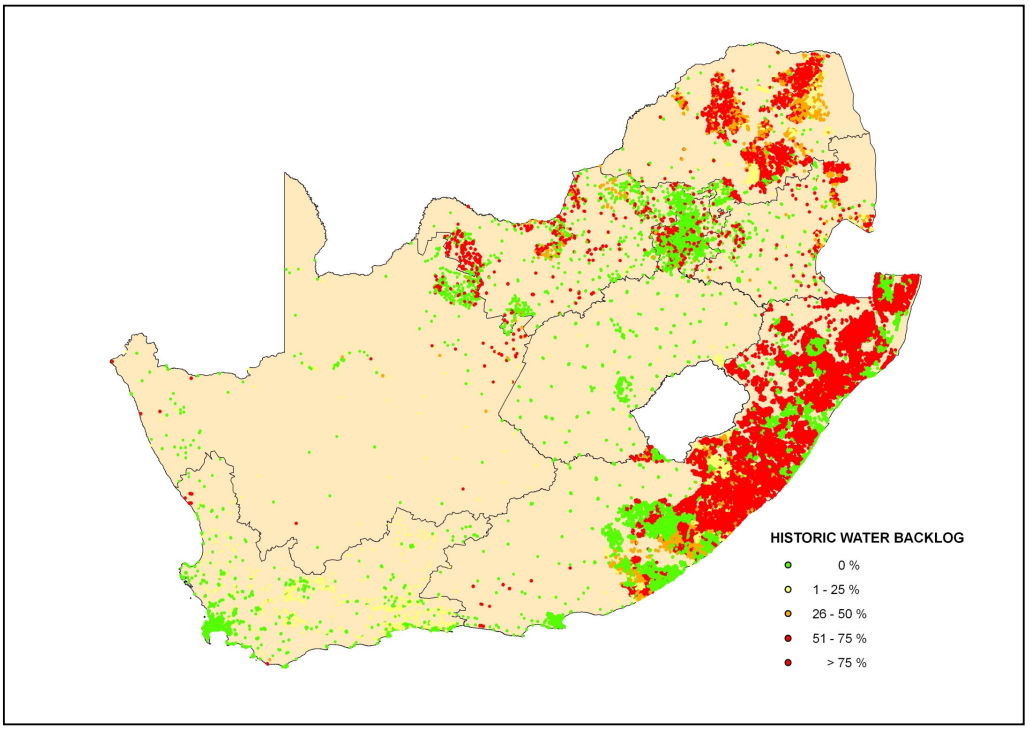
In 1994, South Africa's population was around 38.9 million people, three-fifths of whom (59%) had access to basic levels of water service and roughly 15.9 million people had no access to safe water supplies. There have been dramatic improvements since 1994 with almost nine-tenths of the population (88%) having access to basic service levels, and 5.7

million people, which is 12% of an estimated population of 48.7 million, still needing access to safe water supplies.

The following figure illustrates the spatial distribution of the formal historical basic water supply needs in the country, which are pervasive in the Eastern Cape, KwaZulu-Natal, and parts of Limpopo and the North West province. It must be noted that in spite of these backlogs, the Department achieved the MDG goal of halving water service backlogs in 2005 and recently halved the sanitation backlog.

There are considerable constraints in eradicating these backlogs all together such as the topographical features of KwaZulu-Natal, water stress in Limpopo and limited surface water development potential in North West province.

Figure 6 Formal historic basic water supply needs

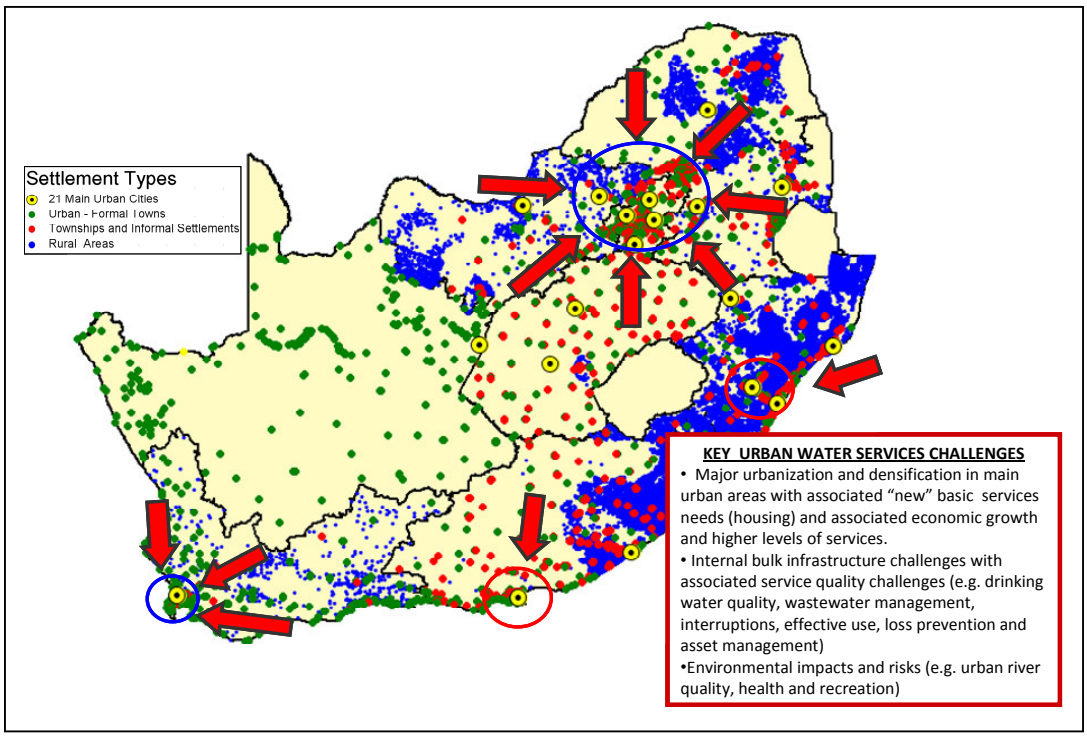


It is often assumed that the bulk of the existing backlogs is situated within water-rich or surplus areas (namely KwaZulu/Natal and the Eastern Cape) and a simplified deduction based on water availability could lead to the conclusion that the sector has failed to serve needy citizens. However, in the absence of major investment in water resource development, bulk water supply and distribution systems, available water in these provinces will not reach people due to the operating challenges, which relate to high energy costs for pumping and skilled operating capacity. Furthermore, local groundwater resources, which are limited and often of poor quality, have generally been developed and utilised and serve as an interim solution only.

In Limpopo and Mpumalanga, on the other hand, the backlogs are attributed to water scarcity since human settlements are located in scarce rive catchments and developments are primarily hampered by a lack of water resources and related bulk infrastructure. Major bulk water resource development as well as bulk infrastructure planning and development are underway such as the De Hoop dam, Nwamitwa. Since these developments will take several years to complete, the current backlogs will remain and funding and capacity for interim solutions are challenges.

In addition to historical water service backlogs, the provision of water services to urban centres, which represent the nuclei of economic and population growth in the country. In many urban areas such as Gauteng and Western Cape, the historic basic water supply targets will be met by 2008. However, these areas are challenged by new needs resulting from housing developments, densification, informal settlements and shared services. In Gauteng, the formal backlog has been eradicated while the new basic services needs exceed 680,000 households. The figure for the Western Cape is 400,000 households. These mostly require high levels of services both for water supply and sanitation with associated financing and operating costs as well as institutional capacity. Presently, many water and wastewater works have reached their design capacities, are in a poor state and not properly functioning, hence resulting in major wastewater spillages and related environmental and health impacts. Bulk infrastructure development, asset management as well as water quality management are priority intervention areas.

Figure 7 Urban water service challenges and perspectives



4 Water and sectors

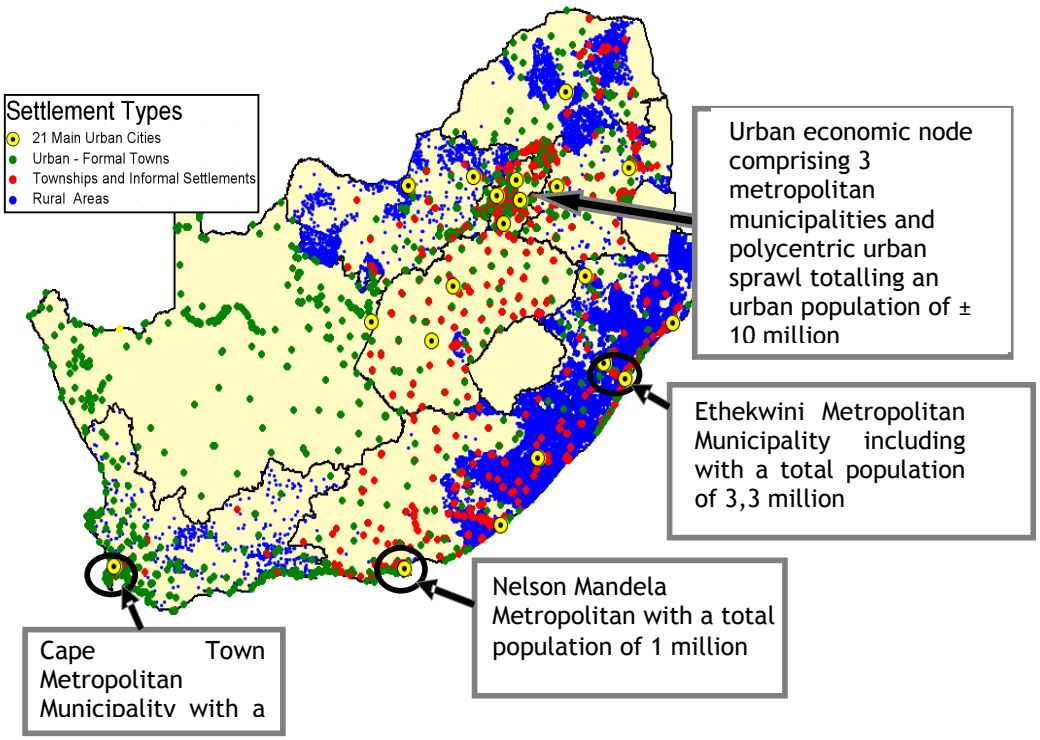
This section of the report profiles some of the key sectors that have major dependency on access to a reliable supply of water and at particular levels of quality. This applies to the domestic sector, mining, energy, agriculture, forestry, environment and recreation.

4.1 Domestic sector

The domestic sector straddles urban and rural settlements and has an estimated population of 47 million people. At an estimated growth rate of 2.01%, the population in 2025 will be in the region of 53 million people. The spatial population distribution reveals spatial variability with population growth rates for urban centres exceeding those of rural communities significantly. Planning for water demand needs to take these variances into account in order to quantify future demand as accurately as possible.

4.1.1 Distribution of human settlements

The following map provides the spatial location and characterisation of the settlement types in the country:



There are about 12 million dwellings in South Africa, three-fifths (63%) of which are classified as formal. The number of informal and backyard dwellers, which is about 30% of urban dwellers, exceed traditional housing in rural areas.

4.1.2 Urban settlement perspective

The way in which urbanisation is taking place in South Africa has fundamentally affected the provisioning of water and sanitation services and results in the regular failure of existing bulk infrastructure. This is due to several factors including the rapid rate of rural migration and the accompanying mushrooming of informal settlements on the urban periphery (often in nature corridors and flood planes) combined with an influx of low income households into city centres, formally inhabited by affluent businesses and young middle-income households. Furthermore, newly formed business nodes are establishing in former low-density residential areas with limited bulk water, sewage, storm water and transport infrastructure. These highly dynamic and unpredictable patterns of urban settlement are exacerbated by the fact they are currently not being driven by formal town and regional planning.

Socio-economic indicators

Nearly two-fifths of the population (37% or 16 million people) live within South Africa's main economic centres covering less than 2% of the country's surface area. The demand for formal housing is huge with 26% of households without formal shelter. The cities average population growth rate is 2.8% per year against an estimated 1,4% for the remainder of the country and a national average of less than 2.01%. HIV/Aids prevalance of 37% is of great concern and will affect city population and productivity.

In 2002, the top nine cities produced 62% of the country's GDP (R380 billion). The nine cities have half of the national workforce and between 1996 and 2001, 52% of all new jobs were created in these cities. In the same period, unemployment increased by 35%. Of the 7,8 million people within a working age, 3 million were unemployed representing more than two-fifths (44,2%) of the country's unemployed. The lack of skills remains a challenge with 8% of city residents without any schooling, 27% having a final school certificate (matric) and only 12% having some form of post-school higher education.

Water status

Based on the existing reconciliation strategies, water shortages are predicted for the majority of large towns in the short to medium term, necessitating the urgent application of viable interventions. Examples in this regard are Rustenburg, Gauteng region, Cape Town, Ethekwini, Nelson Mandela, Polokwane and new developments in Lephalale. While the absolute number of households served with water connections has improved significantly, the growth in households and their relocation to urban centres has meant that the proportion of households without effective services on site (i.e. yard or house connection) has mostly remained static at an average of approximately 21% of households.

Many of the city sewerage networks are running close to full capacity and much of the existing infrastructure is reaching the end of its lifespan. Growing demands for waterborne sanitation is placing huge pressure on the existing infrastructure and water resources causing regular failure and pollution.

4.1.3 Rural settlement perspective

The layout of traditional rural settlements presents significant challenges in respect to the provision of water services per the existing RDP standards since many deep rural areas are characterized by scattered households located predominantly on hillsides above the flood planes to avert sub-tropical diseases associated with humid climates and water bodies.

Up to 2,7 million people (6% of the national population) live in such scattered patterns, currently clustered into over 15,000 groupings of settlements. The remainder of rural settlements are classified into over 7,500 small villages (less than 5,000 people each) and over 500 larger rural villages (with more than 5,000 people each).

To provide each household with even the most basic water supply service is a complicated and costly exercise. Where possible, local groundwater resources, protected springs and/or rainwater harvesting methods are used to address the most dispersed settlement areas in the short term. In the longer term, settlement development should be influenced by providing incentives for densification or, where necessary, relocate some of the most inaccessible households to nearby settlements. Many of the larger villages are also located on hillsides and generally have unplanned layouts. The soil conditions are mostly rocky and local water resources are limited. The construction costs are therefore typically high, requiring significant financial commitment from government to achieve the country's target to provide all people with basic water supply infrastructure by 2014.

Socio-economic indicators

The rural population is an estimated 19,9 million people (or 40% of the population), living in 23,600 settlements.

Rural communities are mostly dependent on agriculture or social services. Mining, agriculture and forestry are predominant employers. More than half (56%) of unemployed people live in rural areas. Up to two-fifth (39%) of poor households are involved in agriculture for food or cash (subsistence farming) relying mainly on women, children and older people. Over a tenth (14%) of rural households (600,000 households) use farming as their sole source of food whilst a quarter (23% or 1 million households) use farming for supplementary food. Nearly three-quarters (72%) of the poor live in rural areas.

4.1.4 Water Resource Implications

Current domestic water use is estimated at 27% of the total national water use. Urban municipal areas account for 23% of the national water use while rural settlements only use approximately 4%. Urban water use is much higher because of higher service levels and the inclusion of commercial, business and small to medium sized industrial uses in municipalities. The industrial use in urban areas accounts for approximately 20% of the total water use by urban settlements and is likely to increase with the continued industrialization trend.

1. Addressing the basic water services backlogs and ensuring universal access to water

Households that have access to basic water supply increased from 60% in 1995 to 98% in 2008. For the same period access to basic sanitation services increased from 49% to 73%. The eradication of the basic water supply backlogs will increase the total domestic water use by approximately 200 million m^3/annum or 6% of the current national domestic water use. While this may seem insignificant at a national level, its significance becomes apparent at a local level, as it represents the doubling or even tripling of the current domestic water use of many rural settlements.

2. Optimal service levels

The Department of Housing's Urban Development Policy is explicit about its desire for yard connections and waterborne sanitation, which has implications for the quantity of water used by the domestic sector. However, since DWAF has to achieve universal access to water services and sanitation by 2014, the Department is also considering interim measures and in some instances, services below the prescribed RDP standards in bid to achieve the 2014 target.

3. Economic development

To develop sustainable settlements, local government must address economic development and job creation. This will, however, lead to increased water use by cities as most of the smaller industries and manufacturing businesses are located within city areas. Considering the urbanization trend, population growth, service level increases and increased industrialization, the total water use of cities and larger towns could increase by more than 15% to 20% per annum over the next 5 years. These factors are taken into account within the water supply reconciliation studies.

Based on domestic water demand scenarios, at least four of the large cities will run into water deficit situations in the next two decades. Many of the rural settlements already face water resource shortages due to local water availability and climatic conditions. The effect of global warming may further aggravate local shortages requiring increased regional water sharing and expensive water transfer infrastructure.

4.1.5 Drinking Water Quality

South Africa has a policy that all domestic water supplies should be clean and drinkable. All drinking water quality has to comply with the South African National Standards specifications (SANS 241), which is in line with all international drinking quality standards.

By law, all municipalities have to monitor their drinking water quality. Currently, not all municipalities comply on a continuous basis due to a lack of skills, funding and management capacity. To ensure compliance to the national standard, the Department is developing a comprehensive monitoring and evaluation system with appropriate intervention actions.

4.1.6 Pollution

Access to effective water services (supply and sanitation) as well as the water services and water resources environment are critical elements in the health environment and the associated health strategy of South Africa. Access to water is at the top of the health

intervention strategy as well as the key indicator in respect to the MDG health goals. Furthermore, due to domestic, industrial, agricultural and other sources of pollution as well as natural habitats, water resources can host various water-based diseases varying from cholera, bilharzia and malaria to chemical and other types of threats, with major risks and implications.

4.1.7 Water Services Infrastructure

Water services infrastructure is a critical element in the water services value chain, linking the water resource, its treatment and conveyance, with the user/customer. Effective infrastructure planning, maintenance, operations and management are of the utmost importance. It requires appropriate institutional as well as financial resources. It is essential that a life cycle planning and management approach must be adopted focusing on life after construction, which comprises more than 80% of the life cycle cost as well as actual delivery.

4.2 Mining

The mining sector, a big contributor to the South African economy, has two major impacts on water resources. It utilises water for production and is a major contributor to water quality problems. Its enormous water use is exacerbated by the fact that mining activities mostly occur in the dryer parts of the country, compelling mines to use water as efficiently as possible.

Whilst mining activities are scattered throughout the country, the following details the concentration of mining activities:

1) The Vaal River system supplies water to a) the coal and gold mines on the Mpumalanga Highveld, b) the gold mines in Gauteng, the North West Province and the Free State, and d) to the iron, manganese and diamond mines in the Northern Cape.

2) The Crocodile (W) River supplies water a) to the chromium and platinum based mines in the North West and b) to the iron ore mines in Limpopo. In future, it will supply the coal based developments on the Waterberg coalfields in the Limpopo Province.

3) The Olifants River supplies water to the growing chrome and platinum mining developments in the Limpopo and Mpumalanga Provinces. The De Hoop Dam is currently being constructed to supply the water requirements over the short term. It is, however, possible that more water will be required in future. Further development of the Olifants will have to be compared to the acquiring of irrigation water for mining purposes, or a transfer from the Vaal River, that will have to be supported from transfers from the Orange or Thukela Rivers.

4.3 Energy

There is a close working relationship with the large water users in the energy sector to ensure that current power plants, as well as possible future plants, are incorporated into water resource planning initiatives. This is of particular importance given current expansion plans for the national energy grid.

The bulk of Eskom's large coal-fired power stations are situated in the supply area of the Vaal River System and a complex pipeline infrastructure network provides these stations with water from DWAF dams. When these stations were built, Eskom used "wet-cooled" technology, with a typical large power station requiring 45 million m^3/annum of water. This technique has shifted to what is now known as a "dry-cooled" system, which uses 6 million m^3/annum water for a similar power station. Dry-cooled stations cost more to build and operate and are less efficient than wet-cooled stations, but the country's water situation has necessitated this change. Eskom is planning another dry-cooled station in the Vaal River water supply area and this requirement has been factored into the Vaal River Reconciliation Strategy Study.

The large coal-to-liquid plants, Sasol 1 at Sasolburg and Sasol 2 and 3 at Secunda, are also situated in the supply area of the Vaal River. These plants also use large volumes of water for fuel production, as well as for associated chemical products.

The Vaal River Eastern Sub-system Augmentation Pipeline (VRESAP) is currently being built to augment the water supply to the Eskom power stations and Sasol 2 and 3 from the Vaal Dam.

The greatest potential for the building of new coal-fired power stations is on the Waterberg coalfields near Lephalale in the Limpopo province. Eskom currently has the dry-cooled Matimba power station in this area and has approval to add the dry-cooled Medupi station. This may be followed by three or four more power stations. Water for existing use in this area comes from the Mokolo Dam but this supply is inadequate to meet the requirements of these new power stations, even though dry-cooled. The solution is to bring water from the Crocodile (West) River, where the growing return flows from the northern urban and industrial areas of Gauteng serve as the main source of water. A feasibility study is currently being done on the pipeline, pumping stations and reservoirs that will be required for this transfer. This pipeline must be operational by 2012.

It is envisaged that the Department will supply water from the De Hoop Dam for the operation of Eskom's proposed hydropower pumped storage scheme in the proximity of the De Hoop Dam near Steelpoort and Roossenekal in the Limpopo Province. Furthermore, the Department is negotiating with Eskom to pump water 700 m high from the Steelpoort River valley to the top of the Nebo Plateau at a reduced energy cost for the benefit of communities in the Nebo area.

Sasol is also currently investigating the possibility of building what are known as the Mafutha 1 and 2 coal-to-liquid fuel plants. These plants would be comparable with Sasol 2 and 3 at Secunda. One option is to build these plants near Koppies in the Free State, with water supplied from the Vaal River. The other option is in the Lephalale area, with water from the Crocodile (West) River (as for Medupi power station), or from the Vaal River System if return flows in the Crocodile (West) River prove to be insufficient. These plants require large quantities of water (80 million m^3 per annum) and will put pressure on the water resources, but forward planning has taken this growth into account in strategy scenarios and in the feasibility study for the Crocodile-Lephalale pipeline.

4.4 Agriculture

Agriculture forms a key, but small, part of the South African economy, contributing to 4% of the GDP. In addition, the agro processing industry, which is dependent on irrigation, makes up 20% of South Africa's GDP and is an important source of foreign exchange earnings. It is also a crucial source of employment, particularly in rural areas, employing 15% of the labour force.

It is the largest water user sector in the country, consuming almost 60% of the entire water resource available. A challenge is to produce more food with the same or less water. It is essential to enhance the productivity of water, which improves the competitive advantage of agriculture in a global economy. Agriculture is also facing increasing competition from the domestic and industrial users.

The new Irrigation Development Strategy by the Department of Agriculture proposes a 600,000 ha additional irrigation from water-loss savings and improved irrigation efficiency. This includes the rehabilitation of existing irrigation schemes in the former homelands and the use of water already allocated to agriculture that has not been used up to date. It also includes irrigable soils in the Free State that could only be irrigated through inter-basin water transfers resulting from possible establishment of waterworks on the Eastern seaboard.

4.5 Forestry

The forest resources of South Africa consist of three main components: woodlands, indigenous forests, and plantations. The Department's 2003 vision and mission commits the department to ensuring that 'Forests are managed for people and the need to create an enabling environment for economic and social development through sustainable forest management at the local level'.

4.5.1 Plantation Forestry Sector

Globally, South Africa has the highest proportion of its plantations environmentally certified, with 82% of planted forests certified by international certification bodies. There is approximately 1,3 million ha of plantations in South Africa, of which over 80% are situated in Mpumalanga, KwaZulu-Natal and the Eastern Cape.

These forests produced more than 24 million m^3 of commercial roundwood, worth more than R5-billion in 2006. In these forests, employment is provided for about 107,000 people, of which 69,556 are in formal employment, 13,274 are contract workers and 24,170 small growers with their staff that they employ .

4.5.2 Extent of emerging timber grower activity coverage in South Africa

Table 1 Outgrower Timber Schemes in South Africa

Company	No. of growers	No. of hectares	Average hectares
SAPPI – Project Grow	9 810	15 000	1.5
Government supported projects	6 200	2 584	0.4
MONDI – Khulanathi	3 000	7 000	2.3
SAWGA – Phezukomkhono	2 860	4 560	1.6
NCT Forestry Coop	1600	25 000	15.6
TWK Agriculture Ltd	500	1800	3.6
Independent growers	200	809	4.0
Total	24 170	56 753	4.1

Importantly, plantation forestry provides raw material for downstream activities such as pulp milling, paper manufacturing, saw milling, wood chip exports, timber board, mining timber and treated poles, which in turn represented an income of around R 16,123 billion in 2006. The extent and ownership of these plantations is shown in table 2.

Table 2 Commercial Plantations

Extent Public Ha	Extent Private Ha	Total Ha	Sustainable Forestry Certification	Number of people directly employed in plantation sector
314 654	1 029 502	1 344 156	1 093 187	107 000

Through the restructuring program of the State, the Department has entered into four leases and is ensuring compliance to the leases by regular inspection. Table3 shows the extent of land already leased to private consortiums made up of existing forestry role players and empowerment partners.

Table 3 Land Leased to Private Consortiums

No. of tenants	Extent (ha)	*Rentals
4	246 811	R 100 039 823

*These lease rentals are being held in trust pending the clarification of tenure through the land reform process. After these processes are complete the money will be distributed to the identified beneficiaries.

4.5.3 Economic and Financial Implications

The total value of reported sales of timber-based products in 2005/06 amounted to R 16,123 billion, which is an increase of 7.3% on the value of R 15, 025 billion reported for the 2004/05 period. Woodpulp and paper products continued to dominate the industry, accounting for R6,891 billion or 42.7% of the industry. More than 63,000 people are employed in the wood processing sector.

Table 4 Value of timber and timber product sales (Millions of Rand)

Product	2003/4	2004/5	2005/6
Sawn and planed timber	2098,3	2 251,89	2 280.3
Wooden poles	194,53	219,52	222.3
Mining timber	178,54	240,38	245.3
Wood-based panel products	906,73	926,48	934.5
Wood pulp, paper and paper products	8857,58	6 819,94	6891.1
Firewood	0,18	0,23	0.27
Wood chips	1716,08	1 848,06	1 852.8
Mill residues	147,85	35,46	36.5
Charcoal	57,42	59,40	60.7
Other products	604,378	2 624,09	3 600.1
Total	14814,88	15 025,49	16 123.8

The sale of timber for mining purposes has experienced a decrease over the past reporting period the sale of chips for export to the Far East, has remained more constant.

In recent years, the rate of new afforestation in South Africa has declined considerably due to a number of factors, such as suitable forestry land becoming increasingly scarce and the sometimes-prohibitive costs of obtaining a licence to plant timber. In this past year, however, due to the efforts of DWAF in identifying potential areas with other affected departments and stakeholders the applications received for planting trees grew to 5,500 ha from just 800 ha in 2004.

The private sector was responsible for 99,2 % of the reported new afforestation. Of the newly afforested area, 44,3% comprised areas planted with eucalyptus trees, 49% with softwoods and 6,7% with wattle trees.

4.5.4 Natural Forests and Woodlands

Natural forests cover less than one percent of the country's land surface, harbouring a diversity of plant and animal species. The average national occurrence of species per hectare in natural forests is 418 species per hectare. According to a baseline study on woodlands in South Africa, 2003, woodlands occur on 29 302 316 ha or some 24% of the land area.

While natural forests and woodlands make a large contribution to the economy primarily through eco-tourism ventures associated with these assets, an even greater contribution is made to livelihoods through the provision of fuel wood, building materials, food, natural medicines, craft raw materials and a host of other non-timber forest products.

4.6 Environment

South Africa is dependant on its water resources to provide for its social and economic needs and to support the environment to ensure long term sustainable use. However, as this resource is scarce and unevenly distributed throughout the country, it is one of the limiting factors to the nation's economic production and growth - in short, society cannot sustain any economic activity without the goods and services provided by water resources. For these reasons, an integrated water resource management approach is required that promotes the coordinated development and management of water resources to maximise social and economic development, while ensuring equitable and sustainable utilisation of the resource.

If properly managed, water resources can be utilised indefinitely, such that people can benefit from their innate ability to recover and reset themselves over time. However, exploitation of land and water resources without understanding their limits, can affect catchment processes and functions, and impact negatively on the ecology that has evolved over millions of years. When the balance, resilience, integrity and ecological health of water resources is disturbed, they can become dominated by one or a few hardy organisms, such as blackfly, algae, or introduced pests such as water hyacinth, which have no natural enemies here. Alternatively, when water resources are over-utilised, rivers that once flowed permanently may stop or wetlands dry up. If such levels of exploitation are allowed, the rights of downstream users are impacted on.

Due to the different characteristics of water resources, they fulfil a variety of functions and offer a range of ecological goods, services and attributes to both the environment and society. These can include:
supply of primary resources (basic human uses - cooking, cleaning and washing, supply of reeds, clay and fish);
regulatory functions (climate, nutrient cycling, erosion and sedimentation);
recreational/aesthetic value (fishing, boating, swimming and appreciation for nature);
economic value and functions (water supply to farming and industry, breakdown of pollutants, flood attenuation);
cultural value (baptism); and
ecological functions (provide habitat for all forms of life, part of a greater ecosystem and food web, biodiversity importance).

Water is well recognised as an economic good, and is often considered as a social good whose value can be measured, but the value of aquatic ecosystems is less understood. Aquatic ecosystems offer valuable goods, services and attributes that contribute to human welfare and have economic value. Resources that can be harvested, such as fish and reeds are considered to be goods, while services are processes offered by water resources such as water purification, water storage, and transport. The attributes of water resources include beauty, educational, cultural, spiritual and recreational aspects. Aquatic ecosystem goods are critical for the poor, who often depend on them for their livelihoods. Changes in availability of these services affect the well being of the poor. Tourism opportunities based on the inherent natural beauty of a place have the potential to create jobs with far fewer negative impacts on the natural environment than industrial or mining developments.

Managing water resources for their biodiversity also means protecting those resources for the diversity of goods, services and attributes that they provide. This does not mean that water resources should not be utilised; it just means that the natural components, processes and functions on which the water resources depend should be protected and taken into consideration when decisions are made concerning the use and development of water resources. Responsible management is the core of sustainable utilisation of the water resource and is central to integrated water resource management. In order to understand and manage the water resources within their sustainable limits, a Resource Directed Measures (RDM) strategy was developed by DWAF and is used to give effect to the water resource protection provisions as prescribed in chapter 3 of the National Water Act.

4.7 Recreation

Recreation in South Africa is highly dependent on water availability and quality and underpins South Africa's ecotourism sector, an increasingly important economic sector.

Due to South Africa's hot climate, many urban households have swimming pools or share in a municipal swimming facility. These together with water parks, fountains and water features are requiring significant volumes of water due to high evaporation and other losses. Municipalities also irrigate parks and recreational areas during dry seasons, which is partly done through re-use of municipal waste water, where possible, or through the water supply systems.

Many of the high value settlement developments are taking place at or near rivers and water bodies due to the increased property value associated with recreational water uses and the scenic setting associated with water bodies. Examples include Hartebeespoort Dam, Vaal River and Dam, urban lakes and rivers, Pongolapoort Dam.

Unfortunately, this often leads to environmental impact on riverine ecologies and pollution of water. In some cases the natural river flows are changed and/or impounded effecting the water quality, aquatic life and evaporation losses.

The urban growth is also resulting in an increased recreational use of nearby dams, rivers and natural lakes. Access to and use of water bodies is also affecting the environmental and water quality of the water. The water use must therefore be managed effectively and with the necessary precautions such as flood and pollution prevention.

4.8 Establishing the economic value of water

The following table provides a preliminary indication of the economic value of water to a selection of sectors:

Sector	Gross Domestic Product R/m^3	Employment number/Mm^3	Low Income Households R/m^3
Urban sector: Commercial and industrial consumers	R498.83	1,745.73	R158.47
Rural – subsistence agriculture	R0.89	21.64	R0.17
Commercial irrigation	R2.80	133.79	R0.70
Commercial forestry	R1.96	57.02	R0.31

The Department intends to refine and extend this analysis of the economic value of water for a number of reasons. Firstly, in light of its commitment to water redress, the Department needs to make informed decisions in respect to its Water Allocation Reform programme. Secondly, it assists the Department in understanding where it needs to focus its efforts with regards to Water Conservation and Water Demand Management. Thirdly, it wishes to ensure that water allocations achieve the best possible economic returns as water is becoming an increasingly scarce resource.

5 Risks, threats and challenges

There are several dominant risks, threats and challenges to the country being able to supply sustainable water supplies into the future. These are water availability, climate change, infrastructure, human resources, compliance and enforcement, raw water quality, and financial support and water pricing, each of which will be discussed separately.

5.1 Climate change

Climate change is an accepted threat to the sustainability of water supplies as highlighted by the Inter-Governmental Panel on Climate Change's technical report. What is uncertain is the quantification of the impact and this means that the planning required to ensure sufficient water supplies in fifteen to twenty years is difficult to effect. It is vital that sound data on the characteristics of water resources, and in particular, the monitoring of rainfall and runoff, are maintained so that yields estimates are more accurate, allowing for adaption in the planning environment.

All scenario planning, such as the reconciliation strategies for the metropolitan areas, must factor in the climate change to ensure that augmentation options are considered and mitigation measures introduced timeously.

5.2 Natural Resource Management

A critical threat to water for growth and development in South Africa is natural resource degradation. Certain invasive alien plant species use more water than the indigenous plants that they displace, and estimates are that already they have already decreased the mean annual runoff by 7%, and (if left alone) that this figure could increase to 16%. Climate change could exacerbate the impacts even further. Not only do invasive alien plant species have a negative impact on water quantity, but within that stream-flow reduction, water quality, eutrophication, river-bank degradation, thermal pollution, light pollution, erosion, siltation of dams and estuaries, flooding, destruction of infrastructure, biological diversity, the integrity and functioning of both terrestrial and aquatic systems, fire, the productive use of land, disease, access, recreation and tourism. All of these factors will influence water for growth and development, and this is recognized through the investment in the Working for Water programme.

A second major consideration in natural resource management is that of wetland conservation. South Africa has almost 120,000 known wetlands, more than half of which are destroyed or degraded. The impact once again on water quantity, water quality (wetlands being known as the "kidneys of natural systems"), flood attenuation, tourism and recreation, biological diversity and food security, point to this being a second major factor for water for growth and development. This has been reflected in the development of the Working for Wetlands programme.

Linked to above concerns have been land-use practices, and the impact that these have on water security. The need to rehabilitate degraded land, which benefits water, erosion, siltation and carbon sequestration, is pivotal for water for growth and development (for, of course, growth and development can only take place with a variety of measures that are addressed, one of which is water). The Working for Woodlands programme, in concert with the LandCare programme, is a response to this.

A fourth major consideration is wild fires. While wild fires are essential for ecosystem services in fire-prone vegetation, the acceleration and intensity of wild fires (often fuelled by invasive alien plants) impact water security (water quality and water quantity), habitat destruction, impacts on life and livelihoods, flooding and other impacts, once again illustrate the need for an integrated approach to dealing with water for growth and development. The Working on Fire programme is a response to this.

5.3 Infrastructure

5.3.1 Water resources

There is a need to invest in the upgrading of current infrastructure since the majority of capital investments were made in the 1970s and 1980s. Most assets are thus approaching the end of their useful life, which means funding will be required for major rehabilitation to extend the lifespan of these assets. The capital replacement cost (CRC) of the poor

condition assets amounts to about R6.4 billion and there is a maintenance backlog for those assets deemed to be in good condition. About R4 billion per annum is require to renew or rehabilitate this infrastructure and the bulk of the rehabilitation for the next 30 years will be on canals and tunnels, which supply irrigation mainly.

Further analysis of the scheduled replacement costs per asset type is required to differentiate between critical and non-critical assets. The critical assets have to be prioritized and may even be brought forward into the first 10-year period. It may be possible to defer some of the non-critical assets such as secondary and tertiary canal systems, until there are lowered replacement needs, whilst accepting the related impacts such as water losses, lowering of service levels, reduced revenue streams and strained relationships with customers.

5.3.2 Water services

There is an ongoing need to sustain the process of addressing water supply backlogs, which invariably requires continued investment in new infrastructure to areas that lack safe water supplies. This has to be balanced with the need to maintain the existing water services infrastructure as well. Water Service Institutions (WSIs) are expected to develop and apply Infrastructure Asset Management (IAM) through their Water Services Development Plans (WSDPs) and water board business plans. A drawback of these plans is their tendency to focus on the development of new infrastructure to address basic service backlogs at the expense of the IAM requirements of the existing infrastructure.

Unless IAM requirements are adhered to, funds to address the cost of unplanned repairs and replacements may have to be prioritised over new construction, which would severely limit the programme for addressing backlogs and expanding service delivery. Current reasons for this lack of adherence includes the lack of skilled contractors to render services and poor construction supervision, which diminishes the life expectancy of the infrastructure; the lack of municipal staff to operate and maintain water services infrastructure; and the absence of or weak municipal systems for infrastructure management. The result is poor service quality leading to customer dissatisfaction and non-payment of services. This, in turn, impacts the financial viability of schemes and compromises the WSIs ability to provide effective services.

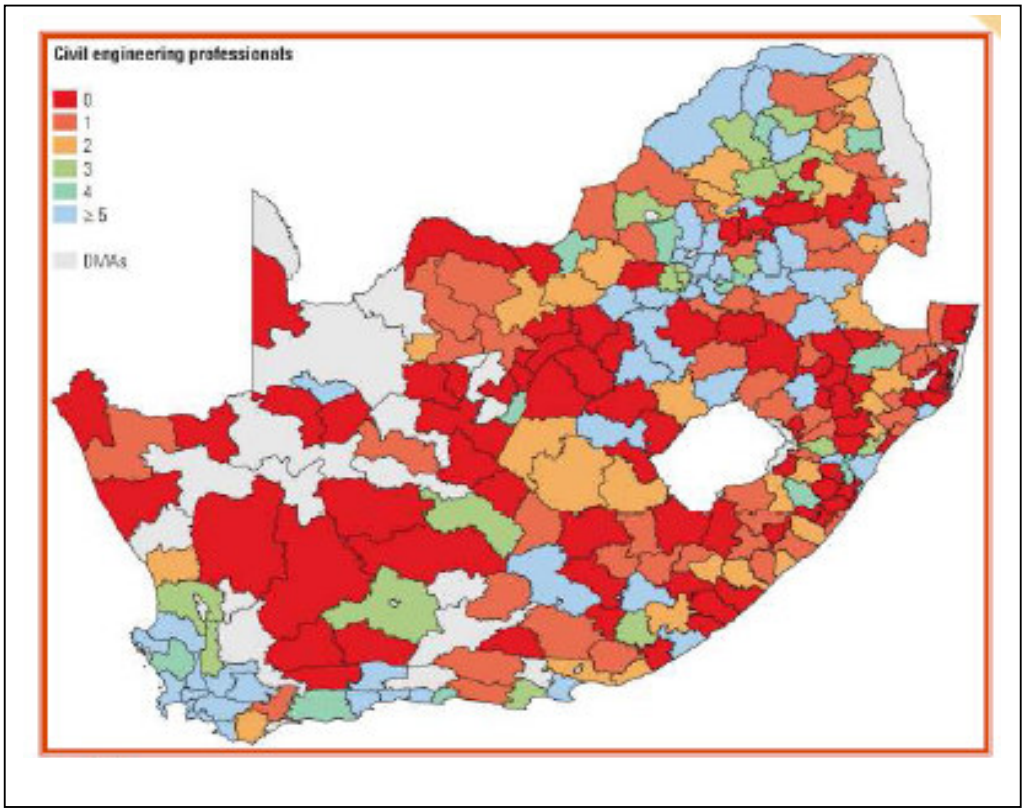
Of particular concern is the status of the Waste Water Treatment Works, which are affected by failing infrastructure (water purification and reticulation infrastructure), poor waste water collection and treatment systems, and lack of human resources (capacity and skills) to meet effluent standards. The impact of poorly managed Waste Water Treatment Works is the inability to sustain safe drinking water quality.

5.4 Skills shortages

The water management sector is experiencing skills shortages in respect to engineering, science, technical and artisan areas of skill, and which are accordingly classified as scarce and critical skills. This is largely attributed to an insufficient skills base and fierce competition in the sector for skilled personnel. Huge losses in institutional memory and strategic and operational decision-making capabilities are also anticipated as a result of high rates of retirement in the next decade.

The following graph captures the skills shortages in respect to civil engineering professionals within local municipalities, as one indicator of skills shortage in the sector. It illustrates the extreme shortages in many municipalities, which affects the municipalities' ability to maintain and expand water management and supply systems and processes.

Figure 8 Status of civil engineering professionals in local municipalities



5.5 Compliance and enforcement

There is major concern about the extent of unlawful water use and pollution – the abuse of the Vaal River system epitomises this behaviour - resulting in the quantity of water being used exceeding the respective systems' yield and pollution of fresh water resource resulting in eutrophication (lack of oxygen in the water).

In the Vaal River system, the unlawful use of water, mainly by irrigators, is a major problem, mainly upstream from the Vaal Dam. This water is, in effect, being supplied by the Lesotho Highlands Water Project (LHWP), and the current volume of water abstracted illegally along the Vaal is equivalent to the yield of the new Mohale Dam.

This unlawful water use means that the system yield was exceeded by total use in 2007. The impact is the same as if the tunnel between the Mohale and Katse Dams collapsed and Phase 1B was effectively cut off from the system. A R7,8 billion project to ensure sufficient water for Gauteng has effectively been neutralized through the theft of this water. This is currently masked by the good rainfall and run-off of the past seasons, but this could change dramatically under drought conditions.

Pollution of water resources is attributed to the impact of mining activities leading to heavy metal contamination as a result of acid mine drainage; poor agricultural practices resulting in increasing salt loads; and urbanisation and industry-related activities.

5.6 Raw water quality

There is concern about the declining quality of water in rivers and dams as a result of pollution and poor land use management and its socio-economic and environmental impacts. Examples of economic impacts include costs borne by Eskom because the quality

of water does not meet the design specifications of its power stations and loss of earnings in the agricultural sector because water quality does not meet EU standards. Social impacts include negative health impacts and ensuing consequence such as loss of life and productivity. Environmental impacts include eutrophication and groundwater contamination.

Sources of pollution include the agricultural and industrial activities, poorly managed waste water treatment works and human settlements.

6 Current interventions

6.1 Planning Interventions

The **Water for Growth and Development (WfGD)** framework is a planning programme ensuring continued water to developing areas. It is supported by existing legislation and policy but needs continued political support. This programme is in line with the Strategic Framework for Water Services (SFWS) and the National Water Resource Strategy (NWRS).

National development plans need to take due cognisance of the constraints imposed by water scarcity, and planning should include consideration of technical, economic, socio-economic and environmental impacts.

Based on the conclusion that the **National Spatial Development Perspective (NSDP)** should inform the development plans, policies and programmes of all spheres and agencies of government as a matter of policy, DWAF has produced reconciliation strategies for most of the 26 key national growth points as identified by the NSDP, and will be further expanded to cover the whole country.

The **National Water Resource Strategy (NWRS)** provides a clear indication of the overall state of the country's water resources and provides a number of measures to optimise and extend the availability and use of water, offering strategies towards equitable, sustainable and efficient use in line with NWA principles.

The **Strategic Framework for Water Resources (SFWR)** sets out a comprehensive approach with respect to the provision of water resources, ranging from small rural areas to industries in the largest urban areas. It outlines the change in approach needed to achieve policy goals. Water services refer to water supply and sanitation services and include regional water schemes, local water schemes, on-site sanitation and the collection and treatment of wastewater.

The **Internal Strategic Perspectives (ISPs)** can be viewed as regional strategy tools, ISPs have been developed for each of the 19 Water Management Areas (WMAs), serving the purpose of refining the water resource information and providing a review of each area in terms of resource availability and management.

Reconciliation Strategies: The Department has embarked upon a process of preparing reconciliation strategies throughout the country, looking at water requirements (based on use, estimated need and projected need), at water availability (ability to meet those demands), and at the overall resource situation - from infrastructure and affordability - to ways of reducing demand and increasing availability. The approach to water resource reconciliation is set out in a strategy that recommends actions to ensure sufficient water. These strategies could vary from complex, in the case of major metropolitan areas and systems and catchments, to simple strategies for smaller towns.

The key objectives of the reconciliation study are to develop future water requirement scenarios, investigate all possible water sources and methods for reconciling, provide

recommendations for interventions and actions and offer a system for continuous updating in the future.

Current completed studies include:
Western Cape Water Supply System: Reconciliation Strategy Study;
Reconciliation Strategy for the Amatole Bulk Water supply System.

Studies in progress include:
Vaal River System: Large Bulk Water Supply Reconciliation Strategies;
Crocodile (West) Reconciliation Strategy Study;
Water Reconciliation Strategy Study for the KwaZulu-Natal Coastal Metropolitan Areas;
Algoa Water Supply Area.

Further studies are planned, and the process will be taken forward by Strategy Steering Committees, which will monitor the actual water use, assess the results from further planning studies and make recommendations on the implementation of interventions.

The next step is to extend the reconciliation strategies to all other towns, which will provide first-order reconciliation strategies for all towns in South Africa over the next three years. These strategies should give clear direction to municipal managers on the best sources of water supply for their development needs.

6.2 Water Services Infrastructure

Recent work in assessing and documenting the state of water services infrastructure served to underline the need for a **National Water Services Infrastructure Asset Management (IAM) Strategy**. This strategy aims to avoid infrastructure deteriorating to crisis levels, there by negating the impact and affect on national government's growth and poverty reduction targets.

Challenges are classified as one of nine potential solution areas. The results of this have shown that the key areas for attention are human resources, skills development and capacity building.

6.3 Skills Development Initiatives

A number of skills development initiatives have been put in place in the water sector, with some success in terms of training in scarce skills.
A **Water Sector Support Coordinating Unit (WSSCU)** was established in 2007 and focuses on the acceleration of basic water services delivery by identifying and addressing project implementation bottlenecks in DWAF and municipalities. Hands-on engineering and technical support is provided through the **DBSA Siyenza Manje programme**, the **SAICE/SABTACO deployment programme** (known as ENERGYS – Engineers Now to Ensure Roll-out by Growing Young Skills), and the **Masenzani Management Support Contract**.

The WSSCU has begun to explore partnership arrangements with various organisations, and has established a relationship with DWAF Forestry and Water Learning Academy to identify how short-term deployments in the sector can be linked with on-site training programmes.

6.4 Raw Water Quality Management and Pollution Control

Initiatives in this area focus on compliance and enforcement. There has been a shift in DWAF's approach to municipalities that do not meet compliance standards in terms of the management of their Waste Water Treatment Works.

DWAF is developing its small Compliance, Monitoring and Enforcement (CME) Units, the regional teams of which will move into the CMAs as they are established.

Due to a previously poor past track record in completing cases against offenders, DWAF's CME Units are now working in partnership with SAPS, DEAT, NIA, SARS and DoA, as well as being part of the Environmental Prosecuting Forum. The National Environmental Management Act (NEMA) is currently being amended to enable the appointment of DWAF officials as environmental management inspectors (EMI) with the associated powers.

6.5 Water for development

Since 1994, the water sector has implemented various policies and programmes with associated funding to support service delivery, job creation and poverty alleviation, such as the roll-out of the Free Basic Water Policy; Financial Support for Resource Poor Farmer Policy & Supporting Regulations; the Water Allocation Reform, Working for Water and the Masibambane I, II & III programmes. These programmes remain vital for the WfGD programme.

Through these and other programmes, the water sector has realised successes in the establishment of Catchment Management Agencies, Water Allocation Reform, improvement in Raw Water Quality and Effluent management; better management of bulk water infrastructure; more effective regulation; implementation of WCDM programmes; improvement in Drinking Water Quality and addressing the sanitation backlogs.

Working for Water (WfW) is an Extended Public Works Programme (EPWP), administered by DWAF on behalf of DWAF, DEAT and NDA, which seeks to effectively manage invasive alien plants in South Africa in a labour intensive way that optimizes the socio-economic empowerment opportunities presented by the programme. Since its inception, WfW has generated employment opportunities through more that 300 projects and has also supported some value added industries projects with the development of capacity.

6.5.1 Socio-Economic Benefits of Large Water Resource Development Projects

Investment in new large water resource projects, such as dams, bulk water pipelines, pumping station and reservoirs, often have significant spin-off benefits to local communities, which are sometimes otherwise economically depressed areas.

The Thukela Water Project created employment, increased skills levels in the community, boosted the local economy and improved infrastructure.

The De Hoop Dam Project created similar benefits, and this was done as part of a Charter which set targets for Social and Economic Development, and was managed through the establishment of an Authorities Coordination Committee.

7 Options and choices

This section of the report details the options and choices that the Department, government and other stakeholders will have to consider when focusing its decision-making to ensure that water management and use optimizes the twin goals of growth and development.

The section begins with a discussion about the range of instruments that are available to the Department to effect behaviour change with respect to water use. This is followed by a discussion about the range of options available to the Department to consider in respect to securing water availability, which goes far beyond the conventional means of water augmentation schemes. The remainder of the section then offers further detail on supply-side management and demand-side management interventions, climate change, interventions for 'water for growth' and 'water for development' and lastly, water governance and co-operative planning.

7.1 Reconciliation strategies: balancing supply and demand

The approach towards determining and planning for water resource sufficiency and sustainability is through Reconciliation Strategies that have already been developed for the major metropolitan areas, or must now be developed for the remaining areas.

It is essential that these strategies be undertaken and updated to cover all metropolitan areas and towns in the country and later to include all water users. The reconciliation process must be supported through to implementation and meaningful handover to relevant authorities. Strategies must be adapted as the future unfolds and Strategy Steering Committees, comprising of all major stakeholders, are being established for the metropolitan areas to monitor implementation and allow for appropriate adjustments and timely interventions.

Water demand must be managed and water used as efficiently as possible. All supply side options must be considered as will be discussed in the following section.

7.2 Options for securing water availability

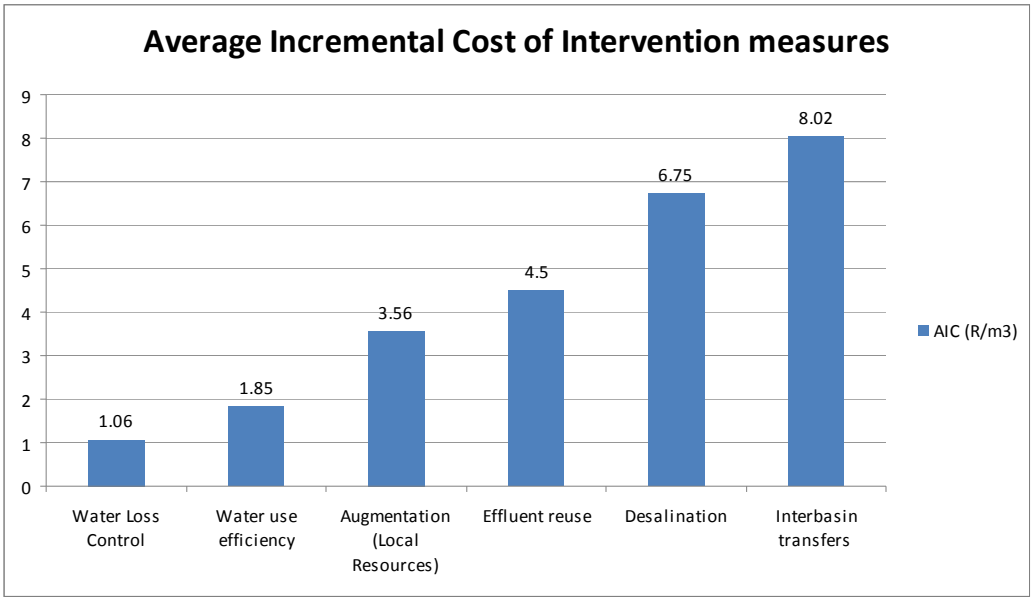
7.2.1 A global view of water source options

Historically, investment by the Department 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 currently very little potential in this regard apart from the southern parts of KwaZulu-Natal and the eastern parts of the Eastern Cape. With the emerging findings of the reconciliation strategies and imminent water shortages in South Africa's largest urban centres, the Department must consider other viable water supplies to serve the varying needs (quantity and quality) of each water-reliant sector.

Apart from traditional augmentation schemes, other water supply options include effluent re-use (or water recycling), desalination and interbasin transfers. Demand-supply options include water loss control and water use efficiency.

The graph below provides an indicative costing based on a case study of the marginal cost of water supply in the municipal sector conducted in the Inkomati WMA and information on desalination was derived from recent plants installed in the Western Cape. It is therefore key to note the general trends in this graph are based on the least cost where there is potential in implementing all the intervention measures.

Figure 9 Average Incremental Cost of Intervention Measures



It is important to note that developing the global or national marginal cost of different intervention measures can be very misleading as the marginal cost of different options are dependent on the following aspects for each option:

In the case of water losses, the level of water losses for the different sectors and the potential to implement water loss control measures determines the marginal cost of implementing water losses. Where a sector is close to the Economic Level of Leakage (ELL), the marginal cost of implementing the measure increases substantially.

In the case of interbasin transfers, depending on where the transfers are sourced from, the dam sites and the environmental considerations of different sites, as well as the timing of the augmentation scheme (time value of money), the marginal cost of transfers can vary substantially. The economy of scale of the transfer schemes also affects the unit cost of additional supplies from the transfer.

The desalination measure is based on desalinating seawater, and supplying coastal towns. However, the economy of scale (size of the desalination plant) of the plant can impact on the unit cost of desalination.

The unit cost of reuse of domestic effluent is likely to be cheaper compared with the reuse of industrial effluent because the quality of industrial effluent is poorer than domestic effluent.

Therefore, the figures should not be taken as the actual marginal cost of the intervention in general but will vary on a project by project basis and will depend on the potential that exists in each of the water supply intervention options. The general trend is that where WC/WDM exists, it will provide the least cost to providing the same unit of water compared to all other options.

7.2.2 Future water mix

The following matrix provides a high level perspective of the potential shifts in water mix being anticipated by the Department.

Table 5 A long term global view of the potential combination of main water sources

Water supplies	2008	Mid-term 2025	Long-term 2040
Surface water	77%	72%	65%
Groundwater	8%	10%	12%
Re-turn flows (irrigation, treated effluent and mining)	15%	19%	25%
Desalination	<1%	5%	7%
Notes on assumptions: 2025 and 2040 water requirements based on high growth scenario. No additional water for irrigation assumed. Only surface water resources that at present appear likely to be developed, were taken into account. Groundwater development assumed for rural areas and for some bulk schemes, i.e. Cape Town. All inland return flows discharged to rivers and groundwater resources, therefore available for indirect re-use. Coastal areas at present discharge most treated effluent to sea, re-use schemes could be implemented by supply of treated effluent to agricultural users or by returning treated effluent to surface sources or artificially recharge groundwater sources. Available supply for urban uses could be increased. Desalination includes treatment of seawater and brackish groundwater. Increase in groundwater, return-flow use and desalination may seem small, but volumes are big and would need major effort and resources to achieve.			

In the long-term, while surface water will remain the predominant source of water, the Department expects surface water to contribute proportionately less with proportionately significant increases in return flows through the treatment of urban and mining effluent and desalination.

Options for water supply must be considered beyond the traditional river storage options. In order to assess the requirements of water supply, it is important to look at all options on the demand and supply-side. Cost analysis should be undertaken on the cost of infrastructure, cost of distribution to system or place of demand both in terms of CAPEX and OPEX. Furthermore, environmental costs should be part of the evaluation and decision-making. Ultimately, the Department will ensure that cost-benefit analyses will factor in total benefit and not be limited to direct capital and operational costs so that its decision-making factors in full costs, including environmental costs.

7.2.3 Desalination

Desalination refers to the treatment of saltwater, a common practice in many parts of the world where coastal cities' water needs are supplied by large-scale desalination plants. The City of Perth in Australia, for example, has recently commissioned a state-of-the-art large-scale desalination plant to supplement its surface and groundwater resources. With the sea being an unlimited source of water, desalination of seawater is the ultimate option for supplying coastal cities. In recent years, the technology in this field has improved significantly and the associated energy use and costs have decreased to the extent that feasibility must be taken seriously. The possible impacts of climate change on the availability of surface and groundwater put another important perspective on the desalination of seawater, especially in the Western Cape.

The intended use would be productive (industrial and agriculture) although it is possible, especially with technological developments, for desalinated seawater to be treated to a drinking water standard.

The benefits of desalination include its proximity to demand, reduced infrastructure costs, reduced water losses, and favourable upgrading and replacement costs. Desalination plants can be operated when needed and can be upscaled with far shorter lead times than dams for example. Due to the availability of packaged plants or modules, this is an efficient method to cater for prolonged drought emergencies, dealing with the impact of climate change and repaid growth scenarios.

In terms of costs, the advancements in desalination technology mean that it can cost anywhere between R5/m^3 to R7/ m^3. The largest component of the cost relates to the energy required to pump water through the membranes as well as the cost of these membranes and their replacement. The cost of water is also dependent on the recovery rate. Sea water, for example, has a recovery rate of about 50%. There are ways of offsetting these energy costs as demonstrated in the Perth desalination project, which included a household energy savings programme and the desalination plant also buys a significant portion of its energy from wind farms established for this purpose.

The City of Cape Town, Umgeni Water and Ethekwini Metro are at the early stages of investigating the feasibility of desalination. Small towns that have gone ahead with small-scale plants include Bushmans River Mouth and Kenton-on-Sea (Albany Water).

While desalinated seawater may be a great solution for coastal cities, it would come at great cost for inland areas. It is very expensive to transfer water over long distances, also due to the associated use of energy for pumping. The initial cost estimates for the transfer of water from the Crocodile West catchment to the Lephalale area over a distance of about 200 km is in the order of R8 to R10/m^3. From this it can be deduced that it would be prohibitively expensive to desalinate seawater and pump it to inland cities.

7.2.4 Water recycling

The water recycling may take a number of forms, each with substantially different costs, quantities and value to the end user. The various forms include:

***Industrial reuse*:** commercial users may apply water in cooling, wash-down or other industrial processes. In some cases, recycled water can be treated through reverse osmosis or similar processes to obtain a high quality water product. This will have some cost implications. The quantity that can be recycled is constrained by the number of industries within a close proximity of a wastewater treatment plant that can make use of recycled water in their processes.

***Agricultural reuse*:** substantial volumes of recycled water could be made available for agricultural use. In many cases, the vast distances between the wastewater treatment plant and the customer make the cost prohibitive.

***Third pipe residential*:** treated wastewater can potentially be used for non-drinking purposes such as garden watering and toilet flushing. Although there are no third pipe schemes in South Africa, there may be benefits in implementing these schemes. The benefit of third pipe schemes often hinges on the ability to reduce costs in other parts of the water supply or wastewater system.

Since domestic water use is mostly non-consumptive, the re-use of water should be considered where possible. This together with demand and conservation measures should be implemented to ensure that the countries limited water resources will be adequate for the growth in domestic water demands.

***Indirect potable reuse*:** water can be treated to an extremely high quality and then returned into a river, surface- or ground-water supply for eventual re-extraction and use in the potable water supply system. Although this is being done in some areas, which are highly water stressed such as the Crocodile (West) River system, and other areas, there is scope for increasing indirect potable reuse.

The Reconciliation Strategy Studies for the metropolitan areas have identified the use of treated effluent as a major potential source of water, especially in coastal cities where the bulk of the effluent is currently discharged into the sea. Limited re-use of water for industrial purposes is already being practised in almost all of the coastal cities.

The benefit of treated effluent includes the immediate availability of the water source with high assurance of supply and water is already being treated through invested costs of infrastructure and human resources. Where current treatment does not adhere to standards for discharge to rivers, the treated effluent can be used for economic activities. Options include treated wastewater, used as irrigation water, which in turn is used to augment primary water supplied.

The treatment of water from mining sources is yet another highly attractive option as it could lower the environmental costs of this water, which tends to present a high pollution risk to the country's rivers.

Preliminary comparisons have indicated that the use of treated effluent is becoming cost effective, and this may well be cheaper than the desalination of seawater. As reuse would happen more than once, the effective increase of the available resource will be considerably more than the portion recycled and the primary resource need only be used to top up the water that is being recycled. The treatment of water also reduces the environmental difficulties of disposal.

In inland areas, the return flows from waste water treatment works flow back into the rivers and are used again indirectly, mostly for irrigation. In the Vaal River system, it is now projected that the increase in effluent from Gauteng (resulting from the growth in urban water use) will soon exceed the quantity required to meet the needs of existing down-stream users; this even though some of this water has been earmarked for transfer to the Lephalale area of the Limpopo Province for use at the planned power stations as well as a possible coal-to-liquid fuel plant. With projected water shortages in Gauteng this surplus effluent should logically be treated to back potable standards for re-use in the Rand Water supply area, rather than released downstream.

Effluent can be treated to different levels (e.g. potable or irrigable) and use matched to treatment. Its application for industrial purposes is an obvious first option. The exchange of treated effluent with fresh water used for irrigation is another possibility. However, to make full use of the opportunity, the bulk of the effluent should be treated to potable standards. While the technology is available to do so (it having first been developed in South Africa and implemented in Windhoek in Namibia), it has not been used on a large scale elsewhere in the world. The treating of effluent to potable standards should not at this stage been seen a solution to water scarcity in small towns due to the sophisticated treatment that is required, demanding both technical skill and equipment. Lower standards could be applied to provide water for food gardens and crops.

The treating of effluent for re-use falls in the area of responsibility of the municipalities, but the capacity in local government (and for that matter also in the private sector) is limited. No major centre has yet adopted the treatment of effluent as a favoured option. Ethekwini is taking the first steps and these must be supported.

DWAF's aim is to establish the use of recycled water as a key element in the sustainable management of water as a limited resource. The aim is to encourage the commercial use of this valuable water resource while ensuring the highest environmental standards in land-use and recycled water management.

7.2.5 Groundwater use and treatment

Groundwater, long managed as private water in South Africa, was declared to be a public resource under the National Water Act of 1998. The country has not yet caught up with the implications of this change. The focus has been on surface water, with groundwater often seen as a resource of last resort, delivered to rural communities in times of drought and disaster. Groundwater must be "mainstreamed" alongside surface water as a key resource, the proper use of which greatly increases our total availability of water.

Groundwater offers a significant volume of additional water to agriculture, the mining sector, towns, and even the city of Cape Town. It is often the only available and affordable supply of water for many towns and rural communities that could allow future growth and development. Groundwater is widely accessible, often close to the point of use, yet is frequently either not recognised as a resource, or shunned as inferior to surface water, both by planners and consumers. At least one major bank is unwilling to finance development schemes based on groundwater.

Groundwater is critical to many Karoo and coastal towns. The dolomitic aquifers are a major fresh water source in the North West Province (e.g. Tosca). Agricultural developments ranging from potatoes in the Sandveld to tomatoes in Dendron depend on groundwater. Cape Town and Oudtshoorn are exploring the Table Mountain Group Aquifer as a major source of water to use conjunctively with surface supplies. Groundwater also brings accessible supplies to many rural communities from the Eastern Cape (former Transkei areas) to Limpopo and may well, with time, supply up to 20% of the country's water. Most importantly, given that it is a partially unexploited resource, groundwater offers a relatively conflict-free way of offering water to the rural poor across the country.

The treatment of brackish groundwater is an option in areas of poor water quality. Generally, it is closer to the point of demand and benefits include increased water assurance, reduced risk of water restrictions, minimal evaporation losses and serve as emergency supplies due to shorter lead times for implementation.

DWAF, in the National Water Resource Strategy, and in more detailed strategies for Water Management Areas, has highlighted the importance of groundwater in integrated water resource management. In order to bring groundwater to its rightful place alongside surface water, it is essential that DWAF invest the funding necessary to accurately quantify resource volumes at a scale useful to planners and users at local level. At present the Department lacks the depth in skills and leadership in hydrogeology to drive the understanding and acceptance of groundwater from national down to local management level. Steps must be taken to strengthen skills within the Department, but also to build technical training capacity at institutions across the country.

The sustainable use of groundwater lies first in the careful siting of boreholes and thence in monitoring and management to ensure that use does not exceed supply. Successful use depends entirely on good management. This goes for any water resource but is all the more important where the supply is "invisible" to the user. The Department is currently in the process of developing a National Groundwater Strategy that can be expected to identify many of these issues and offer way forward.

7.2.6 Recommendations

In the long-term, while surface water will remain the predominant source of water, the Department expects surface water to contribute proportionately less with proportionately significant increases in return flows through the treatment of urban and mining effluent and desalination.

Options for water supply must be considered beyond the traditional river storage options. In order to assess the requirements of water supply, it is important to look at all options on the demand and supply-side. Cost analysis should be undertaken on the cost of infrastructure, cost of distribution to system or place of demand both in terms of CAPEX and OPEX. Furthermore, environmental costs should be part of the evaluation and decision-

making. Ultimately, the Department will ensure that cost-benefit analyses will factor in total benefit and not be limited to direct capital and operational costs so that its decision-making factors in full costs, including environmental costs.

Desalination of seawater: Based on the findings of the Reconciliation Strategy for the City of Cape Town, it is recommended that a full feasibility study be undertaken for the desalination of seawater at all the major coastal cities.

Recycling: It is recommended that the use of treated effluent be investigated to a feasibility level as a matter of urgency and that pilot plants be constructed to test implementation.

A very serious effort will have to be made to build capacity in the country to harness this resource. The Department will take the lead with feasibility studies (in close liaison and cooperation with the respective local authorities), where the local authorities have not yet bought into the idea. When the feasibility and benefits of the use of treated effluent is proven, the implementation will be handed over to the local authority.

Development of surface water resources: The de Hoop dam is currently under construction on the Olifants to support platinum mining and related developments. All preparatory work has been completed for the Springgrove Dam in the Mvoti, critical to support the Dube Tradeport development. The final decision on construction is imminent and building must start as soon as possible. Pre-feasibility studies are to commence for a dam on the Mkomazi as a long-term supply source for Ethekwini Metro. Given the lead time, decisions on feasibility studies must not be delayed once a need has been identified.

It is recommended that where any other potential exits, investigations for the development of surface resources are undertaken well in advance of when the water may be required. These investigations may then be compared with the other potential resources as well as interbasin transfers and will only be implemented if the found to be the best solution. Investigations must take into account the full cost of dams and their impacts. The planning, and even the design, of dam projects should be done well in advance of the time when the water may be needed. The final decision to proceed with construction must, however, be made only when it is evident that the water will be required as resource development should always follow demand.

Development of Groundwater: Towns, villages, communities, mines and other users with insufficient surface water, and especially where distant from surface water schemes must accept and adopt groundwater as a primary resource if they are to get the water they need to grow. Local Municipalities must recognise and take up this opportunity.

Boreholes should be sited by expert hydrogeologists where the best yields are to be expected. Sustainable yields must be determined and abstraction rules adhered to.
All borehole water levels should be monitored to ensure that abstraction is within sustainable limits. Actual abstraction must be measured and controlled.

Water quality cannot be assumed to be safe to human health and must also be monitored regularly. Only if sustainable high quality supplies are provided to people, can we expect and demand that people accept groundwater as a satisfactory source. This responsibility lies both with planners and implementers.

Inter-governmental cooperation is essential to the successful use of groundwater. The Departments of Education, Health, Minerals and Energy, and Agriculture all seek local sources of water and must work together with DWAF in sourcing, drilling for, abstracting and monitoring supplies.

Management is absolutely fundamental and groundwater skills must be fostered at local government level. Local Government must take responsibility for the sourcing and utilisation of the resource, but should also be able to call upon DWAF for support in this.

DWAF must set and maintain groundwater quality and management standards. Guidelines and rules that are in place need to be disseminated and enforced, which requires regulatory and support capacity.

Central to this is the maintenance and improvement of the National Groundwater Information Database, and that the information in this database be reviewed, analysed and reported upon annually, providing recommendations at local and national level on the status and use of the resource.

Furthermore, the treatment of saline or brackish water, especially groundwater, is a very important approach to meeting the potable water needs of water scarce towns and is part of the Department's Reconciliation Strategy.

7.3 Supply-side management

Section 7.2 has discussed the various options available to the Department to secure water availability and improve the sustainability of the water mix. This section will consider other supply-side measures that are equally important to the sustainability of water supply and integrity, including water infrastructure asset management, water quality protection and the role of compliance and enforcement in the protection of water resources, both in terms of use and quality.

7.3.1 Water Infrastructure Asset Management

The purpose of "asset management" is to maximize the value of an asset over its lifecycle; thereby ensuring that the responsible Water Service Authority derives the most benefit from its investment. It includes constructing, operating, repairing or replacing assets at the optimum time to ensure system reliability at the lowest cost and least impact to the authority. This will translate into lower tariff increases and higher cost recovery.

The annual expenditure on maintenance and refurbishment of water infrastructure assets is expected to rise significantly over time as the country moves from a capital investment phase in developing new infrastructure to a replacement phase (where existing assets increasingly come to the end of their life and thus need to be replaced). The long-term cost implications for the water sector (or individual authority) with a poorly structured replacement/renewal regime will be dramatic. This will result in inefficiency in the use of the existing water resources.

In order to ensure that the existing water infrastructure is managed effectively and efficiently, the development of comprehensive Asset Management Programs will be required and implemented in dealing with the demands of an aging water infrastructure, increasing costs, and competing demands for limited resources.

In developing and implementing Asset management programmes, water authorities need to review the current organisational and business processes required with strong focus on the following management actions:

Create awareness, starting with the issuing of a water services IAM policy statement.
Scan and analyse IAM initiatives other than those of DWAF, and also other initiatives for support to water services institutions, and achieve synergy with these where appropriate.
Build on existing corporate and individual incentives, including tightening the regulatory process.
Discover, organise, and disseminate good practice in water services IAM.
Review the content of and the relationship between IDP, WSDP and IAM, prioritise, and rationalise.

7.3.2 Water Quality Management

Water Quality Management (WQM) in South Africa has evolved from a pollution control approach, to the current approach where water quality management consists of an integrated source, remediation and resource directed management. This integrated WQM

approach is actualized through a combination of measures and arrangements provided for in the NWA. These provisions incorporate two complementary strategies:

i. Resource Directed Measures
These measures focus on the quality of the water resource itself. It includes quantity and quality, the character and condition of instream and riparian habitats, and the characteristics, condition and distribution of the aquatic biota.

Resource directed measures comprise of the following measures:
National water resources classification system
Setting the reserve
Determining resource quality objectives

ii. Source Directed Controls
These measures contribute to defining the limits and constraints that must be imposed on the use of water resources to achieve the desired level of protection.

Source directed controls may be categorized as either best management practice measures or site specific measures.

Water resource management in South Africa links the acceptable level of impact to the concept of resource quality objectives (RQOs), which balance the need to protect water resources with the need to develop and use them. The setting of RQOs is catchment specific, based on the social, economic and political drivers for development and utilisation of a specific water resource.

Water Quality Management Instruments
Essentially WQM employs a combination of the following environmental management instruments:

i. Regulatory Instruments
Water use and the impacts on water quality are regulated through a range of authorizations which are either being directly managed by DWAF or in co-operation with other government departments:
Licensing of water use that may have in terms of section 40 of the NWA;
Issuing disposal site permits in terms of section 20 of the ECA
Recommendation for approval of EMPs in terms of the MPRDA
Recommendation for approval of EIAs.

ii. Market based instruments
In WQM, the Pricing Strategy includes a system of waste discharge charges provision:
Promote the sustainable development and efficient use of water resources and the internalisation of environmental costs by impactors

Create financial incentives for dischargers to reduce waste and use water resources in a more optimal way

Recover the costs of mitigating the impacts of waste discharge on water quality.

The WDCS is focused on reducing discharge load in order to achieve or maintain RQOs in a catchment. The Department aims to fast-track the implementation of the Waste Discharge Charge System and to ensure the expeditious construction, operations and maintenance, and rehabilitation of Waste Water Treatment Works, in concert with DPLG and the respective municipalities, through the establishment of a funding facility within the Department.

7.3.3 Compliance monitoring and enforcement

The Department requires the development of co-operative institutional capacity across the water sector to achieve the regulatory framework, designed to achieve a reduction of both unlawful water use and levels of pollution of South African rivers, groundwater and estuaries, through improved compliance monitoring and enforcement. The Department therefore requires adequate financial resourcing in order to support the development of a strong Compliance, Monitoring and Enforcement function and support the investigation and utilisation of technology.

The Department furthermore recommends that an Asset Forfeiture Unit be considered for the possibility of retaining assets seized during action against non-compliant water users.

7.4 Effecting change in water use behaviour

Whilst the Department spends considerable effort on supply-side measures to secure water availability for the future, there is a complementary movement to increase efforts to conserve water and implement water demand measures, making use of regulations, economic instruments, voluntary measures and public awareness and education. This section will provide an overview on some of the interventions to effect change in water use behaviour via these various means.

7.4.1 Regulations

The South African public, in general, is concerned about poor service delivery for water supply and sanitation services. There is also fear about the quality of our rivers and other water resources as well as illegal abstraction from such resources. Municipalities and other water services institutions are experiencing serious challenges with regards to sustainable access to basic services, ensuring and maintaining service quality such as drinking water quality and wastewater management, as well as water use efficiency.

There is a public outcry for stricter regulation and enforcement of water services and action against non-compliance. Negative perceptions of DWAF as a regulator and municipalities as water service authorities are impacting negatively on the social and economic environment and lead to customer frustration, and can potentially impact on investor confidence. Key interventions include strong monitoring, regulation and enforcement. DWAF has a mandate to control water supply, hence regulation should be more robustly applied in areas where there are looming service delivery crises as well as potential high risks to human health and life. The following management actions are therefore necessary:

Ensure aligned institutional arrangements for regulation are in place;
Establishment of a compliance monitoring and enforcement unit;
Improve on monitoring of both raw water and drinking water quality and reporting to the public through campaigns such as the *Blue Drop* and *Green Drop* initiatives;
Operation and maintenance of waste water treatment works to ensure quality of treated effluent as well as refurbishment and maintenance of water infrastructure in general; and
Curb the illegal abstractions from water resources and regulate dam owners to ensure dam safety.

7.4.2 Economic instruments

While water has been traditionally considered an infinite resource, current pressures on water resources suggest the contrary. Excessive withdrawals from catchments for multiple uses have large “unpriced” external effects, which include negative land use impacts and biological degradation as a result of water pollution. In light of the limits to the country’s water resources in terms of quantity and quality, it is up to the Department to consider translating these impacts through the price mechanism to reflect the underlying scarcity value of water.

The Department concurs with the economic view that social welfare is maximized when all costs are reflected in prices, a concept sometimes referred to as “full cost pricing” or the

"polluter pays principle". Only when production and consumption decisions take into account all costs to society leading to the most appropriate balance between supply and demand, will pricing serve as an effective tool to manage demand. When prices are artificially low, consumption tends to be excessive and visa versa.
It is unlikely that the Department will be able to fully price all externalities to water charges, it is important to use pricing as a means for consumers to appreciate the true value of water and hopefully effect changes in its consumption.

The Department has a **raw water pricing strategy**, introduced in April 2007, which levies four charges (water resource management, operations and maintenance, depreciation, Return of Asset). The irrigation agriculture and resource poor farmers are excluded from the ROA charge, which is seen as a threat to DWAF's ability to recover the cost of supplying water, especially to irrigated agriculture. There is a definite sense that water is too cheaply priced for this sector despite average increases in excess of 20% per annum since the new pricing strategy was introduced.

Water prices can be used to modify customer behaviour to use less water and to achieve efficiency gains that will enable water system managers to postpone the need for new capital outlays. The general types of conservation pricing options include:

Repeal of discounts to industry as an establishment incentive;
Increasing block tariffs;
Seasonal rates, higher tariffs during dry seasons and droughts;
Excess use charges.

Application to municipalities

However, in using pricing as a tool to manage demand, the following must also be considered especially for municipal water use:

Affordability: The pricing design especially at municipal level should take into account the characteristics of particular customer classes and their ability to pay higher rates. "Lifeline" rates structures can mitigate undue hardships for low-income customers and should also cover the basic volumes of water needed for sanitation.

Revenue Stability: The total loss from municipal water reticulation systems for the country in 2005 was in the order of 1,150 million^3/meters, which is equivalent to 28.8% of the approximately 2,000 million^3/meters of total municipal system water input at that time. Revenue instability is the most frequently cited problem to reject the adoption of water conservation projects. This is because conservation results in less water being sold; one way of mitigating this loss of revenue is to shift some charges from a volumes base to a fixed charge.

Application to the irrigation sector

Regarding the **irrigation sector**, there have been recent reports suggesting that South Africa, for the first time in its history, has become a net food importer as a result of underinvestment in the irrigation sector. A declining irrigation sector will have negative impacts on the agro processing sector, which is an important foreign exchange earner. However, this sector consumes more water than any other and a small savings in this sector could have significant impacts on water conservation and the country needs to make a choice in this regard.

The Irrigation Development Strategy of the DoA proposes that 600,000 ha of additional irrigation could be developed from water loss savings and improved irrigation efficiency. The sector could be provided with a financial incentive to upgrade their irrigation systems to support water conservation. These incentives could be financed by a 1% Return on Asset (ROA) charge to irrigation water use, (while all other user sectors pay a ROA of 4%). A further incentive will obviously be the resultant water savings, which could be sold to the state or be traded in areas where water is in surplus.

In addition to the pricing strategy, the Department has initiated a **waste discharge charge system** (WDCS), aimed at internalising costs associated with waste and to encourage the reduction in waste load, thereby minimising the detrimental impacts on water resources. While the waste discharge charge system allows for full cost recovery, the administration system required to implement it is most likely to prove difficult. In the recent Appeal Court judgment in the Impala WUA matter, it was made clear by the judgment that if charges are not proven, then users do not have to pay until all financial records are clearly explained to clients. One of our major challenges is the fact that users often complain that charges are not correctly costed and explained. In this regard, there is much work to be done at the regional offices to ensure correct billing and the effective communication of such charges.

Recommendations
The following management actions are therefore critical:

Municipal use: Municipalities must be encouraged to invest in infrastructure maintenance projects that will minimise water losses, any resultant loss in water income could be mitigated by reducing volumetric charges and increasing fixed charges.

Irrigated agriculture: Water tariffs should be used as a tool to manage demand in the agricultural sector; this should be achieved by the introduction of a Return on Asset (ROA) charge of 1% to the sector.

Significant water savings in the irrigation sector can only be achieved by upgrading to better irrigation technology; the sector should therefore be provided with a financial incentive to upgrade their irrigation technology, which may be financed from the ROA income.

In areas of water scarcity trade between users sector must be regulated to ensure the best possible socio-economic use of water.

7.4.3 Self-regulation

Self-regulation can prove to be a highly effective form of behaviour change, especially in a sector such as mining, where major industry players seek to comply with the requirements of the ISO 14000 as part of their efforts to enhance their business practice. The Department will ensure that it supports operations that comply with ISO 14000 standards by providing them with the required regulatory support such as Water Use Authorisations.

7.4.4 Public Awareness and Education

Public awareness campaigns on the value and scarcity of water are an essential component to initiatives to conserve water. The Department over the years has invested significantly in water awareness campaigns and intends to sustain these campaigns, especially targeting younger children of primary school age. The Department's philosophy is that meaningful change in people's attitudes towards water must be inculcated from a young age in order to reap the benefits of these positive attitudes in the future. However, these campaigns should not be targeted at the younger generations only as it anticipates the conceptualization and launching of a massive national awareness campaign whose primary purpose will be to instil a sense of appreciation of the value of water among all South Africans. The impact of the campaign should be a change in attitude and behaviour towards water conservation and water use efficiency resulting in the realisation of the WfG&D's vision of 'water is life – securing our needs across generations' underpinned by the principle of 'every drop counts'.

7.5 Water Conservation and Water Demand Management

WC/WDM targets are based on the reconciliation studies and are a national priority that requires commitment and action from all levels of government and water users to avert a water crisis. Immediate action is required, especially in areas already showing stress.

7.5.1 National programme recommendations

Various WCW/DM activities have been initiated at a national level to promote more efficient use of scarce water and energy resources, such as the MoU with Eskom. These will be pursued in the other water-dependent sectors.

The following provides some of the recommendations informed by water management areas Water Management Areas Based Recommendations

7.5.2 Urban sector

From the assessment of the scope for WC/WDM in the Upper and Middle Vaal River Basin, several key issues were identified from which the following conclusions and recommendations were made:

- WC/WDM can provide a significant reduction in the water demands in the area if measures are implemented and properly maintained on a sustainable basis.
- The cost of implementing WC/WDM measures is often less than maintenance costs, which are often overlooked with the result that the WCWDM interventions fail within a year or two of being implemented.
- There is a range in the potential savings that can be achieved from a maximum optimistic estimate of approximately 400 million m^3/annum in the year 2024 to a more conservative and possibly realistic estimate of 200 million m^3/annum.
- Savings are extremely limited in some areas where wastage/leakage is low.
- WC/WDM can be effective and sustainable as has been shown by several large projects undertaken.
- Lack of maintenance will result in many systems deteriorating into intermittent supply if action is not taken.

7.5.3 Irrigation sector

Efforts have been made to identify the causes of water losses in the six irrigation schemes in the Vaal catchment to propose achievable water conservation and demand management initiatives. Most of the conveyance losses in the catchment are attributed to operational losses, which can be easily alleviated.

The potential for water saving by implementing latest technologies has been investigated based on theoretical irrigation application efficiency values. A 2% improvement in each of the six selected schemes would provide a 7.3 million m^3/annum saving, which can be reallocated for other users, including growth and economic development.

There is little incentive for farmers to implement more efficient irrigation systems whilst they are not using their full allocation and are therefore not likely to be motivated by allocation restrictions; however, it is possible to link the water tariff to assurance of supply, as this is likely to provide the kind of incentive to encourage farmers to balance their risks of supply against using more efficient irrigation systems.

7.5.4 Industrial sector

Various industries have reduced their consumption having focused on the management of their effluents which has contributed to drastic reductions in intake water and the recommendation is that effluent treatment and reuse should be implemented on a much larger scale. Economical arguments exist for both for and against effluent management.

Potential measures for water demand management and water conservation for the industrial sector include:

- Retrofit or eliminate once through cooling systems.
- Proper operation and maintenance of hot water and steam systems.
- Education and Awareness Programs.

7.5.5 Mining sector

Potential measures for water demand management and water conservation for the mining sector include:

Non-potable use including partially treated effluent.
Improved efficiency of Effluent Treatment Plants (Reverse Osmosis).
New technology/ retrofitting.
The recycling of process and decant water through treatment for supply to other mines/ industrial users as well as municipalities.

7.5.6 Western Cape water supply system

The WC/WDM strategies came about following the potential savings findings of the recommendation strategy for City of Cape Town:

Pressure Management (PM): A realistic predicted saving of 17 million cubic meters per annum through pressure management has been identified.
Leakage Repair: The implementation of leakage repair as an option should be actively promoted
Elimination of Automatic Flushing Urinals (AFU): Several options are available for replacement/retrofitting of AFU, which could amount to an estimated potential water saving of 4.3 Mm^3/a.
Introduction of Water Efficient Fittings: Retrofitting with water efficient fittings with more efficient ones, at private households, commercials, institutional and industrial buildings was identified as having a realistic total annual saving of 10.2 Mm3.
Tariffs: Correctly structured increased rising block water tariffs can play a major role in moderating water demand.
Metering: Universal metering is essential in order to restrict and control consumption as well as to ensure an equitable distribution of the costs involved in providing supply.
User Education: The potential annual savings attributed to user education may result in an annual saving of 20 million cubic meters predominantly by eliminating the wasteful use of water and promoting waterwise gardening.
Promotion of Private Boreholes: A quick, low cost, socially acceptable solution, but has a low yield and environmental implications.
Promotion of Grey Water Use: Is also a quick, cost low, solution, but is not likely to be socially acceptable and may have health as well as environmental implications.

7.5.7 Mokolo River catchment

Whilst the water use and availability in the Mokolo River catchment is currently in balance, the available water supplies will not be able to meet the increasing future demands due to economic growth in the catchment. The additional 3 Ml/d can be provided from augmenting the water supplies.

Irrigation Sector: The total water use by irrigation was estimated to be 59 million m^3 per annum, which gives the specific water use of 6 740 m^3 per hectare per annum. The effective irrigation efficiency for the Mokolo River Catchment was calculated to be 71%.

Most areas do not have good data sources of water losses that affect efficiency; however, conveyance efficiencies for the area downstream of Mokolo Dam range from 30 to 45%. If this could be increased to 70-90% potential water savings of close between 6 million and 10 million m^3 per annum are visible.

Industry, mining and power-generation Sector: Currently the power station abstracts approximately 3.465 million m^3 per annum from Mokolo Dam, which accounts for 49%of Eskom's allocation of 7.1 million m^3 per annum. There is unaccounted for water (UAW) of 447 111 m^3, which includes both apparent losses due to meter calibration errors as well as real physical losses.

The total potential water savings at Matimba Power Station can amount to approximately 3.3 Ml/d or 1.2 million m^3 per annum if the following WCWDM recommendations are implemented:

- Carry out a comprehensive performance assessment (CPE) of the water treatment plant.

- Undertake testing of the water meters in the power station and calibrate them to ensure accurate meter reading for improved water balance assessment.
- Undertake comprehensive leak identification, detection, and leak repair programme of the power station water infrastructure.
- Review the potential for blowdown optimisation through the process of ozonation.

Domestic Sector: The situation assessment identified that there is potential for water loss control by implementing active leakage control and rehabilitation of the existing infrastructure the apparent losses were estimated to be 5%. The potential savings from implementing water conservation and water demand management measures amount to approximately 1.822 Ml/d. An additional 2.164 Ml/d savings can be realized through implementing consumer use reduction measures.

7.5.8 Umvoti-Umzimkhulu catchment:

Water resources in the Umvoti–Umzimkhulu WMA are stressed owing to an over-allocation of water from some water resources. The current scarcity of water provides a challenge to growth. There is a water deficit by 132 million m^3/a, the WMA comprises of 30-40% water losses

The potential savings within the Umvoti–Umzimkhulu, if the WC/WDM measures are implemented per sector, are as follows bearing in mind that there are no figures for industry:
Water losses in irrigation are estimated at 30-40 % and assessments indicate potential savings of up to 30%.
Water losses for domestic are estimated at 22% with an opportunity to realize 5% savings.

Responsibility and accountability to account for water losses, inefficient and ineffective use as well as wastage of water, in all municipalities and all large water users such as agriculture, industry, mining and power generation is the most important requirement.

7.5.9 Management options for WC/WDM

Specific Recommendations for Agriculture:
Balancing weirs.
Removal of alien vegetation.
Irrigation pipelining.
Irrigation scheduling.
Irrigation pricing –volumetric based.

Specific Recommendations for the Mokolo River catchment:
A meter renewal program be developed in order to reduce meter reading areas.
General improvement of assets and operational records.
Field work is required to confirm the information recorded in an Asset Management Plan.
Available drawings of primary system components such as pumping stations and services reservoir are stored in a central repository.
Consumer use reduction: There should be a steep rising tariff aimed at achieving reduction in consumer use accompanied by education and awareness programmes.
Review By-Laws: The water by-laws of each of the towns comprising Lephalale need to be reviewed and revised into a uniform version that reflects the fundamentals of WC/WDM and how it can be enforced.
Consumer use specific measures: A number of water use audits on representative households, schools and other non domestic users should be undertaken.
The construction of a hydraulic model of the distribution network is required to determine whether the positions and specifications of the existing PRVs are correct.
Based on the calibrated hydraulic model, it is recommended that the full system metering required and the establishment of zones and district meter areas is implemented for ease of monitoring the reticulation network to facilitate leakage identification and repair.
Consumer demand management and that active leakage control is reviewed once the network has been correctly sectorised.

The increase in abstraction from the bulk purchase of water from Kumba Resources should be deferred for the time being.
Current data indicates that pressure management does not seem to offer sufficient water savings to be financially viable. A review of the position and size of the existing pressure reducing valves (PRVs) is proposed, with a view to installing time modulated controllers to reduce pressure to 2 bars at night.
Implementation of an active leakage control programme which comprises establishment of zones and/or DMAs, leak location and repair offers some savings to be financially viable in Marapong.

Specific recommendations for the Umvoti-Umzimkhulu catchment:
Development of a standardized water balance.
Identifying the extent of pressurized water supply to customers and strategies in place for pressure management.
Efficient leakage reporting system and assessment of active leakage control.
Monitoring of consumer meter readings (Residential/Commercial/Industrial).
Infrastructure maintenance planning (Emergency/Routine) and investigation of asset register.
Sectorisation of reticulation system in place.
Efficient bulk and zone management metering systems in place.
As built drawings of all bulk and reticulation infrastructure.
Awareness and education programmes (Schools/Communities/other media).
Informative/Itemised billing.

7.6 Climate change

Climate change has become an increasingly important issue in water resource management. Research clearly identifies the resulting risks to the water resources of the country: higher temperatures and more extreme weather resulting in increased rainfall intensity in some parts of the country and longer and extreme drought periods in others. As a result of climate change, the reliability of supply to water users and the levels of risk of supplying users are likely to increase. To address the potential risks and threats posed by climate change with respect to water security, the following actions should be strongly considered:

- Development of a water sector response strategy comprising of adaptation plans and mitigation measures;
- Stimulate shift in focus on climatic prediction and mitigation to response and adaptation options; and
- Focus on those water management areas (WMAs) or catchments likely to face the greatest risk of water shortages and develop appropriate and reliable understanding so that risk and disaster management plans can be drawn up and implemented.

7.7 Water for development

7.7.1 Accelerating access to basic services and sanitation

South Africa has shown significant progress in eradicating basic water services backlogs. In terms of basic water supply, South Africa has already halved the backlog in 2005, thus achieving the MDG ten years ahead of the 2015 target date. In terms of sanitation services, there has been a 40% improvement since 1994, which is also well within the timeframe of the MDG.

However, based on the current delivery trend, funding availability, implementation mechanisms and processes, water resource availability and the continuous movement and growth in backlogs, there are serious risks threatening the ability of local government to meet targets as set by the Government.

7.7.2 Fundamental principals to acceleration of basic services

1. Adoption of an integrated approach towards provision of basic services

Key departments have a responsibility to develop a framework that will ensure that provisioning of basic services occurs in an integrated manner that will result in alignment of targets and effective utilisation of government resources.

The spatially differentiated and targeted approach requires that confirmation of the challenges and issues that are impacting on infrastructure delivery are specific to each district and metropolitan area, in order for interventions to be appropriate.

2. Sustainability underpins all interventions
Whilst the focus is on accelerating infrastructure delivery, it is crucial that this be done in a way that will ensure long term sustainability, while considering the need for integrated planning. The vision for integrated and sustainable human settlements is fundamental to any plan that attempts to address service delivery in an integrated manner.

7.7.3 Policy implications

Extending RDP standards: In provinces, such as KwaZulu-Natal, Eastern Cape and Limpopo, which have large sparsely distributed rural populations, the cost of the provision of basic water and sanitation services per the RDP requirements is extremely high. Since several municipalities are not able to provide a RDP standard of service due to their financial limitations, there is a tendency to not provide any service at all. The Department is deeply concerned about the extent of the backlogs in service, particularly in these rural areas that have been historically neglected, and anticipates the intensification of interim measures such as rainwater harvesting and groundwater abstraction. However, the Department is also aware of the perceptions that such sources of water may not be considered fit for drinking and therefore anticipates a correspondence between perceived water quality and its use. Thus these alternative sources may be used for non-consumptive purposes (washing, cooking, subsistence farming) and reticulated water for consumptive purposes (drinking water).

Free Basic Water Policy and vulnerable sectors of the population: The draft Anti-Poverty Strategy is anchored on nine pillars, three of which have a direct bearing on the supply of potable water. These are (1) creation of economic opportunities, (2) access to basic services, and (3) environmental sustainability (protection and rehabilitation of ecosystems, reversing environmental degradation and promoting ecotourism). Furthermore, the strategy has identified six vulnerable groupings within the sphere of poverty and these are older people, the unemployed, children and child-headed households, women and single-parent households, people with disabilities (ill health and people living with HIV/AIDS could be included here) and people living in poor areas. In terms of ensuring that these households receive free basic water, they must be registered on municipalities' indigent register. The strategy states that of the estimated 5.5 million indigent households in the country, approximately 4 million (73%) are registered on municipal databases and currently receive free basic water. The Department would like to see all indigent households, especially those characterised by the six vulnerable groupings, be registered and receive free basic water, as this will go a long way in supporting at least two pillars of the draft strategy.

Adequacy of the Free Basic Water Allowance: The quantity of water to be made available under the Free Basic Water policy has to be reviewed in the context of special health and hygiene requirements of such individuals as those living with HIV/AIDs.

Where sustainable, water services authorities should give consideration to increasing the basic quantity of water provided free of charge (25 litres per person per day), aiming for the free provision of at least 50 litres per person per day to poor households. National government will consider increasing the national subsidy over time to make this feasible in all water services authority areas.

The key challenges of the free basic water policy are as follows:
The provision of the infrastructure necessary to provide access to water to all households;
The development of subsidy mechanisms which benefit those who most need it;
The equitable treatment of large households and multiple households sharing one connection; and
Collecting revenue for services rendered over and above an allocated free basic amount.

7.7.4 The review of the Municipal Infrastructure Grant (MIG) Policy

The current MIG programme is aimed at providing all South Africans with at least a basic level of services and the focus is on covering the capital cost of basic infrastructure for the poor.

If infrastructure development is to contribute effectively to economic growth, an appropriate financing model as well as a revision of the MIG policy that will support development of infrastructure including water for small scale economic activities should be developed.

7.7.5 Proposed Interventions to Accelerate Access to Basic Services

Acceleration of Access to Basic Services: An important first step towards accelerating service delivery is ensuring the right policy is in place, which includes:
The objectives and targets to be achieved within the sector;
The institutional, financial, regulatory, support and monitoring frameworks for the sector; and
Clarity on the roles and responsibilities of sector players.

Strengthening partnerships: The sector-wide approach is fundamental to scaling up services delivery and is the basic approach underlying this strategic framework. Programmatic, sector-wide approaches improve sector coordination. The national level facilities and coordinates policy and sector collaboration, while local or regional agencies are responsible for service delivery. The sector wide approach includes the entire sector and serves as an important link between policy objectives and implementation to achieve the objectives.

Effective financing strategies: A very effective financing framework for local government financial support from National Treasury has been established in South Africa and includes capital grants for infrastructure (MIG); operating grants for free basic services (equitable share subsidy), and capacity building grants to improve performance.

Co-ordinated planning framework for the targets: Targets at national level need to be translated into targets for each and every local government, with multi-year planning, resources required, support required and proposed institutional arrangements for ongoing services provision. This requires local level development planning for the water and sanitation sector, which when rolled up becomes the national water and sanitation plan to tackle the MDGs coupled with national level supporting activities. The sector MTEF is based on this plan.

Technical support and delivery mechanisms that can accelerate infrastructure development: Most municipalities do not have the capacity to implement water and sanitation projects at the scale required to meet the targets. Although municipalities have received extensive capital subsidies from the Municipal Infrastructure Grant, many have not been able to spend funds as planned. A critical challenge to municipal capacity is the lack of sufficient engineering skills and implementation capacity at the municipal level. Infrastructure implementation capacity therefore has to be optimised.

A menu of delivery mechanism options has been developed so that local government can select the most appropriate delivery mechanisms to speed up delivery.

Partnerships for both infrastructure development and for the provision function: At the core of the sector-wide approach is the development of partnerships across the entire spectrum of the water sector to enhance both delivery and provision capacity with the involvement of the private sector.

Service provision institutional arrangements to ensure sustainability provision: Accelerating service delivery through infrastructure delivery is not enough. One if the most important decisions in the service delivery cycle is the choice of water services provider. A programmatic approach makes provision for this.

A clear sector support strategy that spells out both local governance and service provision support is key to addressing the delivery capacity of the sector. Establishing effective programme management capacity is integral to the programmatic approach, where structures at different levels are designed to support those responsible for delivery.

Partnership with municipalities: This approach will be focusing on newly identified projects. DWAF will, in partnership with identified municipalities, form project/programme management teams and implement projects. This approach is suitable in cases where there is existing technical capacity in a municipality. For example, DWAF might partner with Metros and provide hands-on support to municipalities without capacity or expertise to implement sanitation. The use of engineers and other technical skills offered by the private sector should be investigated.

Direct hands-on support to municipalities: This approach will be targeting municipalities with critical capacity constraints, where there is none or very little technical expertise in a municipality. With the agreement of all parties involved, DWAF will directly implement programmes or projects. To ensure long term sustainability and transfer of skills, this approach should be run parallel to an initiative aiming at placing interns within municipalities to whom skills can be transferred.

Climate change and people: Water shocks or variability in water supply that is a result of drought or floods, which are symptomatic of climate change, requires investment into the effective management of water infrastructure nationally and locally to protect vulnerable communities and their economies.

Municipalities, especially those that are likely to be affected most by climate change, need to start engaging in developing mitigation strategies that will improve adaptation to changes that will come with climate change. Cities like Nelson Mandela and Cape Town, which are vulnerable to floods, need to invest in water infrastructure to ensure greater protection.

Development of small scale infrastructure to promote rural development: Provinces like Eastern Cape, Limpopo and Kwa-Zulu Natal, which have large rural populations, should consider development of small projects like rainwater harvesting. Rainwater harvesting has considerable benefits and does not need to be confined to rural areas only. It contributes to water conservation, addresses issues of affordability and improves reliability of water services. It can also be an effective mitigation strategy against drought. In addition, the building of small communal dams and stand alone schemes to support livestock should be an integral part of rural development.

The Role of Women: Women should be thought of as strategic users of water. They manage the use of water for processing and preparing food, for drinking, bathing and washing, for irrigating home gardens and watering livestock. Women know the location, reliability and quality of local water resources. They collect water, store it and control its use and sanitation. They recycle water, using grey water for washing and irrigation and runoff from these and therefore their participation in all development programmes should be given priority. Policies and programmatic interventions such as Water Allocation Reform need to factor this in to achieve the desired end result.

7.7.6 Recommendations

1. Acceleration of access to basic water and sanitation
The development and implementation of a strategy between DWAF, DoH and DPLG and is the first and most important step in accelerating access to basic services. DWAF should play a leading role in this regard.

To ensure sustainability the Comprehensive Municipal Infrastructure Plans and the IDPs must be considered.
2. Review the Water Services Policy
In cases where a formal service has not been provided by the responsible municipality, options of looking at other technology options like rainwater harvesting should be looked into.

Revision of the FBW policy to address the above mentioned challenges should be undertaken.

DWAF should look into a policy framework that will guide multiple uses of water sources in both urban and rural areas.

Financial grants should be based on multi-year plans and according to backlog needs.

A concept of a Programme Delivery Support Unit (PDSU), which mobilises resources and partnerships including private sector involvement, will have to be investigated.

7.8 Water for growth

7.8.1 Energy

Reliable energy is of the greatest importance to the country and water supply for electricity generation is classified as a strategic use, reflecting its priority status.

In terms of the country's electricity needs, Eskom has, with some clear directives from DWAF, progressed from highly inefficient wet-cooled systems to efficient wet-cooled systems, and towards very efficient dry-cooled systems. Since the largest coal reserves for future coal-fired power stations are in an area that has very limited water resources, water must be used even more efficiently. In order to scrub emissions to acceptable levels takes more than this minimum level of water (typically increasing use from 6 million to 12 million m^3 of water per power station per year), and Eskom has been required to increase its water use again, although still well down on the 60 million m^3 used originally for the same size of station.

South Africa does not have adequate water supplies to meet the needs of large conventional **hydropower stations**. Small hydropower generators are a possibility in a few cases, with the key being that use is conjunctive with irrigation or other storage releases. Pumped storage is an important non-consumptive use in which South Africa is a leader.

In terms of the country's **fuel requirements**, Sasol has over the years become a supplier of a significant portion of our fuel requirements. The water requirement to build another Coal-to-Liquid (CTL) plant will also receive priority.

The production of biofuel crops for **biodiesel** or ethanol may have significant implications for water availability. Water will need to be supplied to processing plants - but more importantly the feedstock requirements can be very large, especially if crops are irrigated.

Meeting water demand for the energy sector
Almost all of the requirements for the coal fired power stations and the CTL plants are being supplied from the Vaal River system, and future requirements will for, all practical

purposes, also be met from the Vaal. These requirements have all been accounted for in the Vaal System Reconciliation strategies.

The requirements in the Lephalale area will be supplied from treated effluent emanating from users of Vaal River water. Pipelines and pumping station infrastructure are now being built to transfer water from where it is available in the Crocodile and Vaal River catchments to the Lephalale area.

The requirements of the Eskom power stations and Sasol 2&3 at Secunda on the coalfields of Mpumalanga are also being supplied from the Vaal River system and a large pipeline from the Vaal Dam has recently been completed to supplement supplies to this area. Investigations to increase the capacity of this pipeline have also started.

DWAF is working closely with Eskom to ensure that water is also properly considered in the selection process for Independent Power Projects. Many of the proposals fall within the supply area of the Vaal System. Some proposals are, however, in areas where the supply of water may not be feasible, which could mean that the project itself will not be feasible.

Recommendations
To keep water use to a minimum, it is recommended that Eskom urgently investigate the possibility of an upscaling of the Fluidised Bed Combustion technology used in small plants to the large boilers used in large power stations.

7.8.2 Mining

Much of the mining sector is supplied from the Vaal River System including, *inter alia*, the Mpumalanga coalfields and gold mines, Gauteng gold and coal, the Northern Free State and North West goldfields, and even the iron, manganese and diamond mines in the Northern Cape. Added to urban/ industrial and energy water requirements, this explains why the Vaal System is unable to provide further water to the agricultural irrigation sector. Mining is also one of the biggest threats to the water sector through its impacts on water quality, a legacy that can linger for hundreds of years.

The De Hoop Dam is being constructed in the Olifants Water Management Area with the primary purpose of providing water to the platinum mines. The Olifants River is itself now under such pressure that it may require supplementary water from the Vaal.

Water is also provided to small-scale mining: gold, coal, alluvial diamonds and sand mining. These are important activities in providing jobs and income, often to the very poor, but the costs to the environment can be unreasonably high.

Mining is authorised by government based on many factors of which availability of water and the impact on water quality are important factors. Mines must carry full cost of water supplied to them, including closure plans that will deal with impacts after the mines have closed. These are primarily negative impacts on water quality.

As with all user sectors, water use efficiency is most important in mining. As illustrated by the example of Eskom in its search for water efficient power stations, the mines need to be both regulated and encouraged.

Recommendations
Government will have to provide more support towards ensuring good practice by small scale miners if the long term environmental damage is not to outweigh their collective benefit.

Mines need to more seriously consider the use of local resources, such as treated effluent and groundwater. Mines often encounter groundwater as part of mining operations and need to see this as an opportunity rather than a cost. Given the problems of leaching and

acid mine drainage, it is important that mines intercept water before it reaches the mining works, when it is still an asset rather than a liability.

7.8.3 Industrial

Most bulk industrial use is discussed either as urban use (to follow) or, in the case of the Sasol CTL plants, as an energy use. There are a few bulk industrial users falling outside these areas or categories such as pulp mills, Petro SA near Mossel Bay, and proposed ethanol plants. DWAF should be informed of all new activities requiring water long before firm plans are made to start with any development.

7.8.4 Urban

Urban use is here defined to include both domestic use and industrial use within the urban areas, which range from the large metropolitan areas to small towns.

Some large industries, such as Eskom and Sasol, are "stand alone" and abstract directly from the resource, even if within urban areas. Where applicable they are dealt with separately.

The bulk of the economy of the country occurs in urban areas, and the large metros account, in turn, for most of this. The growth of urban areas is strongly linked to the economy, with economic development fuelling inward migration. Water does not drive growth, but the lack of water can severely limit it, with severe consequences for both people and the economy.

The urban sector will have to pay the full cost of water except for a component of basic human needs that the government may provide through grants. The supply of water may become very expensive in remote centres a distance from exploitable water sources, and growth constraints must be expected. The adoption of services such as dry sanitation may be required if sustainability, affordability and some level of growth to benefit society, are to be achieved in areas of extreme water scarcity. In some Northern Cape towns, for example, there is not enough water to provide for water borne sewerage and to serve the mines upon which jobs and the local economy are dependent.

Recommendations
The recommendations in the Reconciliation Strategies for the four large metropolitan areas must now be implemented if the Department is to assure sufficient water supplies for domestic and industrial uses.

It is recommended that water be supplied to all urban areas to ensure that all reasonable requirements are met. Reconciliation strategies will be developed for each area. The focus is on ensuring that growth points, as identified in the NSDP, get the water they need. In all cases WC/WDM will have to be implemented, while all possible supply side options will be investigated and recommendations made for each area.

7.8.5 Irrigated agriculture

Measurement of irrigated water: Water management in irrigated agriculture will bring about water use efficiency, and can be divided into two main parts: water supply management and irrigation management.

The benefits of measurement are to ensure that adequate supplies of irrigation water are available where and when lawful irrigation farmers need it. The two key aspects are adequacy and assurance of supply. Adequacy of supply is particularly important during the peak water requirement period of the crop season, while assurance of supply is critical during growth stages at which crops are sensitive to water stress.

The easiest water supply management system is to provide a diced amount of water to a farmer at fixed time intervals; however, it reduces the efficiency of irrigation management. The best irrigation water use efficiencies are achieved if they can obtain

water according to demand. Such demand-based supply systems are being used successfully in some places, where crops and income per unit of water applied are both increased.

Since Department of Agriculture is a key actor in this field, the establishment of appropriate institutional structures and arrangements between itself, DWAF and the provinces is required.

Upgrade under-utilised commercial irrigation: More that 70,000 hectares of irrigable land is under-utilised. This land has water allocation and is situated on existing government schemes where the necessary infrastructure is in place. Similar situations possibly exist on some private irrigation farms.

Small-scale irrigation for household community level food security: Many of the former homeland irrigation schemes have 'food plots'. The food plots were very important in terms of enhancing household and community level food security. The food plots suffered collapse and need to be revitalised. Additional food plot sections or miniature schemes could be developed where such development would be of strategic importance. Food plots do not pose a significant risk to irrigation activities.

Food production in home gardens is another important form of miniature irrigation and provision/allocation of water for this purpose is important. Provision of water by means of 'leivore' or other suitable means, such as rain water harvesting, should be promoted. This could consist of collection of water from rooftops in tanks or collection of runoff in underground tanks.

Garden scale techniques such as clay pot irrigation should also be considered as it can lead to water savings within irrigated vegetable production of between 50-70%, compared to traditional rope and bucket or similar systems.

The use of groundwater for irrigation: The use of groundwater for irrigation grew significantly from 2% of the available groundwater in 1980 to 30% by 1996. This increase is mainly due to the use of groundwater for centre pivot irrigation. Approximately 240 000 ha are irrigated with groundwater.

Irrigation water governance: To ensure the sustainability and proper management of irrigation development, the Department of Agriculture should develop guidelines on all aspects of irrigation planning, development and management. A team of experts should play a key advisory role in this regard.

Recommendations

Recommendations for commercial irrigation operations: Commercial irrigation must be scheduled to ensure only the required amount of water is used and at efficient timings, and involves continuous measuring of water applications. This must be enforced, and complied with. The following actions are recommended:
Enforce irrigation scheduling;
Stop unlawful use of water for irrigation;
Measure the amount of water applied at given times;
Prepare a water use efficiency and risk management plan; and
Gradually reduce the amount of water used for irrigation through appropriate technology.

Recommendations for water management agencies:
Identify all areas that used to have irrigation farming and support provincial Departments of Agriculture in the re-establishment of irrigated crop production on these areas;
Use conditional funding allocation to give priority to areas that used to produce high value crops, and have the capacity to do so on a sustainable basis.

Recommendations for household and community level irrigation:
Promote the revitalisation and inclusion of the food plot components of homeland irrigation schemes;

Promote provision of water for home garden food production in rural town and villages and in peri-urban areas;
Promote rooftop and field runoff water harvesting and storage; and
Promote efficient water saving irrigation technologies, such as clay pot irrigation.

Recommendations for irrigational use of groundwater:
Explore further use of groundwater for small-scale irrigation;
Develop groundwater for household and community level food plots;
Promote groundwater resource usage among isolated communities.

Given that improved water use efficiency may not be realised very soon, there is a need for DWAF to regulate through introducing a cascading water tariff for irrigation, where by 50% of the predetermined water quota is supplied at a fixed tariff, after which the water tariff rise with consumption (80%) up to the limit of the quota, and is calculated according to the total quantity used.

7.8.6 Environment and natural resource management

The real value of aquatic ecosystems, and ecosystems that affect water availability, must be recognized and given weight in water management decisions. A balance must be achieved between water as a necessary input to promote economic growth, create jobs and eradicate poverty, its role in maintaining the functioning and resilience of ecosystems, and its importance in enhancing social welfare, both now, and in the future.

The introduction of the concept of an environmental Reserve in the NWA has had a very strong positive impact on all river systems, by putting the brakes on unbridled development. It is, however, proving extremely challenging to meet environmental needs where catchments are already fully developed. This requires reclaiming water from existing water users, who are increasingly urban and industrial users, through compulsory licensing, in order to improve environmental standards that have long been degraded.

South Africa has few major rivers that have not been developed (the Mzimvubu and the Mkomazi are the biggest), but many smaller systems, and especially coastal rivers, that are ecologically 'pristine'. Every effort should be made to apply standards required by the ecological Reserve to these rivers. Some development would certainly be possible in the Mzimvubu, including forestry and smaller scale irrigation schemes, which happens to be all that the terrain allows. Partially developed rivers (Olifants, Mkuze, others) have seen some degradation and any further development should be undertaken with discretion. Fully developed rivers such as the Vaal, Mgeni and Crocodile East are today no more than 'workhorse rivers' and should be managed as such.

Natural resource management is essential for water for growth and development. The natural resource management programmes – Working for Water, Working for Wetlands, Working on Fire, Working for Woodlands and Working for Energy – are key components of the management of water quantity and quality in South Africa, and pivotal to the success of Water for Growth and Development. Next to demand-side management, they offer the best returns on investment for water management – but with the added benefits of multiple benefits for biodiversity, energy, land-use practices, employment opportunities, fire management and other benefits. What is essential is that co-operative governance ensures the optimal returns on investment from these interventions, and the use of legislation, incentives, disincentives, advocacy and research to support this.

7.8.7 Forestry and Small-Scale Enterprises

Afforestation was declared a Stream Flow Reduction Activity (SFRA) under the NWA. This is because its use of rainwater impacts on the flow in the streams and thus on downstream users. However, since it is a direct user of rainfall, no water resource infrastructure, nor the associated operating and maintenance costs, is required. This makes forestry a very efficient water resource user. At the same time, wood is a very important local resource for structural and mining timber, and important earner of foreign exchange through exports of paper and wood chips. Forestry provides jobs in remote rural areas, both with the

established commercial sector but also through emerging growers. These are areas where there is little other opportunity. The Industry estimates that it needs another 760,000ha of forestry to keep the country self-sufficient, but consensus is that somewhere between 100,000 and 200,000 hectares is as much as the country and its water resources can accommodate. Allocation of water for afforestation should receive priority in areas where water is still available for this purpose. This would be almost exclusively on communal land.

Some catchments i.e. Mzimkulu, Mzimvubu and smaller coastal catchments in KZN and the eastern part of the Eastern Cape, are still fairly undeveloped from a water resource perspective and have high potential for large scale afforestation. Without dams from which to make dry season releases, the current low flow from the rivers may already be fully utilised or required for the ecological Reserve. It should, however, be possible, and not too costly, to develop small dams to "compensate" the existing users for the impact of the afforestation.

Many catchments with high potential for afforestation are already water stressed and there is no more water to allocate for afforestation, or irrigation for that matter. There is almost no opportunity to be found in either Limpopo or Mpumalanga. Typically, the Letaba, the Olifants, the Nkomati (excluding perhaps the Sabie, thanks to the Inyaka Dam), the Usutu and the Keiskamma catchments are already developed as far as resources can sustain.

In some of these catchments there may still be the opportunity to develop the surface resource further but the allocation of that water must be done in accordance with the general policy set out below.

Recommendations
It is recommended that the state consider funding these dams, or encourage the forestry industry to do so. This would allow for very significant development, based on communities and small growers, making it possible to achieve the 100 000 ha of new afforestation targeted in the Eastern Cape over the next 10 years.

Water for irrigation could, in some cases, be taken up by forestry, or *vice versa*.

Where further surface resource development is required to make water available for allocation the following rules should apply:

If water is intended for urban and rural supply, now or in future, users must pay the full cost of that water.
Any surplus should be allocated to users that will produce the largest social and economic benefit to the country for the least cost. Forestry would be a strong contender for this water in high rainfall areas and should be given equal opportunity with agriculture and other potential users to apply for licences. Government may want to subsidise the cost to some of these users as some of the benefits may need to be "paid" for by the state.

7.9 Water governance and co-operative planning

7.9.1 Water governance

A primary thrust of the Water for Growth and Development initiative is to emphasise the life-sustaining importance of water as a scarce resource in South Africa and to focus the attention on the fact that, unless the continuous judicious use and effective management of our water resources is taken on board by every stakeholder, water availability threatens to become a constraint on growth and development in the near future. Our water management policies and legislation provide for participative water governance and a spectrum of water management and water services institutions is envisaged for the delegation of powers and responsibilities to relevant levels.

Although many of these institutions have already been established, the processes of their establishment and shared water management by, and in conjunction with, these

institutions are complex. DWAF has embarked on a process of institutional and organisational re-alignment. The success of the WfGD is largely dependent on the establishment and commissioning of a resolute institutional framework for water management, with clear roles and responsibilities, both in terms of water resource management and water services. It is imperative that components of this institutional framework be capacitated to fulfil the expectations with regard to their roles and responsibilities.

Reporting on, and accountability for, the various roles that institutions play, as a part of the water value chain, will be a critical part of the oversight and regulatory environment that will be created. The DWAF has already initiated a programme that will create the required regulatory framework. On the other hand, it will be essential that institutions synergize their competencies to effect redress, to minimize duplications and maximize efficiencies. The sector will have to work together to develop the necessary skills and competencies, ensuring that these institutions have the required capacity to deliver upon their mandates.

7.9.2 Co-operative planning

Co-operative planning in the water sector: Within the water sector, WfGD is aiming to ensure better interaction between planning initiatives around water resource management and water service, thereby progressing South African water management towards integrated water resource management. The objective is, amongst others, to outline roles and responsibilities for the spectrum of role-players in the water resource management and water services more clearly. An example is the development of firm roles and responsibilities for water services authorities with regard to water sources within their areas of jurisdiction.

At the inter-sectoral level, DWAF gas aligned its planning initiatives to be in line with broader governmental thrusts since the establishment of the 1st editions NWRS during 2005. At the national level, the Department has, for instance, focused its reconciliation studies on the 26 priority growth nodes as contained in the latest NSDP. As discussed in this document, these studies have revealed serious escalating water resource management problems in respect to the four largest metropoles. The solution for these problems comprise balanced packaged demand and supply management initiatives, which have to be jointly planned and implemented by institutions from the various spheres of government. The co-operation in this respect is generally good, especially of there is a (planning) forum form where DWAF, as sector leader, could guide the required planning and implementation initiatives.

DWAF, furthermore, has programmes aligned to specific national initiatives such as poverty relief. The Water Allocation Reform programme is an example. The Department is experience problems with the planning and roll-out of aspects of WAR, especially as far as the establishment of emerging farmers is concerned. What is required is a process/forum from where projects such as this could be jointly planned and implemented in conjunction with other crucial role-players such as the Departments of Agriculture and Land Affairs.

Similarly, there are various departmental structure that are working and striving to forge closer planning and implementation relationships with provincial and local spheres of government, especially with regard to their PGDPs and IDPs respectively.

Co-operative planning in other sectors/departments: There is a distinct need that other institutions outside the water sector should take due cognisance of constraints originating from the country's scarce water resources and the resulting problems and uncertainties because these should inform planning and development decisions. To make this possible, the Department strives to re-package the concepts and information regarding water management in a more user-friendly way to simplify its use and understanding.

8 High level recommendations

8.1 Mainstreaming water

It is the Department's intention to ensure that water is placed at the heart of all planning decisions taking place in the country; to ensure that any decisions taken that rely on the steady supply of water, both in quantitative and qualitative terms, adequately factor in water availability. Water can only support growth and development in the country without compromising the ecological sustainability of the resource if, and only if, water is at the nucleus of planning and decision-making, which includes but is not limited to sectoral planning.

8.2 Diversifying the water mix

Water availability is currently based on surface water (77%), return flows (14%) and groundwater (9%). Reconciliation studies undertaken in major urban centres have revealed that in addition to these sources, desalination and effluent re-use ought to be considered given the high risk of water shortages. Desalination refers to the treatment of saltwater and effluent re-use refers to the treatment of urban and mining effluent. Both are a major source of water for coastal cities and treated effluent for major inland systems. In the long term, surface water will remain the predominant source of water but the Department expects a reduction on the dependence on this source accompanied by the increased use of groundwater and a significant increase in return flows through the treatment of urban and mining effluent. The mix at the local level will be dependent on the most affordable and appropriate source depending on water use; for example, desalination of seawater for productive uses in coastal locations is considered highly feasible provided that it is not transported inland – similarly, inland water resources should be retained for use inland.

8.3 Striking a balance between supply and demand-side measures

The reality is that as a country we can no longer afford water losses and therefore it is imperative that the focus on water conservation and water demand measures must be strengthened, especially as there is a greater return on investment through water loss control and water use efficiency. The Department will prioritise the establishment of the water demand funding facilitation unit to provide support to municipalities in their effort to introduce water conservation and demand management. The Department has identified that a key challenge to sustained and health water supplies is the poor maintenance of waste water treatment works (WWTW) and recommendations from the Department concern the structuring of the Municipal Infrastructure Grant (MIG) so that it is used for the purposes of WWTW rehabilitation and construction.

8.4 Water for Development: Addressing service backlogs

The Department is satisfied with the achievement of the Millennium Development Goals (MDGs) in respect to the halving of water and sanitation backlogs in 2005 and 2008 respectively, however, too many South Africans still do not have access to basic water and sanitation services and it therefore wishes to achieve the target of full access to basic water and sanitation services for all by 2014. It is the Department's recommendation that the service backlogs, which are predominantly situated in KwaZulu-Natal, Eastern Cape, Limpopo, and the North West province, are prioritised and addressed through a combination of short-term interventions such as rainwater harvesting and the further exploitation of groundwater sources, which may necessitate a policy change. Ultimately, a balance needs to be struck between large and small-scale infrastructure projects. Where a community can be serviced by existing large-scale infrastructure, this should happen with immediate effect – inequities in access to water will not be tolerated. Where a community cannot be serviced by a large-scale infrastructure project due to the cost of such an intervention (for example, pumping water to mountain-top communities at higher altitudes), then small-scale schemes must be planned and implemented. Where large-scale infrastructure could

solve local water scarcity, such as the De Hoop Dam, the necessary planning and resourcing must be undertaken and interim measures introduced to compensate for the long lead-times. The Department should also prioritise schemes in areas with resource development potential that coincide with areas with high service backlogs. It will also support sector plans where water use for growth purposes can simultaneously support water use for development purposes. The Department will seek out and support interventions that support the dual goals of water for growth and development as, one goal should not be at the expense of the other.

8.5 Water for Growth: Changing water use behaviour for the future

The Department is very mindful of water use behaviour that impacts negatively on the resource both quantitatively and qualitatively. It is currently exploring a potential mix of mechanisms to change this behaviour, which include regulatory instruments, market-based instruments, self-regulation, and awareness and education, and it will match appropriate mechanisms to mitigate offending behaviour. Currently, two sets of behaviours that it is very concerned about and which it wishes to address as a matter of urgency are the unlawful and damaging extraction from and pollution of the Vaal River system and the extent of water use inefficiencies among commercial irrigation agriculture.

The extent of unlawful water use mainly upstream of the Vaal River system, mainly by irrigators, is a major problem as it resulted in the quantity of available water being exceeded by current demands. Furthermore, the pollution of freshwater resources in this River system, mainly as a result of the impact of mining activities, also results in eutrophication (lack of oxygen in the water). The Department's position is therefore to stop unlawful use of water in the Vaal River system and curb the pollution incidents through robust compliance monitoring and enforcement.

Commercial irrigation agriculture receives 62% of allocated water and to date has been exempted from certain water charges. It is the Department's view that this sector needs to make a contribution to the operations and maintenance of state-owned irrigation infrastructure as particular consumptive behaviours in the sector suggest that water may be to cheaply priced. The Department is also considering other interventions including water allocation reform, water trading and the promotion of techniques to enhance water use efficiency by this sector.

8.6 Nurturing attitudinal and behavioural changes towards the value of water

The Department over the years has invested significantly in water awareness campaigns and intends to sustain these campaigns, especially targeting younger children of primary school age. The Department's philosophy is that meaningful change in people's attitudes towards water must be inculcated from a young age in order to reap the benefits of these positive attitudes in the future. However, these campaigns should not be targeted at the younger generations only as it anticipates the conceptualisation and launching of a massive national awareness campaign whose primary purpose will be to instil a sense of appreciation of the value of water among all South Africans. The impact of the campaign should be a change in attitude and behaviour towards water conservation and water use efficiency resulting in the realisation of the WfG&D's vision of 'water is life – securing our needs across generations' underpinned by the principle of 'every drop counts'.

Preliminary population scenario updates prepared for DWAF by Kayamandi Development Services (Pty) Ltd