Department of Water Affairs and Forestry

Republic of South Africa

WATER FOR GROWTH AND DEVELOPMENT

FRAMEWORK DOCUMENT

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FOREWORD

Since the onset of democracy in South Africa in 1994, the role of water in the lives of South Africans has undergone considerable change and continues to do so. It is an accepted fact that water is inextricably linked to growth and development. In the 2007 State of the Nation Address, the President of the country challenged all sectors and departments to seriously consider how each sector will contribute to the 6% economic growth target set for the country, supported by the Accelerated and Shared Growth Initiative for South Africa (ASGISA).

If the water sector is to rise to this challenge set by government, it is necessary to accept that growth and development requires adequate water of the right quality at the right time, place and cost. However, these growth and development challenges come at a time when there are possible negative climate change impacts that could affect our existing unpredictable South African climate.

In the face of these challenges, it is an economic necessity to manage the scarce water resources of South Africa strategically in order to support sustainable and pro-poor growth and development. Over the past century, the South African economy has been supported by a well planned and well managed water infrastructure. The challenge is to continue this into the next decade and beyond, while at the same time, ensuring that the benefits accrue to all South Africans.

It is with this understanding that Water for Growth and Development (WfGD) was conceived. WfGD aims to put the country on a new path that recognises the scarcity and value of water. This document presents an overview of how water can contribute towards sustained social development and economic growth and alleviate poverty.

We announced that Water for Growth and Development is the theme for the Masibambane III programme during the March 2006 Water Week and Water for Growth and Development was officially launched at the 2008 Municipal Indaba.

The vision for WfGD is: “Water is Life – Securing the Nation’s Needs Across Generations”. The water sector has in place sound policies and legislation to support WfGD. However, its true success will only be realised through sector collaboration and support in its implementation. The sector and society as a whole needs to re-assess how water can be used more effectively as a tool for economic growth particularly within impoverished communities.

Minister or Director-General: Water Affairs and Forestry
October 2008

TABLE OF CONTENTS

GLOSSARY

ASGISA	Accelerated and Shared Growth Initiative for South Africa
CASP	Comprehensive Agricultural Support Programme
CMA	Catchment Management Agency
CMS	Catchment Management Strategy
CRC	Capital Replacement Cost
DRC	Depreciated Replacement Cost
DWAF	Department of Water Affairs and Forestry
EUL	Expected Useful Life
GDP	Gross Domestic Product
GEAR	Government Efficiency and Accountability Review
GVA	Gross Value Added
GWS	Government Water Scheme
IAM	Infrastructure Asset Management
IDP	Integrated Development Plan
IMC	Inter-Ministerial Committee
ISRDP	Integrated Sustainable Rural Development Plan
LEDP	Local Economic Development Plan
LHWP	Lesotho Highlands Water Project
LUMP	Land Use Management Plan
MAR	Mean Annual Run-off
MLL	Minimum Living Level
MoU	Memorandum of Understanding
MTSO	Medium Term Strategic Objectives
MTSF	Medium Term Strategic Framework
NSDP	National Spatial Development Perspective
NWRS	National Water Resource Strategy
PGDS	Provincial Growth and Development Strategy

PSDP	Provincial Spatial Development Plan
RDP	Reconstruction and Development Programme
ROA	Return on Asset
RUL	Remaining Useful Life
SFWS	Strategic Framework for Water Services
SMME	Small-, Medium- and Micro-Enterprises
TDS	Total Dissolved Solids
UNDP	United Nations Development Programme
WAR	Water Allocation Reform
WfGD	Water for Growth and Development
WMA	Water Management Area
WRC	Water Research Commission
WSDP	Water Services Development Plan

SECTION 1 – INTRODUCTION & PURPOSE

This section introduces the Water for Growth and Development (WfGD) framework as conceptualised by the Department of Water Affairs and Forestry (DWAF). This progressive, cross-cutting and integrated programme moves beyond providing basic water services in South Africa towards focused water use and management for economic and social development in an environmentally sustainable manner. In the context of steadily increasing competition for water, this framework document calls for a radical change in the way water is used and managed.

The first part of the section describes the framework vision: "Water is Life – Securing the Nation's Needs Across Generations", highlighting the value and role of water.

The second part gives an insight into the considerations, as well as the risks and challenges, associated with implementing such a vision in a water-scarce country that has committed itself to achieving economic growth, social development and poverty alleviation whilst at the same time securing the water needs of future generations.

The third part looks at the South African water sector in general and lists its strengths as well as areas that can be improved.

1.1 Vision: Water is Life - Amanzi Impilo

Water is a crucial ingredient for all life on earth. The same unassuming, transparent element that has existed since the planet was first formed, is essential to the biological functions of all life forms. Water also serves as a life-line that feeds economic growth. Clean water can be an instrument for survival and prosperity.

South Africa's democratic constitution states that every citizen has the basic right to access water. In this country, millions of people have already been lifted from poor living conditions through the rollout of sanitation and domestic access to safe drinking water. Many more are set to benefit. However, it is not always enough to make water only available for basic requirements, as an improved quality of life also needs to be catered for.

Just as simply as water can give and improve life, it can also take life. Too little water, as in droughts, or too much, as in floods, can cause destruction, misery and ultimately death. Irrespective of how and where it occurs, water needs to be managed properly and efficiently.

There is no one-size-fits-all solution. The changing needs and circumstances, such as evolving demographics, land use and climate, coupled with an increasingly scarce water resource in South Africa, require a revised approach to our water management systems.

The Department of Water Affairs and Forestry (DWAF), as the custodian of South Africa's water resources and is responsible for the formulation and implementation of relevant policy, has developed the Water for Growth and Development (WfGD) programme to address the multitude of challenges that the water sector faces. The programme was formulated as a response to the increased competition for water and the need for a more efficient way for the various water users to utilise the resource. South Africa needs to change its course towards a new path that recognises the scarcity and value of water.

The WfGD slogan "Water is Life – Securing the Nation's Needs Across Generations" encapsulates the vision of this new path. The key aspects are: value, assured availability and sustainable use of water.

- The words "water is life" reflect the **value of water** as a social and economic good; which are both necessary for a good quality of life for all of our citizens;
- The words "securing the nation's needs" indicate the **assured availability of water** to fulfil the basic water requirements of all South Africans - a question of supply and demand;
- The words "across generations" underline the **sustainable use of water**, which is enshrined in our Constitution - an imperative for long-term water resource protection that takes future challenges into consideration.

The South African government has set clear goals, committing itself to economic growth, social development and environmental health. Within this context, South Africa's water management strives to understand the pressures and complexity of the situation whilst increasingly improving the techniques necessary to manage the resource.

South Africa has adapted and improved its water management systems towards more sustainable water management practices, which range from water resource development projects to the development of comprehensive policies, legislation and strategies as well as integrated water management practices in line with the country's political, economic and social aspirations and values. Today, we are confronted with two immediate, pressing challenges:

(1) Accelerated delivery of basic services; and
(2) Water supply to areas where demands exceed availability.

To tackle these and other challenges, the WfDG programme represents a new generation of "thinking and doing". The aim is to elevate water management in South Africa to the next level through:

- collaboration and integration in purpose and action;
- inter- and intra-sectorally; and
- towards common and shared outcomes with benefits for all.

WfGD recognises that water has a multiplicity of roles, such as:

- support the development that will bring about a growth target of 6%;
- provide for domestic and social needs;
- maintain our environment (with domestic and social objectives); and
- improve our overall quality of life.

The programme makes a distinction between economic growth and the water required to sustain such growth and the needs of South Africa's people and the water required to sustain their livelihoods and raise the overall standard of living.

DWAF strongly believes that the Water for Growth and Development programme is necessary to ensure that the provisions of the Water Services Act (WSA), the National Water Act (NWA), the Strategic Framework for Water Services (SFWS) and the National Water Resource Strategy (NWRS) are fully realised. No new legislation is required to implement WfGD.

1.2 Practical Considerations

The WfGD approach is two-fold: firstly, it is necessary to respond to growth and development needs as they arise; but secondly, to also foresee and match projected needs with water availability. It is a shift from earlier supply-driven approaches, through a period of concerted water service delivery redress to a water conservation and demand-management approach, through this sharply focused response to current and future socio-economic demands for water availability and security. For our economic growth, development, prosperity and water survival an understanding of the South African water dynamic is imperative.

It is clear that concerted action is needed from all spheres of government and sectors to ensure that any potential failure in the water sector is avoided. Each sector is accountable and obligated to fulfil its role in terms of effective planning, use, protection and management of water. It is equally clear that government will need to invest significantly in the water sector to avoid potential water crises and to ensure that water management supports the ASGISA growth targets.

Risks and Issues

The major WfGD risks and issues are associated with inadequate water supply (regarding quantity as well as quality). Risk mitigation requires the following:

- Knowledge and understanding of the projected water demands of user sectors that will drive economic growth and the scale of investment in water infrastructure and management needed to meet this demand.
- Adequate consideration of the social value of water and the inter-linkages with its economic value in pursuing goals such as:

  (1) The effective allocation of water, which must be carefully assessed against a matrix that includes social, economic and ecological value. For example, as urban demand continues to surge, careful assessment is needed of the socio-economic trade-offs in allocating water away from agriculture; net contribution to GDP needs to be weighed against the social multipliers of sustainable rural livelihoods;

  (2) The provision of safe, reliable and adequate access to water and sanitation. Resulting better health will, in turn, lead to greater productivity with associated economic benefits. Greater economic benefits, if appropriately distributed, will, in turn, lead to greater social wellbeing.
- Heeding the connections between water scarcity and poverty. Inadequate access to water is both a cause and a result of poverty.
- An adequate valuation of aquatic-ecosystem goods, services and attributes. The excessive allocation of water for consumptive uses and consequent degradation of ecosystem and water resources must be avoided. Correct valuation will provide motivation for sustaining aquatic ecosystem services through wise management of the relationships between human activities and aquatic ecosystem well-being over the short, medium and long term.

Trends and Challenges

Although the availability of South Africa's water resources for WfGD remains limited by the natural constraints of a comparably dry environment, this is not the primary challenge facing the programme or the sector. South Africa has a "structurally induced relative abundance" of raw water due to heavy past investment in storage and inter-basin transfer infrastructure. However, this can be a double-edged sword. The relative abundance of water for commercial agriculture and industry has led in many areas to the leaching of soil salts, high nutrient and Total Dissolved Solid (TDS) loads in return flows and rising salinity in several major river systems.

The challenge of providing water to meet social and economic needs must also address issues of access to water services and can be exacerbated by failures in both the management of water assets and declining water quality.[1] These issues require immediate intervention in both the traditional water services and water resources sectors.

Specifically, the water services sector requires the provision and removal of treated water, and the provision of sanitation facilities while the water resources sector focus lies on the raw water part of the value chain, including ensuring the availability of raw water and the protection of rivers, wetlands and estuaries. Currently the investment in the water sector across all spheres of government is well below what it should be. If South Africa is to maintain and provide reliable water services that support economic growth and social development, this investment will have to increase substantially. Current investment is in the order to 1.2% of GDP, whereas a benchmark

[1] The WfGD challenges are presented in a report to the ASGISA IMC titled "*A Response to the Immediate Challenges Facing the Water Sector*".

level for water resources and water services investment in a country of the economic status of South Africa should be in the region of two to three percent.

Sector Overview

The South African water sector enjoys well-researched legal and institutional structures, and has tools and mechanisms in place that support customised water management in the catchments. Further strengths of the sector include the following:

- The adoption of catchments as hydrological management units;
- A single custodian and nationally-led leadership approach;
- Decision-making processes that are delegated to catchment-based institutions to allow for the customization of approaches to water management on the basis of local and regional dynamics and circumstances;
- The emphasis on sector support, stakeholder awareness and empowerment through a number of initiatives at all levels of society. These include programmes and initiatives like FETWater (Framework programme for Education and Training in Water), Masibambane, IWRM Project and WIN-SA (Water Information Network South Africa)

Although the water sector has made great strides in ensuring access to clean water there still remain issues that require detailed attention if the water sector is to effectively contribute to social development and economic growth via WfGD. These areas include:

- challenges of drinking water quality;
- water services infrastructure related issues;
- water resources infrastructure issues;
- compliance, monitoring and enforcement under the National Water Act;
- regulation and compliance in water services;
- Raw Water Quality;
- water conservation and water demand management;
- the skills crisis in the water sector;
- a “common understanding” of integration of DWAF and sector business functions;
- attempting to accomplish too-much-too-soon;
- a balanced approach to “perfection before implementation”;
- making implementation processes less complicated; and
- addressing the poor deployment and an increasing dearth of experienced and competent individuals in the water sector.

SECTION 2 – BACKGROUND AND CONTEXT

This section describes the factors and circumstances that have led to our current water situation. It explains how South Africa ranks in terms of water availability and use in the global context.

The first part of the section looks at each of the three key drivers that have shaped the water use, management and development priorities in this country: Geography; Climate; and History, Politics and Legislation.

The second part explains the constitutional and legislative mandate of the Water for Growth and Development programme that gives equal importance to all issues, irrespective of whether these impact at a domestic household (micro) or national (macro) level.

The third part describes the economic imperatives, social needs and environmental considerations behind the comprehensive programme. It also lists the impact of water, whose role can be supportive, facilitative, influencing and participatory, within WfGD.

2.1. Water Availability and Use

South Africa is ranked the 11th most vulnerable country in the world regarding water stress and scarcity, with comparatively small amounts of renewable water available per person (see Figure 1). According to the United Nations Development Programme (UNDP) assessment, the annual renewable water availability per person in the country exceeded 2000 m^3/person In 1955. However this situation changed in the period until 1990 when the amount decreased to below the water stress level of 1700 m^3/person. It is projected that by 2025 our water availability per person will make us a water scarce country with less than 1000 m^3 available per person. At present, the water availability amounts to approximately 1200 m^3 per capita per annum.

Current water availability at 98% assurance levels are as follows:

- Surface resources 77%
- Groundwater 9%
- Return Flows 14%

There are no figures for desalination at this stage. However, it is very small in relation to other water sources and earmarked for future attention as an additional water source, especially in coastal areas.

Water use per sector is as follows:

- Irrigation 62%
- Urban 23%
- Rural 4%
- Mining and industrial (outside urban areas) 6%
- Power generation 2%
- Afforestation 3%

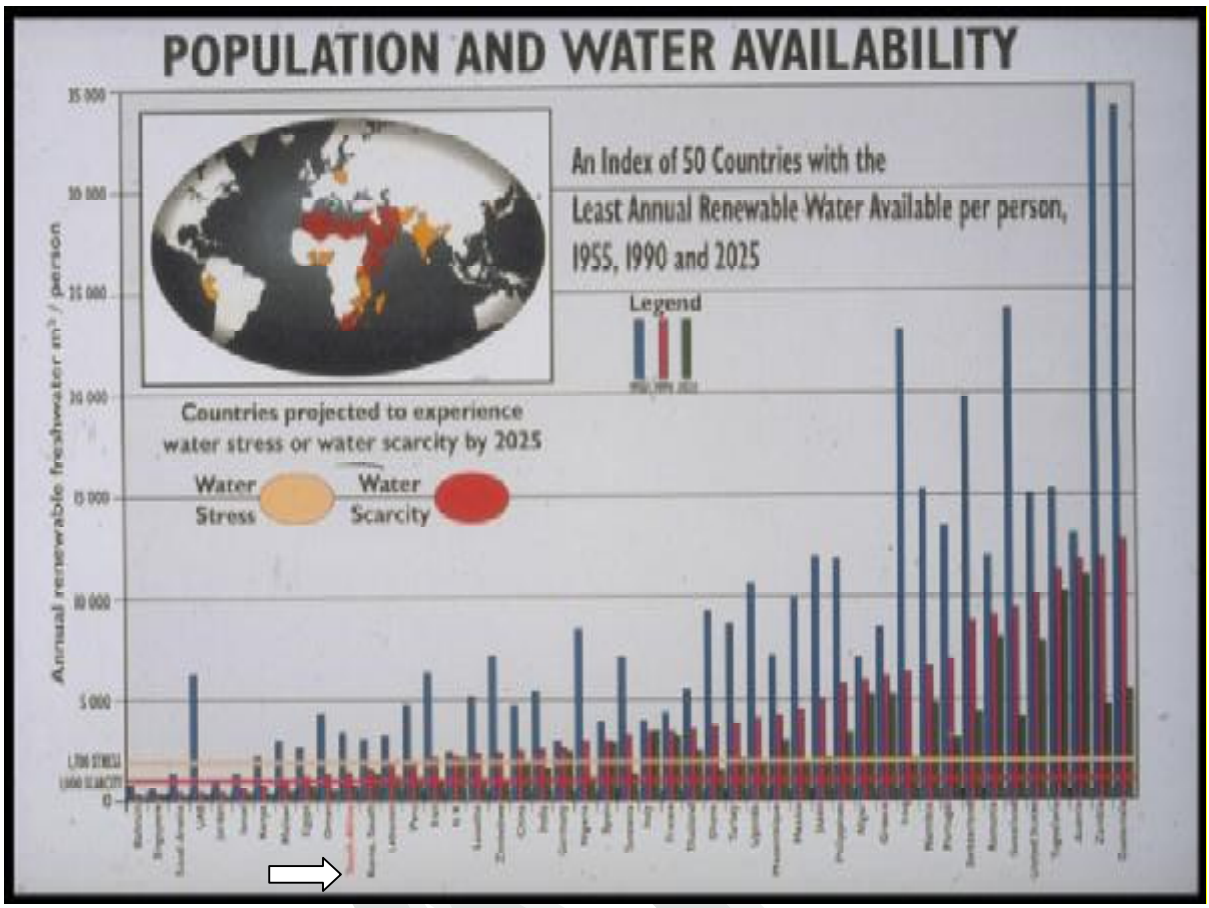


Figure 1. *The UNDP 1999 index of 50 countries with the least annual renewable water available per person and projections for water stress and scarcity. South Africa is the 11th most vulnerable country (indicated by the arrow).*

2.1.1. Geography

South Africa is the fourth largest country in Africa, with a surface area of 1,219,090 km2 and an estimated population of 48 million. Average rainfall is 450 mm per year, but can vary significantly from less than 100 mm along the West Coast to more than 1000 mm on the East Coast and along the escarpment. Water distribution in South Africa mirrors the mean annual rainfall patterns in the country. Figure 2 shows a wet eastern seaboard which becomes progressively drier towards the central and western parts of the country. Overall, the country is semi-arid.

In the interior, seasonal rivers generate 27% of the runoff from 54% of the surface area, while in the west 24% of the surface area is drained by episodic rivers without any significant contribution to the runoff. The natural mean annual runoff (MAR) is about 49 000 million m^3 per year, of which only 27% is currently available as reliable yield. Due to the high temporal and spatial variation in rainfall, high evaporation and the location of water users, the remaining economic development potential is only 5.4 million km^3 per year (11 percent of MAR). Accordingly, per capita water availability is approximately 1,060 m^3 per year (based on MAR), of which the utilisable portion is only 300 m^3 per person per year.

Historical human settlement patterns did not follow conventional trends of taking place where water was in abundance, but followed prevailing economic developments. This was agriculture and mining in the early- to mid-1900's; and later increased mining, urban & industrial developments. Government at the time approved large investments in infrastructure to support agricultural water use and further infrastructure investments to support industrial and urban centres located away from available water resources.

Currently, all the major metropolitan centres in South Africa, except for Durban, are located away from major river systems and water has to be transported to these areas to supply their needs. Irrigated agriculture remains the largest water user in the country and there is increasing sectoral competition and greater mining, industrial, urban and agricultural impacts on water quality.

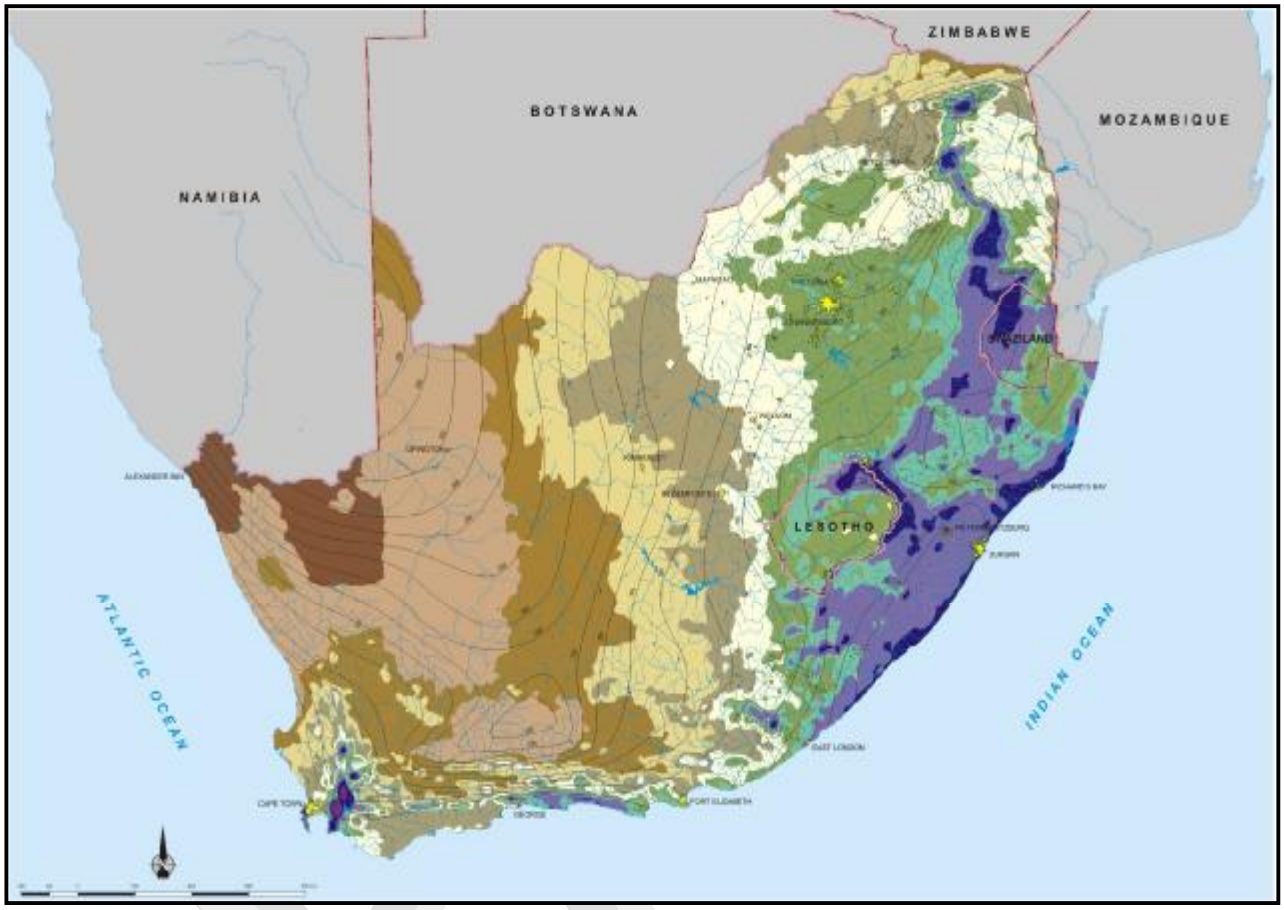


Figure 2. *Rainfall and evaporation rates in South Africa (National Water Resource Strategy, 2004).*

Associated with the increasingly higher costs of transporting water from where it occurs in natural abundance, to where it is needed but not available, are the cost recovery mechanisms which often prices out “lower value” water uses in these areas. High-cost transported water makes the production of certain commodities untenable, unless these are sold at very high (usually uncompetitive) prices or subsidised in some manner or other.

With the increasing settlement, development and the changing economic face of many urban centres, comes greater competition, conflicting uses and increased negative impacts on water resources. Figure 3 shows the projected water demands for 2025, in comparison with 2000, for two scenarios – a base scenario using current growth trends and a high-development scenario. Additional water development potential is indicated in the light area above the red bar in the figure. This does not mean that water is available to cater for ad-hoc or uncoordinated and unplanned development.

An added layer of complexity is that 60% of the water resources in South Africa occur in internationally shared watercourses with one or more of our neighbouring countries, shown in Figure 4. These river basins are subject to international water sharing agreements and protocols among the shared basin states.

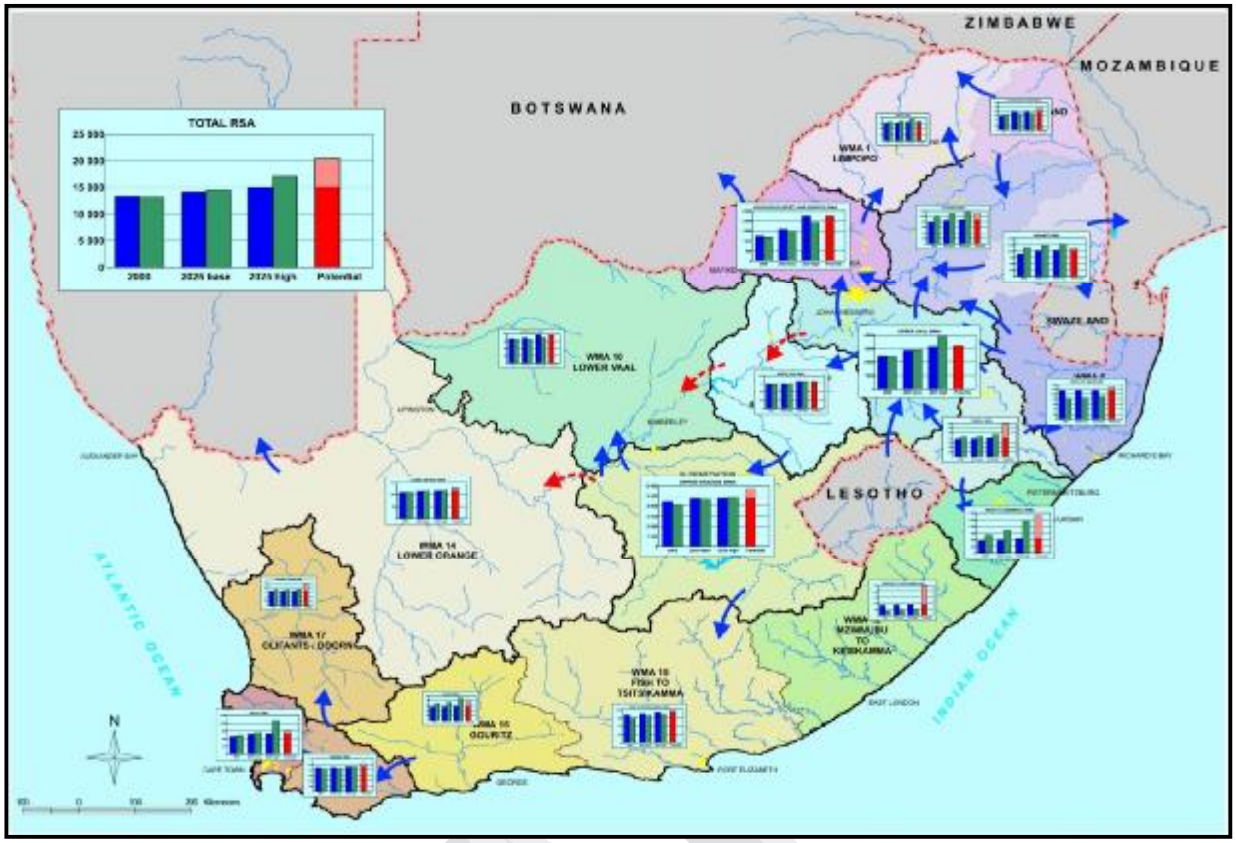


Figure 3. *Water demand and availability projections for 2025 (National Water Resource Strategy, 2004). Blue bars = water availability; Green bars = water use; Red bars = water availability potential with the light area above indicating additional potential.*

Figure 4. *Shared water courses in South Africa (National Water Resource Strategy, 2004).*

2.1.2. Climate

South Africa's average annual rainfall of 497 mm, compared to a world average of 860 mm, is unevenly distributed as 65% of the country receive less than 500 mm annually and 21% less than 200 mm. Droughts occur frequently and may last for several years. This situation is compounded by high annual potential evaporation of up to 3000 mm in some areas. As a result of the country's topography and rainfall, 60% of river flow stems from a mere 20% of the land area, thus heightening the problem of uneven natural distribution of water.

South Africa is the 30th driest country in the world, with 80% of rainfall occurring during the five summer months and only part of the Western Cape region being a winter-rainfall area.

Figure 5 shows a continental comparison between precipitation, runoff and evaporation, with Africa showing the highest evaporation and lowest runoff figures. In South Africa this is an often overlooked and exacerbating factor, especially as our net precipitation rates are in the negative. The rate of evaporation is far higher than the rainfall, which generally results in a reduced runoff of water into our rivers.

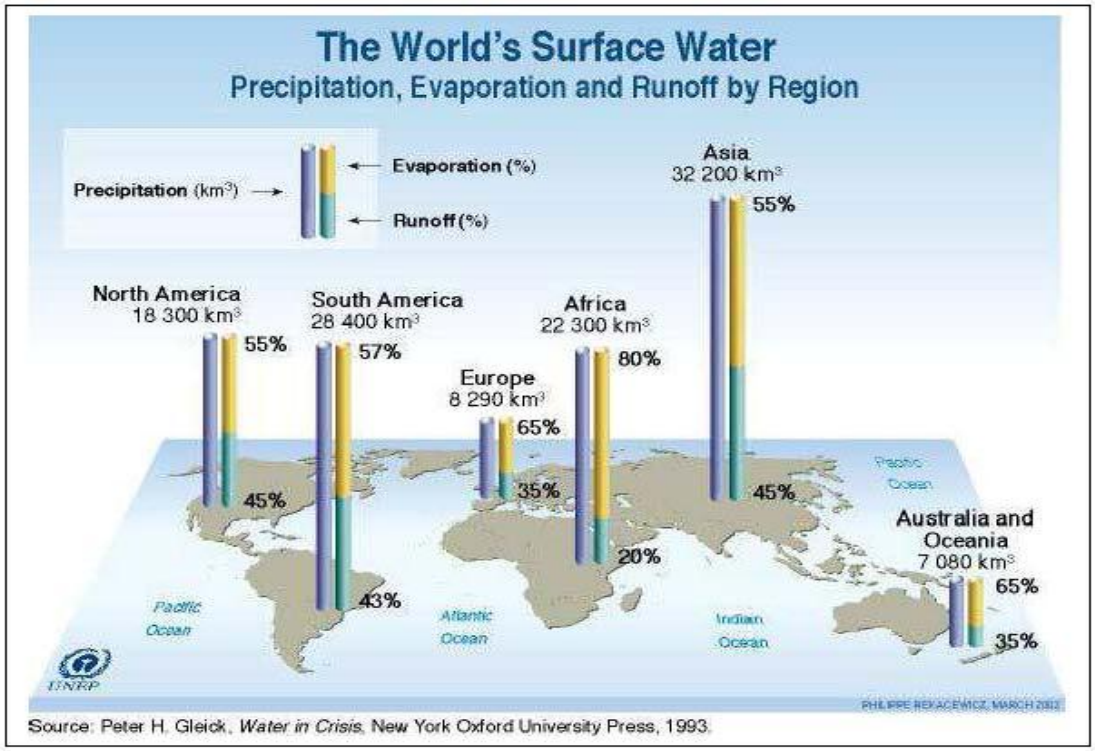


Figure 5. *An illustration of the world's continental surface water precipitation, evaporation and runoff (from Turton, 2008 - The State of Water Resources in South Africa: What the Beverage Industry Needs to Know)*

However, South Africa is fortunate to have well-developed water infrastructure, consisting of a complex network of dams and inter-basin transfers schemes across the country. Per capita storage is considerably higher than for any other African country. This infrastructure has allowed the country to maintain highly water dependent economic activities such as irrigation through dry periods. Despite this infrastructure, many of the catchments in the country are facing water stress, with water demand exceeding supply due to population growth and economic demand. As a result, government interventions are necessary to address the gaps in delivery and access to water, while at the same time being mindful of its mandate to alleviate poverty.

2.1.3. History, Politics and Legislation

Colonialism and apartheid contributed to the skewed and differentiated human settlement and water supply patterns evident in large parts of South Africa, especially in the former homelands and self-governing states. Pre-1994 developmental considerations were translated into the prevailing legislation of their time. In the water sector, the Irrigation Act of 1912 reflected the agricultural needs and character of the country's economy during this period. This was repealed and replaced by the Water Act of 1956 which took cognisance of the changing developmental state of the country – that is, increased mining, industrial and urban water needs. This act underwent a substantial revision and amendment in 1984 to deal with the unprecedented and unanticipated extent to which mining, industrial and urban activities were negatively affecting water resources.

The 1956 Water Act was based on British and European water law and was inappropriate for the South African situation, which has approximately eight times less water. The act was also based on the Roman-Dutch principles of riparian rights (which linked land and water ownership), public and private water and surplus and normal flows. These principles resulted in many difficulties in effectively managing water resources, as well as entrenching skewed land ownership and water access only to a minority population in the country –three percent of the population owned 87% of the land.

After 1994, the focus of South Africa's democratic government shifted towards the transformation of this inequitable access as well as towards supplying water for the basic needs of the majority of citizens, especially in rural areas. Water legislation was again revised in its entirety and the National Water Policy of 1997, Water Services Act of 1997 and National Water Act of 1998 were promulgated in accordance with the 1996 Constitution of South Africa and its Bill of Rights.

Today, water in South Africa falls within the economic classification of quasi-public goods. Such goods lie between pure private goods and pure public goods and services. The early water supply infrastructure in South Africa fell primarily within the public good. Little direct cost recovery from users was attempted. Waterworks, mainly to promote irrigation, were constructed as welfare projects and to develop the country in the face of unfavourable conditions such as erratic rainfall, unemployment and economic recession. As a result, more than 60% of surface water in South Africa is allocated for irrigation.

As the growing needs of a diversifying economy draws more attention to the scarcity of water and the negative impacts of climate change are gradually being realised, it is also becoming clear that historical government supply-side allocation should give way to allocation based on market demand. The principle that water resources should be allocated among different users so that the marginal benefit is the same for all users was accepted as government policy on the recommendation of the Commission of Enquiry into Water Matters in 1970. However, demand side allocation through market forces requires an effective relationship between the supply authority and water users. It implies that waterworks must be financed and operated on commercial principles aimed at the full recovery of the cost of services. Already new water allocation to irrigation development is based on the latest policy position, except in situations where equity and redress are the key drivers linked with new waterworks

2.2. Constitutional and Legislative Mandate

An important consideration within the legislative and policy frameworks is the attention that must be given to both macro- and micro- socio-economic programmes (RDP, GEAR, ASGISA) and planning elements (NSDP, PSDP, LUMP, PGDP, IDP, LEDP) in all water sector initiatives. **Significantly, equal importance is given to all issues, irrespective of whether these impact at a household (micro) or regional and national (macro) level.**

Thus, in summary, while the progress between 1994 and 2004 was primarily in the legislative, policy and water services sectors (focusing on water supply); since 2004, the focus has shifted to policy implementation, addressing the sanitation backlog and issues of social justice in the allocation and re-allocation of water (Water Allocation Reform) – that is, moving people "beyond domestic water use to uses for productive, economic purposes". **The philosophy and approach of managing water in its entirety is now given greater emphasis in WfGD – a sector approach to Water Management instead of Water Resources and Water Services as separate disciplines!**

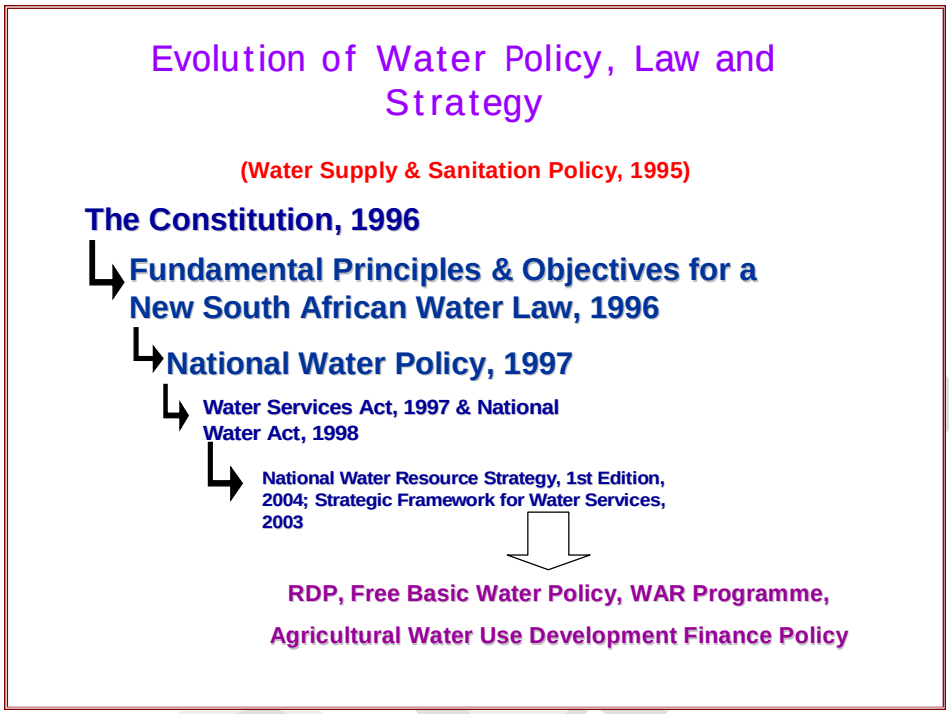


Figure 6. *Water sector legislation and policy development since 1994.*

The timing is therefore appropriate for WfGD to be located within this "new dynamic" and changed paradigm in the water sector and the country and it forms part of the continuum of adaptive management in the water sector.

2.3. Economic Imperatives, Social Needs and Environmental Considerations

While the extensive nature of WfGD may appear to reflect all of the DWAF business, it sharpens the DWAF focus to certain strategic elements that directly contribute to specific socio-economic imperatives in the country and the most important points of reference here are the NSDP, ISRDP, ASGISA, PGDPs and LEDPs, the eradication of water services backlogs and environmental protection for sustainability.

The impact of water within WfGD includes the following – supportive, facilitative, influencing and participatory roles:

- National, regional and local circumstances dictate when and how water can or cannot be the catalyst, enabler or driver of economic growth and development;
- Where appropriate, major water intensive economic development initiatives, especially in the manufacturing and production sectors, should be located in areas having an abundance of water;
- Where water is available in relative abundance, its role is **supportive** of socio-economic initiatives. However, as water becomes limited, the sector adopts a more **facilitative** role through active management of the resource in order to make water available for

developments, for example by reallocating it from stagnant economic sectors to growing ones;

- As the availability of water becomes even more of a constraint to development, the sector takes on an **influencing** role to actively encourage water conservation and demand management measures, and also to discourage water intensive developments;
- Where the demands for water from new developments cannot be met from the available resources, the approach needs to be **participatory**. In these cases, water may have to be reallocated from one use to meet the needs of another. Planning would have to balance the relative benefits of the different uses, and dialogue among stakeholders becomes a critical element of engagement. In these catchments the requirements of the Reserve may have to be met gradually over time and the Reserve, Class and Resource Quality Objectives would have to carefully balance the sustainable use of the resource with the need for socio-economic development.

SECTION 3 – RISKS, THREATS AND CHALLENGES

This section elaborates on the risks, threats and challenges to the Water for Growth and Development programme.

The first part investigates the potential threat of climate change.

The second part looks at the water infrastructure and specifically the condition of DWAF's assets regarding South Africa's water resources and water services.

The third part deals with the shortage of skills in the water sector.

The fourth part highlights the problem of unlawful water use and pollution while the fifth part of the section reports on the declining raw water quality in rivers and dams, as well as with the pollution of groundwater.

The last part in this section looks at the financial support of the water sector and the four tiers of water pricing in South Africa.

3.1. Climate Change and Water Security

The planning of water resources requires the consideration of many uncertainties of which the effect of climate change is one. Water is one of several current and future critical issues facing Africa as highlighted in the Inter-Governmental Panel on Climate Change (IPCC) technical report on climate change. Accord to the report, climate change has the potential to impose additional pressures on water availability and accessibility.

The first uncertainty to consider is in regard to planning for the secure provision of future water requirements. This is especially challenging given the long lead times required to develop new large water resources infrastructure. Such projects typically take 15 to 20 years from planning initiation to water delivery and the actual requirements after 20 years may be very different from the original estimates. This is mitigated by the fact that the planning is done in phases, from the strategy level to pre-feasibility and feasibility levels, followed by the design and tender phases, and adjustments are usually possible before a final commitment is made on construction of the project.

Another major uncertainty lies in our knowledge of the true characteristics of a water resource, where river flows often have to be determined from fairly short hydrological records. Yield estimates are adjusted as the record lengthens. Estimates based on short records tend to be optimistic. With longer records, the potential for measuring more severe droughts increases, leading to a downward adjustment of the available water. A change (usually a reduction) in available water can be addressed by modifying the design specifications, by implementing the new project earlier, or by introducing water use efficiency measures. In the planning environment, there is thus a continuous process of adapting to changing circumstances.

Climate change is an accepted reality. We need to consider long-term predictions in our planning, keep an eye on trends and adapt as indicated. Presently it can be viewed as an added uncertainty where impacts can be mitigated, as is the case with other hydrological uncertainties. What is important is that the monitoring of rainfall and runoff must be continued rigorously, and

the network improved where necessary to ensure that the actual effects of climate change are measured accurately and brought into the analysis of the resources

In the reconciliation strategies for the metropolitan areas the possible impacts of climate change (an example would be the predicted drying of the West Coast, extending down towards Cape Town) on the available water are included in the scenarios of the future, to ensure that augmentation options are studied timeously. Mitigation measures can then be introduced as their necessity becomes evident.

3.2. Infrastructure

South Africa's erratic rainfall patterns make the ability of water infrastructure to perform effectively a matter of national priority, as this can potentially have an impact on the economy, environment and the quality of life of our people. This infrastructure is an essential life-line for industry, including users of national strategic importance such as ESKOM power stations and SASOL, to agriculture and to water service authorities which are responsible for treatment and onward delivery for household and commercial purposes.

3.2.1. Water Resources

Most assets are in a relatively fair to poor condition. There is already a maintenance backlog to get assets in good condition, thus extending their useful life. The capital replacement cost (CRC) of the poor condition assets amount to about R6.4 billion, representing a backlog in capital replacement and refurbishment to be addressed urgently.

The Depreciated Replacement Cost (DRC) method is particularly useful when dealing with assets whose initial values or age have not been recorded, or when dealing with assets whose aggregate values cannot easily be compared against market values. Condition assessment has been undertaken for most of the assets and is used to determine an accumulated depreciation charge that is then deducted from the replacement cost to determine the asset carrying value for inclusion in the asset register.

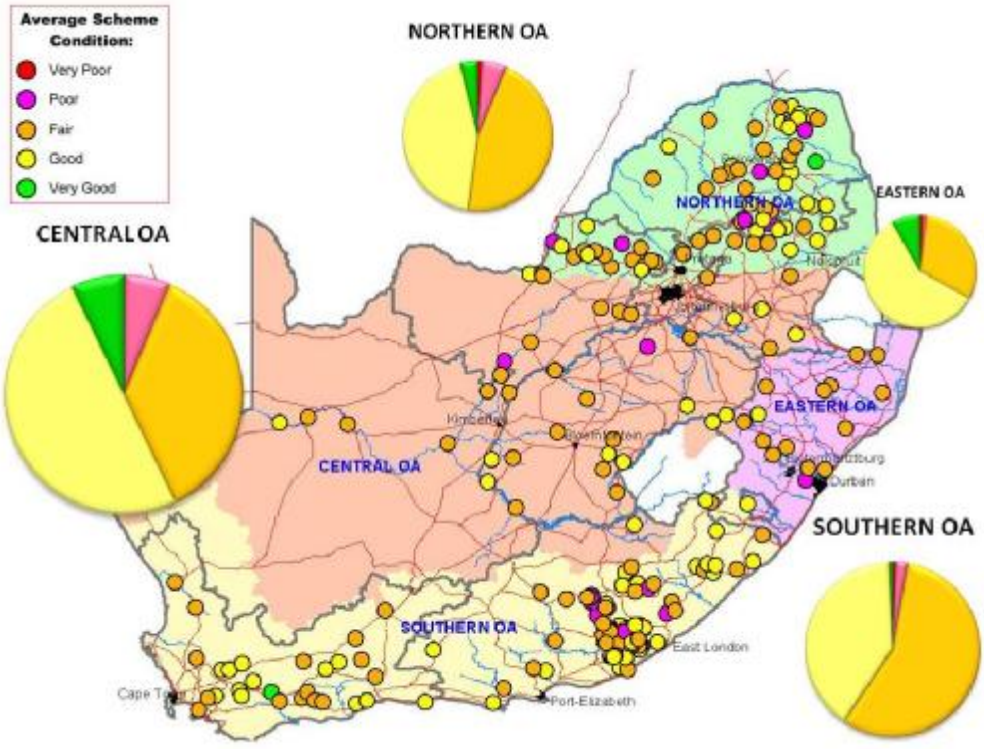


Figure 7. *Condition of DWAF assets*

The map in Figure 7 above shows the average condition of scheme assets, whereas the pie charts indicate the relative value of assets Capital Replacement Cost per condition grading.

Asset Age and Remaining Useful Life

The age of an asset in conjunction with its condition indicates the remaining useful life of an asset. This in turn determines the depreciated replacement cost and informs the renewal investment requirements for life-cycle planning.

The following graph (Figure 8) shows the age profile of all DWAF water resources infrastructure with the average age being 40 years, weighted on replacement value.

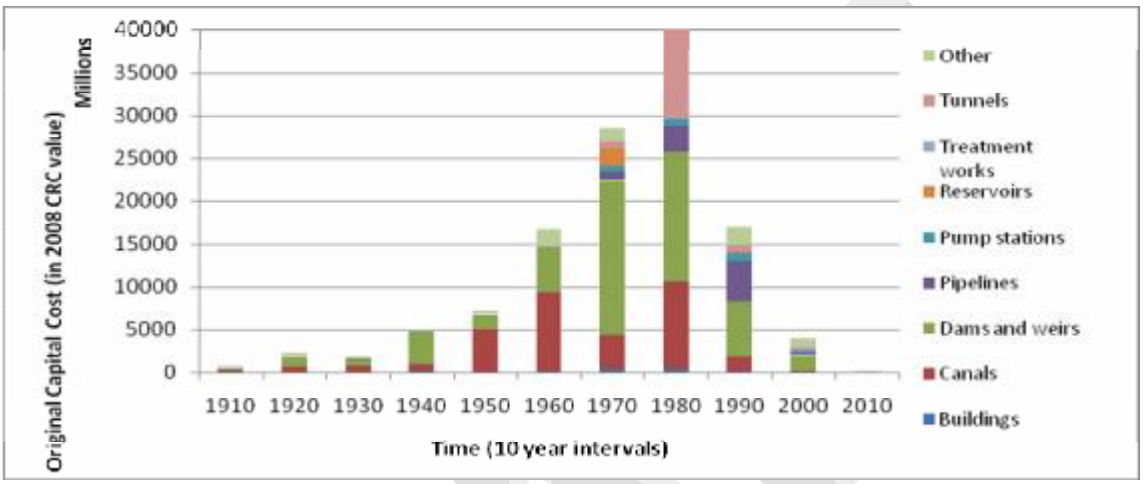


Figure 8. *Age profile of assets*

Figure 8 above indicates that the majority of capital investments were made in the 1970's and 1980's. Most assets are thus approaching the end of their useful life, which means more funds will be required for major rehabilitation to extend the life of these assets for sustainable water supply.

The Remaining Useful Life (RUL) is calculated using the Expected Useful Life (EUL) less the age and refined based on condition data. The condition of assets will depend on how well they were operated and maintained since commissioning. A major project (Sakhile) was undertaken to determine the condition, remaining useful life and the Depreciated Replacement Cost of the DWAF infrastructure assets.

Figure 9 below shows the RUL against the Capital Replacement Cost as a first order indication of future capital renewal investment needs for the respective 10 year blocks. The figure indicates that at least R4 billion per annum is needed to renew or rehabilitate our infrastructure. The bulk of rehabilitation for the next 30 years will be on canals and tunnels, which mainly supply irrigation.

Further analysis of the scheduled replacement costs per asset type is required to establish which of the replacements affect critical assets and which are for non-critical assets. The critical assets have to be prioritized and may even be brought forward into the first 10-year period as a means of risk management. It may be possible to delay the replacement of some of the non-critical assets with lower replacement needs, such as secondary and tertiary canal systems, to later periods thereby accepting related impacts such as water losses, lowering of service levels, reduced revenue streams or reputation with customers.

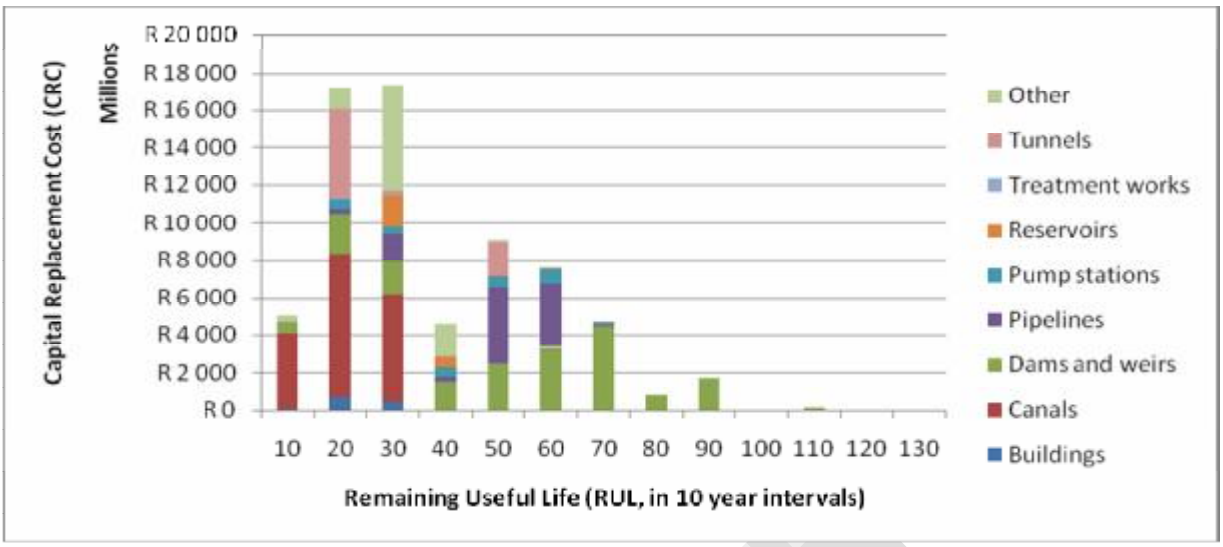


Figure 9. *RUL profile with capital renewal values*

Risks

Maintenance Backlogs

Serious backlogs in maintenance have built up over the years due to budgetary constraints. The total revenue in the Trading Account was much less than the maintenance needs required for all the Government Water Schemes (GWS). This is particularly severe for the irrigation schemes as the charges do not include the capital portion of the assets (ROA) and thus no provision is made for asset replacement, including re-lining of canals, replacing of fences, etc.

Lack of redundancy to undertake maintenance

Another reason for maintenance backlogs is the inability to get outages on certain infrastructure to be able to perform the necessary maintenance activities. This relates to some of the most critical transfer pipelines serving ESKOM and SASOL, where these orgaisations have not provided adequate on-site storage so that DWAF can stop pumping for the time required for maintenance. This has resulted in cumulative maintenance backlogs over a number of years which now have become a major risk of infrastructure failures on selected pipe sections.

Water resource availability risks

Most schemes are operating at the full supply capacity of their current water resources. Since water resource availability varies from year to year due to changing climatic and rainfall conditions, such water availability must be managed continuously to prevent a total failure of supply.

System Operating Rules must be maintained and implemented according to water allocations to various water users, given the availability or shortage of water resources.

3.2.2. Water Services

Municipalities are at the forefront of Government's drive to eradicate all basic services backlogs. Government's initial focus has been on infrastructure backlogs, which remain a huge challenge. However, with the expansion of infrastructure, the challenge to effectively operate and properly maintain is growing in magnitude.

A key requirement of water services legislation is for WSIs to develop and apply Infrastructure Asset Management (IAM) through their water services development plans (WSDPs) and water

board business plans. To date these plans have focussed more on the development of new infrastructure to address the basic services backlog, and less on the IAM requirements over the life of existing and new infrastructure.

Definition

Infrastructure asset management is an integrated process of decision-making, planning and control over the acquisition, use, safeguarding and disposal of assets to maximise their service delivery potential and benefits, and to minimise their related risks and costs over their entire life.

Current State

In 1994 the democratic South African government evaluated the imbalance in infrastructure that characterised the nation and embarked on an ambitious plan to put matters right by addressing the backlog. For example, the government has invested in providing water to 15 million people. Other infrastructure, such as sanitation and road infrastructure, has further improved the quality of life of the people of South Africa. Acting on its mandate, the government is continuing to invest in infrastructure for previously disadvantaged communities at a rapid pace. The water services sector in South Africa is currently responsible for infrastructure assets of a replacement value approaching R200 billion[2].

Water services are essential to maintain healthy and effective domestic living, associated social services (e.g. schools, hospitals, police stations and prisons) and proper business, commercial and industrial operations. While many people in South Africa do not have access to the minimum basic water services infrastructure, others do have the infrastructure but may not be receiving the services due to poor management, inadequate maintenance and a high cost of service delivery.

Wastewater treatment works are of particular concern. For example, In 2005 and 2006 DWAF and the Water Research Commission (WRC) undertook a national investigation and found that 35% of surveyed plants required capital investments to upgrade; approximately two thirds of the plants were experiencing problems with disinfection of treated sewage; and an estimated 105 fully trained and equipped mechanical and electrical maintenance teams were immediately required to prevent further deterioration of valuable infrastructure and equipment.

Other areas of concern include water treatment works, water and sewer reticulation, on-site sanitation, and water and sanitation at some health and education facilities.

Ultimately, unless IAM is improved in these areas, 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.

It is important to note that “Money ‘saved’ on management of assets is not a saving. This is a short-term outlook, often said to be due to political short-term imperatives and lack of capacity and know-how within the municipality. It can become a vicious cycle once infrastructure is allowed to deteriorate. Expensive refurbishment becomes necessary and there is even less money for ongoing maintenance. In addition, deteriorating infrastructure leads to poor service delivery and reduced payment by consumers, exacerbating lack of cost recovery. Government is facing a looming crisis unless something is done.

Furthermore, inadequately skilled contractors and poor construction supervision negatively affects the life expectancy of infrastructure. On the operation side it is apparent that many municipalities do not have suitably skilled and adequate resources to operate and maintain their water services infrastructure effectively. At a management level, municipal systems for infrastructure management are in many cases non-existent, sub-standard or simply too complex for the circumstances in which they are employed.

All of the above leads to poor services quality. Poor service quality in turn leads to consumer dissatisfaction and non-payment for services. Insufficient cost recovery affects the financial viability of schemes and further reduces the institution’s ability to provide effective services. This vicious cycle must be stopped through appropriate interventions.

[2] Preliminary figures from a DWAF analysis still in progress

Key Challenges

The following IAM key challenges are critical for sustainable water services delivery:

- Improvement in planning (including adequate asset registers and asset management plans).
- Improvement in policy, supporting measures, regulation and tools.
- Improvement in municipal systems.
- Management of community expectations for higher levels of service within the local affordability and economic development scenarios.
- Development of necessary expertise, experience and commitment of elected representatives and officials.
- Balancing the need for infrastructure creation with appropriate care of existing infrastructure.
- Compliance with requirements of the Municipal Finance Management Act (MFMA) (Act 56 of 2003) and other legislative imperatives.
- Development of appropriate financing strategies.
- Structured communication with communities and sector partners.
- Improved ability to prove business cases to donors and funders.
- A clear regulatory system with incentives.
- Development of sound information base.
-

Priority Issues

The following priority issues were identified:

- Life-cycle management (service delivery does not end with infrastructure projects)
- Knowing the infrastructure (including asset register)
- Implementing IAM processes and procedures
- Clear responsibility and accountability for IAM
- Hands-on approach (and also that one size does not fit all)
- Water services IAM is a part of total asset management
- Funding requirements and processes for IAM
- IAM staffing requirements (number and skills)

3.3. Scarce Skills

The shortage of skills in the water sector and the continuing loss of skilled personnel remains one of the highest risks in relation to the provision of effective water services and water resources management.

The enormous expansion in service coverage since 1994 has occurred concurrently with a massive loss of municipal engineering capacity, compounded by an acute national shortage of artisans. Since 1989, the number of municipal engineers per 100 000 people has fallen from 21 to below 3, while coverage of networked services has more than doubled. While this is the overall picture within municipalities, the same picture pertains to the water services side of municipalities and the consequences of failure in water services are, arguably, more severe than for any other service. This decline has been happening since well before 1994.

A similar picture pertains in DWAF where a considerable loss of skills has been experienced and where a number of highly experienced professionals are due to leave in the next 5 years. Currently in DWAF there are 159 civil engineering positions, of which 68 are vacant, and 2196 technical positions of which 790 are vacant. The shortage of experienced engineers in the Department poses high risks for management and development of water infrastructure. There is also a very high risk relating to the rapidly dwindling capacity in the water resources planning section. This poses a significant risk for the country in terms of being able to plan for long-term water demands, particularly in the face of global climate change.

The general skills shortage especially in technical areas raises concerns around the ability to manage assets effectively, to develop and manage new water works and infrastructure, and the ability to regulate these.

A number of projects are currently underway to address the skills shortage in the water sector, including the development of a Water and Forestry Learning Academy in DWAF (WFLA).

3.4. Unlawful Water Use and Pollution

Illegal raw water use is a significant problem in many areas of the country, both in terms of illegal abstraction and illegal discharge of effluent into rivers.

In the Vaal River system, for example, unlawful use of water, mainly by irrigators, is a major problem, mainly upstream of 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.

3.5. Raw Water Quality

The declining quality of water in rivers and dams as a result of pollution and poor land use management is impacting negatively on economic growth in various ways.

Significant variances in the quality of water have impacts on the quantity of water used and disposed in Eskom's power stations. Currently the quality of water supplied to power stations is, in some cases, not to the standards for which the power stations were designed. This imposes costs on Eskom which should, rather, be internalized by the polluters. In the agricultural sector, exports are being impacted on by irrigation water quality that does not meet EU standards. Similarly, industry, water boards and municipalities are experiencing challenges related to poor water quality.

Agriculture also contributes significantly to water pollution. High nutrient loads from poorly managed WWTW and agriculture can result in toxic algal blooms and destroy ecosystems. The toxic blooms can poison both livestock and humans. 11% of the regularly monitored dams in South Africa have shown significant to severe algal and cyanobacterial blooms while 58% show significant to serious potential to develop cyanobacterial blooms because of nutrient enrichment.

While industrial pollution needs to be more tightly controlled in certain areas, a key factor in declining raw water quality is the poor management of waste water treatment works by municipalities and the discharge of poorly treated or untreated sewage effluent into rivers.

Industrial and settlement pollutants common in South Africa are: silt, toxic metals, litter, sewage and other waste. Many of the pollutants come from urban waste water, particularly from informal settlements which lack sewage and water purification facilities. The resulting pollution contributes to serious health problems. As more and more people move into cities and towns, a number of factors cause pollution:

- Physical disturbance of land due to construction of houses, industries, roads etc.
- Chemical pollution from industries and mines

- Inadequate sewage collection and treatment
- Inadequate waste collection, resulting in littering

Groundwater is also under threat from pollution and is more difficult to rehabilitate once polluted than surface water.

3.6. Financial Support and Water Pricing

There are a number of criteria and requirements for the setting of water tariffs; the most fundamental are the following:

- Water pricing policies must promote *equity*, such that the Reserve requirements for basic needs are met first while addressing inadequate access and income-inequality constraints. This may require the use of subsidies for poor consumers;
- *Ecological sustainability* must be supported, with the aim of internalising external environmental costs into the water price;
- *Financial sustainability* is imperative, implying that all consumers must face at least some positive marginal price for water, while a water tax base is encouraged to cover both capital and operational costs; and
- Pricing policies are to account for *efficiency* goals recognising the economic and social nature of water.

The water pricing cycle, as defined in the strategic framework for water resources, is depicted in Figure 10 below. This pricing cycle reflects the four tiers of pricing which include raw water tariffs, bulk water tariffs, retail water tariffs and waste water management. These four tiers of pricing address the policy goals mentioned above.

First-tier pricing reflects raw water prices and encompasses what water extractors, whether individuals, water boards, municipalities or water user associations, pay the Department of Water Affairs and Forestry supply schemes for water. This tier includes a resource management charge, recently included for catchment management. Second-tier pricing relates mainly to the water boards selling water at a wholesale or bulk level. The third tier captures the retail price of water, charged by municipalities to end-users. The fourth tier is the waste discharge charge system.

Although on paper this legislative framework seems to be in line with the constitutional requirement to progressively realize access to water by all South Africans, some serious issues remain:

- There are vast areas in South Africa where water infrastructure does not exist and water delivery of any kind is not possible. The policy to provide free basic water therefore needs to be supplemented with a policy that aims to rapidly increase access to water infrastructure, especially for the rural poor.

- Especially in rural communities where there are not a sufficient amount of high volume users to cross-subsidies the provision of free water to all, the Free Basic Water policy creates serious problems for local governments, which are often not able to finance the free provision of basic water for all. This leads rural municipalities to take drastic measures (e.g. disconnections) that deprive their residents of access to water. The policy therefore does not seem to be properly targeted to meet the needs of the rural poor.

- For the urban poor who are used to relatively high levels of water usage, 6 kilolitres of free water for each household per month will not be adequate. For a household of eight people, six kilolitres of water amounts to two flushes of a toilet per person per day and will therefore be completely inadequate.

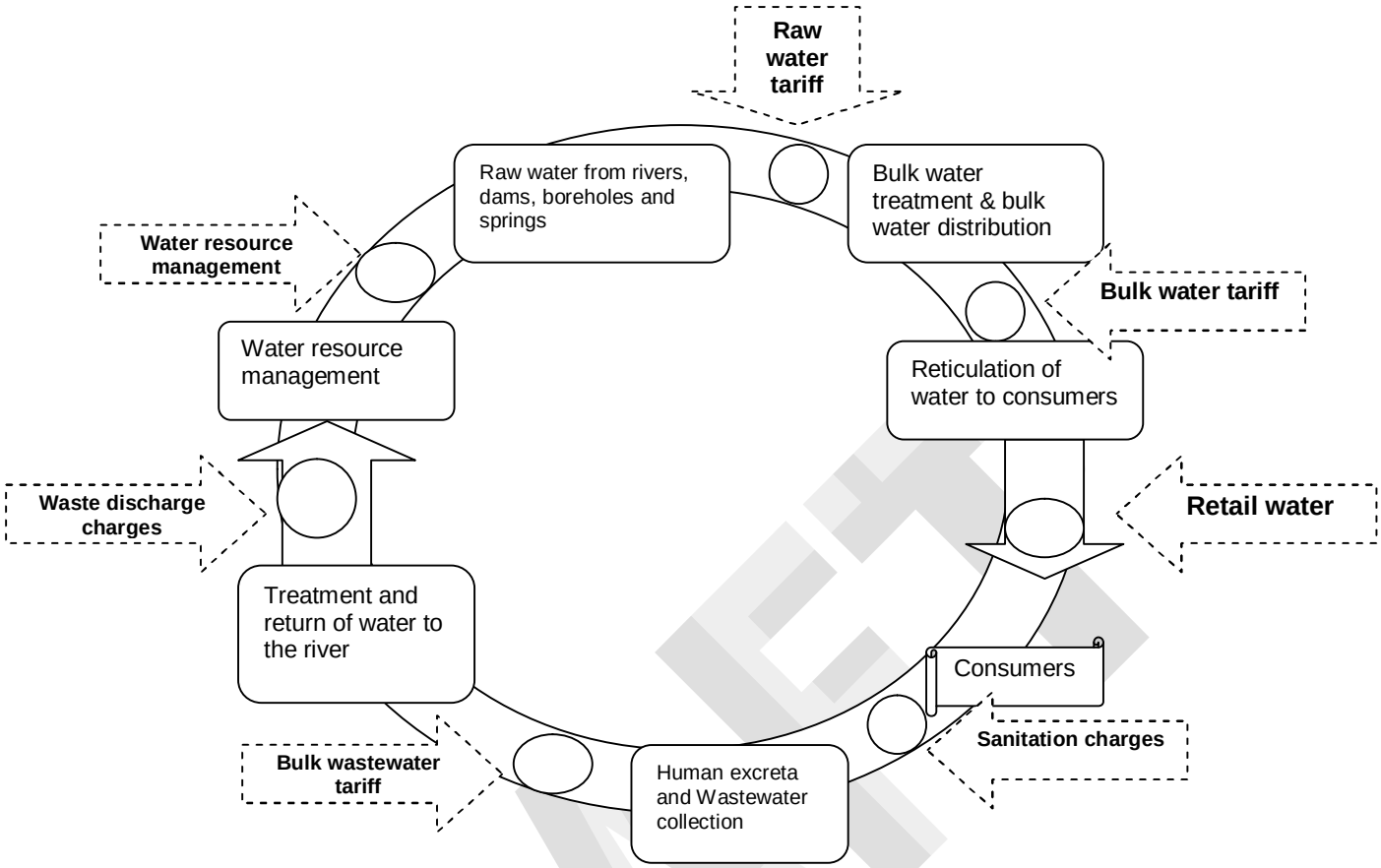


Figure 10. *Water pricing cycle in South Africa (Source: Strategic Framework for Water Services, September 2003)*

Based on current pricing practice, the true economic value of the water resource itself is not explicitly captured by water managers and users in decision-making. To ensure that the economic costs or benefits foregone in one particular use of water over another are internalised in decision-making, it is necessary to understand what the actual value of water is, especially where monetary values cannot easily be assigned to the worth of non-consumptive functions such as maintenance of human life and ecosystem sustainability.

SECTION 4 – GUIDING PRINCIPLES

This section serves to reaffirm the Water Law Principles formulated during the development of th country's current water legislation. It further acknowledges the relevance of these principles, in their entirety, for WfGD and are presented below for ease of reference.

LEGAL ASPECTS OF WATER

Principle 1
The water law shall be subject to and consistent with the Constitution in all matters including the determination of the public interest and the rights and obligations of all parties, public and private, with regards to water. While taking cognisance of existing uses, the water law will actively promote the values enshrined in the Bill of Rights.

Principle 2
All water, wherever it occurs in the water cycle, is a resource common to all, the use of which shall be subject to national control. All water shall have a consistent status in law, irrespective of where it occurs.

Principle 3
There shall be no ownership of water but only a right (for environmental and basic human needs) or an authorisation for its use. Any authorisation to use water in terms of the water law shall not be in perpetuity.

Principle 4
The location of the water resource in relation to land shall not in itself confer preferential rights to usage. The riparian principle shall not apply.

THE WATER CYCLE

Principle 5
In a relatively arid country such as South Africa, it is necessary to recognise the unity of the water cycle and the interdependence of its elements, where evaporation, clouds and rainfall are linked to groundwater, rivers, lakes, wetlands and the sea, and where the basic hydrological unit is the catchment.

Principle 6
The variable, uneven and unpredictable distribution of water in the water cycle should be acknowledged.

WATER RESOURCE MANAGEMENT PRIORITIES

Principle 7
The objective of managing the quantity, quality and reliability of the Nation's water resources is to achieve optimum, long term, environmentally sustainable social and economic benefit for society from their use.

Principle 8
The water required to ensure that all people have access to sufficient water shall be reserved.

Principle 9
The quantity, quality and reliability of water required to maintain the ecological functions on which humans depend shall be reserved so that the human use of water does not individually or cumulatively compromise the long term sustainability of aquatic and associated ecosystems.

Principle 10
The water required to meet the basic human needs referred to in Principle 8 and the needs of the environment shall be identified as "The Reserve" and shall enjoy priority of use by right. The use of water for all other purposes shall be subject to authorisation.

Principle 11
International water resources, specifically shared river systems, shall be managed in a manner that optimises the benefits for all parties in a spirit of mutual co-operation. Allocations agreed for downstream countries shall be respected.

WATER RESOURCE MANAGEMENT APPROACHES

Principle 12
The National Government is the custodian of the nation's water resources, as an indivisible national asset. Guided by its duty to promote the public trust, the National Government has ultimate responsibility for, and authority over, water resource management, the equitable allocation and usage of water and the transfer of water between catchments and international water matters.

Principle 13
As custodian of the nation's water resources, the National Government shall ensure that the development, apportionment, management and use of those resources is carried out using the criteria of public interest, sustainability, equity and efficiency of use in a manner which reflects its public trust obligations and the value of water to society while ensuring that basic domestic needs, the requirements of the environment and international obligations are met.

Principle 14
Water resources shall be developed, apportioned and managed in such a manner as to enable all user sectors to gain equitable access to the desired quantity, quality and reliability of water. Conservation and other measures to manage demand shall be actively promoted as a preferred option to achieve these objectives.

Principle 15
Water quality and quantity are interdependent and shall be managed in an integrated manner, which is consistent with broader environmental management approaches.

Principle 16
Water quality management options shall include the use of economic incentives and penalties to reduce pollution, and the possibility of irretrievable environmental degradation as a result of pollution shall be prevented.

Principle 17
Water resource development and supply activities shall be managed in a manner which is consistent with the broader national approaches to environmental management.

Principle 18
Since many land uses have a significant impact upon the water cycle, the regulation of land use shall, where appropriate, be used as an instrument to manage water resources within the broader integrated framework of land use management.

Principle 19
Any authorisation to use water shall be given in a timely fashion and in a manner which is clear, secure and predictable in respect of the assurance of availability, extent and duration of use. The purpose for which the water may be used shall not arbitrarily be restricted.

Principle 20
The conditions upon which authorisation is granted to use water shall take into consideration the investment made by the user in developing infrastructure to be able to use the water.

Principle 21
The development and management of water resources shall be carried out in a manner which limits to an acceptable minimum the danger to life and property due to natural or manmade disasters.

WATER INSTITUTIONS

Principle 22
The institutional framework for water management shall as far as possible be simple, pragmatic and understandable. It shall be self-driven and minimise the necessity for State intervention. Administrative decisions shall be subject to appeal.

Principle 23
Responsibility for the development, apportionment and management of available water resources shall, where possible and appropriate, be delegated to a catchment or regional level in such a manner as to enable interested parties to participate.

Principle 24
Beneficiaries of the water management system shall contribute to the cost of its establishment and maintenance on an equitable basis.

WATER SERVICES

Principle 25
The right of all citizens to have access to basic water services (the provision of potable water supply and the removal and disposal of human excreta and waste water) necessary to afford them a healthy environment on an equitable and economically and environmentally sustainable basis shall be supported.

Principle 26
Water services shall be regulated in a manner which is consistent with and supportive of the aims and approaches of the broader local government framework.

Principle 27
While the provision of water services is an activity distinct from the development and management of water resources, water services shall be provided in a manner consistent with the goals of water resource management.

Principle 28
Where water services are provided in a monopoly situation, the interests of the individual consumer and the wider public must be protected and the broad goals of public policy promoted.

SECTION 5 – WATER AND SECTORS

Water has an impact on every sector of the economy. This chapter features key sectors that rely heavily on South Africa's water resources and have a significant impact on water availability and quality. Water use per sector is as follows:

- **Irrigation 62%**
- **Urban 23%**
- **Rural 4%**
- **Mining and industrial (outside urban areas) 6%**
- **Power generation 2%**
- **Afforestation 3%**

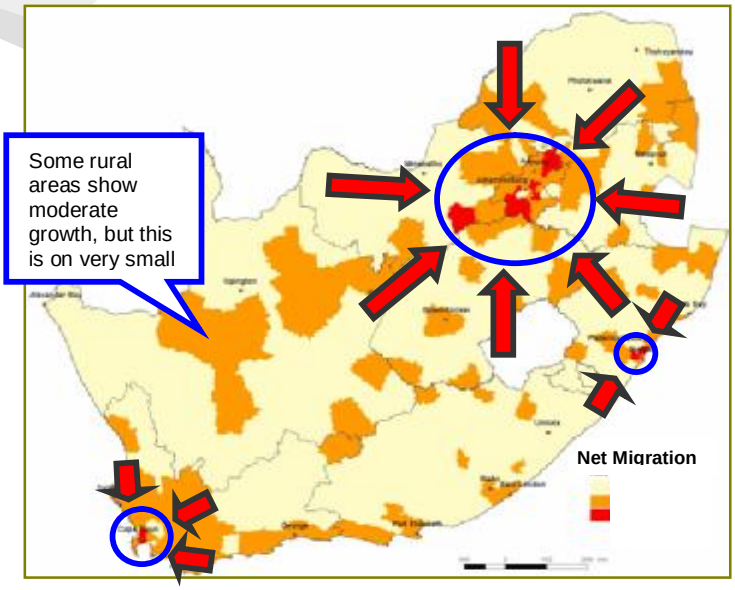
The sectors explored in this section are (in the following order): domestic sector (urban and rural), recreation and environment, followed by the industrial sectors mining, energy,

5.1. Domestic Sector

Water plays a variety of roles in the domestic sector. Firstly, it is an essential resource to sustain human life in that it is required as safe and healthy drinking water and an ingredient for food preparation. It also is essential for maintaining hygiene and is used for washing, cleaning and essential domestic services. Associated with the uses in the household, water plays a key role at clinics, schools, crèches and other public meeting places. It is thus undeniable a critical resource for both social and economic activities.

To manage water service in this sector it is essential to understand the setup, driving forces and challenges of this sector, including the demography and settlement dynamics.

South Africa's estimated population in 2008 is 48.7 million and the national average population growth rate is estimated at 0.82% per year. However, population growth rates are highly variable between areas. Population in economic centers such as Gauteng grew at more than 3% in the beginning of the century but reduced to to less than 2% in 2008, while many rural communities are shrinking.



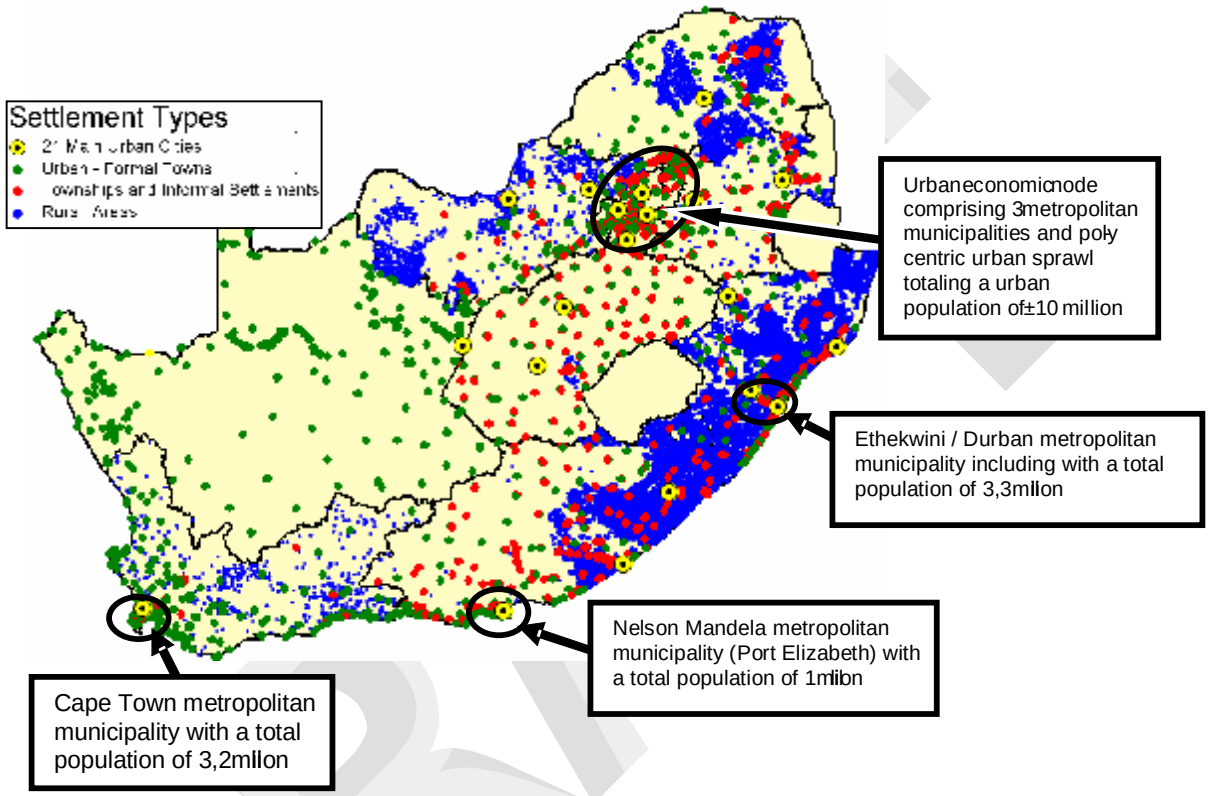
The projected future population of 2020 is currently estimated at 55 to 65 million people, which is substantially less then estimates made in the 1960s primarily due to decreased fertility and increasing mortality rates due to the impact of diseases like HIV and AIDS.

While the population of urban centers like Gauteng is growing at 3% to 4%, the freedom of movement and a general increase in affordability is resulting in many of the larger poor families

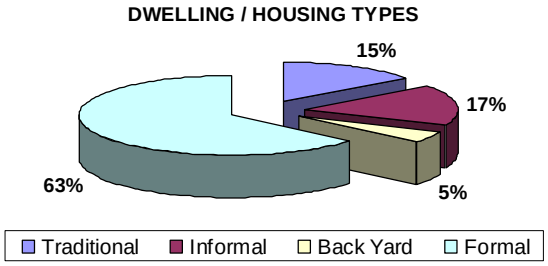
dividing into smaller households and thereby creating a much higher growth in households than the reported population growth rate. Current estimates indicate that households grow by up to 6,8% in parts of Gauteng. This is partially due to duplicate housing for migrant workers and the urbanisation trend.
Adding to the challenge of population growth is the internal migration to urban areas as well as immigration from neighboring countries, which constantly change the need for water services.

5.1.1. Human Settlements

The spatial location and characterisation of the settlement types is shown in the following map:



Based on the national census in 2001 and the community survey in 2006, South Africa's people were living in more than 12 million dwellings of which the majority (63%) are classified as formal. This is followed by a fast growing sprawl of informal housing on the peripherals of urban centers.



Based on this information, the informal and backyard dwellers now exceed the traditional houses in rural areas. It also indicates that about 30% of the urban population life in informal houses, indicating the change in service requirements and housing needs.
The settlement types and related demographic challenges are briefly discussed in the following two sections on urban and rural dynamics.

5.1.2. Urban Settlements

Historically, South African urban settlements comprised of formal business and commerce in the centre, surrounded by affluent residential areas and gradually expanding outwards into lower income residential suburbs.
Many of the larger cities are now experiencing a poly-centric reversal of the historic settlement pattern:

- lower-income families are moving into city centres to gain access to education, jobs and services, while
- affluent businesses and residents are relocating to the outskirts of cities to create various new business nodes, mostly within high-income neighbourhoods.

Due to the accelerated urbanisation of the rural poor population and a limited housing supply in the urban centres, many informal settlements are emerging on the urban peripherals, potentially leading to ghettos without planned access to basic services.

Most of the current growth trends can be explained by migration from rural to urban areas in search of jobs, housing, services and education. Surprisingly, permanent migration to the cities has been relatively small, balanced by some reverse migration by the urban unemployed to rural areas, where the living costs are lower and social support from pensioners and social welfare is more accessible. At the same time, city-to-city migration is increasing, demonstrating the internal restructuring and racial integration.

The newly formed business nodes are often boxed-in by informal settlements limiting their future growth and development. The provisioning of municipal services is also impacted, as most of the newly formed business centres are located in former low-density residential areas with limited bulk water, sewage, stormwater and transport infrastructure.
Overall, the urban settlement dynamics can be described as highly variable, dynamic and unpredictable. The development is currently not driven by formal town and regional planning, but rather by private development opportunities. This affects the provisioning of water and sanitation services and regularly leads to failure of the existing bulk infrastructure.

The following key indicators of the nine largest cities are indicative of the urban environment:

Demographic indicators

The nine cities are home to over 16million people – 37% of the country's total population on less than 2% of its land area. Census 2001 shows that the nine cities have 4,6 million dwellings – 41% of South-Africa's total residential built environment. The demand for 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 1,9%. Many of the informal settlements are located within nature corridors and flood plains. HIV/Aids prevalance of 37% is of great concern and will affect city population and productivity.

Economic indicators

In 2002, the top nine cities produced 62% of the country's GDP (R380 billion). The 9 cities have ±50% of the national workforce. 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 44,2% of SA's total unemployed. The average monthly income is ±89% better in the nine cities than for the rest of the country. The lack of skills remains a challenge with 8% of city residents without any schooling, only 27% having a

final school certificate (matric) and only 12% having some form of post-school higher education. Of concern is a 8,3% decline in professional employment between 1996 and 2001, partially due to emigration and also due to relocation to security complexes outside city boundaries.

Water services indicators

Water demand projections indicate that the majority of major towns will experience water shortages in the short to medium term, unless urgent interventions are applied. Examples include Rustenburg, Gauteng region, Western Cape, eThekwini, Nelson Mandela, Polokwane and new developments at Lephalale (for more detail refer to Chapter 6 - Reconcilliantion Strategies for Large Metopolitan Areas). While the absolute number of households served with water connections has been significant, the fast growth in households and the relocation of families within city boundaries 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 ±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 working life. Growing demands for waterborne sanitation are placing huge pressure on the existing infrastructure and water resources causing regular failure and pollution.

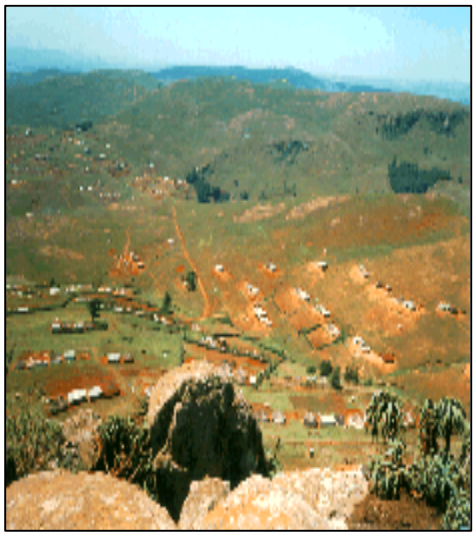
Intervention required includes demand and conservation management, waste water reuse, optimization of local water resources including ground water, infrastructure asset management as well as major water resource and associated infrastructure development.

The implication of these actions are:

- It requires integrated planning and alignment with urban and rural development programmes
- Urban areas require higher level of services
- Major impact on water resource needs
- Major impact on water resource quality (return flows)

5.1.3. Rural Settlements

Traditional rural settlements were not properly planned for modern services such as access roads, stormwater management, water supply, sanitation, waste management and other communal and public services.
As shown in the photo (KwaZulu Natal), many of the 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.

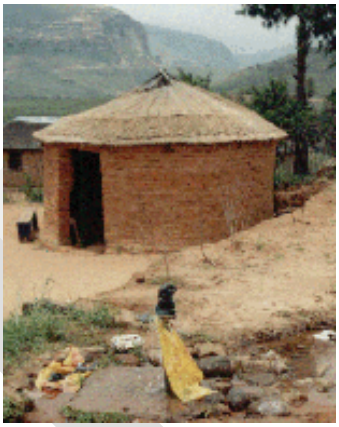


Up to 2,7 million people (6% of the national population) are living in such scattered patterns, currently clustered into over 15000 groupings of “settlements”. The remainder of rural settlements are classified into over 7500 small villages (less than 5000 people each) and over 500 larger rural villages (with more than 5000 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 mostly limited to scarce. The construction costs are therefore mostly high requiring significant financial commitment from Government to provide all people with basic water supply infrastructure by 2014 (S.A. target).

The following indicators characterize the extent of rural settlements and the nature of their development needs:



Demographic indicators

The rural population of 19,9 million people live in 23 600 settlements of which 15609 are groupings of scattered housing.

4,3 million households or 34% of the national number of households reside in rural areas.

The rural population is estimated at 19.9 million or 40% of the national population.

Economic indicators

Rural communities are mostly dependent on the agricultural or social services sectors. Mining and forestry are also significant employers.

±3,8 million people are unemployed in rural areas (56% of the total unemployed).

Up to 39% of poor households are involved in agriculture for food or cash (subsistence farming) relying mainly on women, children and older people.

14% of rural households (600,000 households) use farming as their sole source of food.

23% of rural households (1 million households) use farming for supplementary food.

72% of the poor live in rural areas. Poverty is most prevalent amongst the black population and female-headed households: 61% of the black population is poor; 60% of female-headed households are poor, compared with 31% for male-headed households.

In addition to social grants for all poor households, Government is focussing specific poverty eradication programmes in rural areas such as the Expanded Public Works Programme, which provides jobs to the unemployed people by using labour intensive construction methods in all government development programmes, including the water services projects.

Government also initiated the Integrated Sustainable Rural Development Programme to focus all spheres of Government on the specific development challenges of the rural population. This programme brings together all line functions and expertise within government to find sustainable development solutions in 13 of the poorest rural district municipality areas of the country. All sectors and stakeholders must prioritize their actions within these nodes and regular progress reporting to Cabinet ensures that real change is effected.

Water services indicators

Government has initiated a comprehensive basic water services programme in 1996 to provide effective, affordable and equitable water services to all the needy communities in the country by 2014. This includes both formal historic backlogs as well as informal settlements and housing requirements.

Special focus to be placed on water services quality such as drinking water quality, waste water management, asset management, demand and conservation management as well as sustainable service delivery.

Alignment with poverty alleviation as well as growth and development programmes must be strengthened.

Effective bulk infrastructure planning, investment and implementation is critical.

Effective optimisation and utelisation of lacal water resources including ground water is essential.
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Implications:

- Requires integrated socio-economic planning to address high poverty and resulting migration
- Scattered settlement patterns are difficult and costly to serve
- Requires focussed sanitation programmes
- Requires water resource developments and regional bulk distribution systems
- Requires effective groundwater management
- Requires major funding and institutional support

5.1.4. 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 inclusion of commercial, business and small to medium sized industrial uses in the municipal / domestic water use. The industrial use in urban areas accounts for approximately 20% of the total water use by urban settlements and is likely to increase further with the continued industrialization trend.

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%.

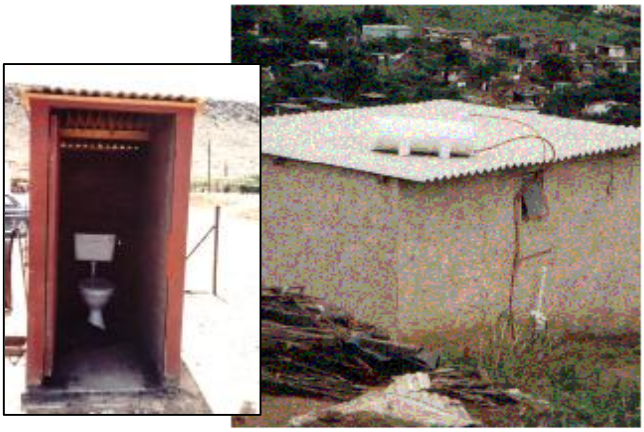
The eradication of the basic water supply backlog will increase the total domestic water use by approximately 200 million m^3/annum or 6% of the current national domestic water use.

While this seems little at the national scale, it is significant in many local circumstances, doubling or even tripling the current domestic water use of many rural settlements.

While South Africa is well advanced with the provisioning of basic water services infrastructure, there remains a huge challenge to maintain the services over the longer-term. Proper operation and maintenance procedures need to be put in place and water services provider institutions need to be capacitated to perform accordingly. A critical factor is to accelerate access to basic services, to also address the urbanization and associated housing needs as well as sustainable water supply and service quality management, as per Cabinet decision.

Increased service levels

New urban development policy is proposing an increase in the minimum standard for all urban settlements to yard/house connections and waterborne sanitation.



Based on projections, domestic water use (as a percentage of the total national water use), will increase from the current 27% to between 30 and 35% within the next 20 years. To address this projected situation, major interventions such as proactive planning, demand and conservation management, infrastructure asset management, resource protection measures, improved governance and management, as well as major resource and infrastructure development, will be required.

The failure of waterborne sanitation systems also poses a much higher pollution threat than the dry sanitation systems with related health and environmental impacts. Failures typically include blocked sewers with overflowing manholes, breakages of sewer pipes and ineffective sewage treatment.

A shift to higher service levels requires improved management and operation skills and good control of effluent releases.

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 context of framework for the water supply reconciliation studies.

Based on domestic water demand scenarios, at least 4 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.

Water resources are also affected by the following water services challenges:

- Development of new settlements to formalize informal houses
- The impact of new settlement developments and paved areas on the urban surface water runoff
- A gradual increase from basic to higher service levels, particularly in urban settlements
- A lack of institutional capacity in many municipalities to manage the increased services
- Water wastage by ill-informed households
- Water losses in poorly maintained water supply networks
- Water related health aspects and
- Diffuse pollution from build-up areas through stormwater runoff
- Sustainability of water services provisioning and related asset management, cost recovery, etc

5.1.5. 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 are complying on a continuous basis due to a lack of skills, funding and management capacity. To ensure compliance to the national standard, the Department of Water Affairs and Forestry is developing a comprehensive monitoring and evaluation system with appropriate intervention actions.

5.1.6. Water and Health

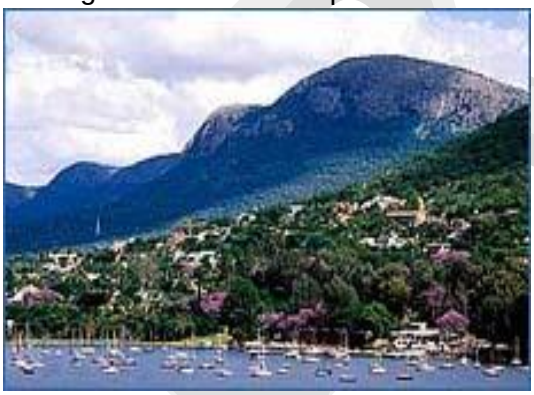
Access to effective water services (supply and sanitation) as well as the water services and water resources environment are critical elements in the health environment and the associated health strategy of South Africa. Access to water is at the top of the health intervention strategy as well as the key indicator in die MDG health goals. Furthermore, due to domestic, industrial, agricultural and other pollution as well as natural habitats, the 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.

5.1.7. 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, operation and management and thus asset management, as well as progressive new development, is of 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 which also focuses on life after construction, which comprises more than 80% of the life cycle cost as well as actual delivery.

5.2. Recreation

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.

5.3. Environment

South Africa is dependent 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 were permanently flowing may stop flowing or wetlands may 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 doesn't 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.

Case Study: Elands River Reserve – A Public/Private Partnership

In 1998, DWAF commissioned an Intermediate Reserve determination study for the surface waters of the Crocodile and Elands Rivers (DWAF, 2000b). The Elands River is a major tributary in the headwaters of the Crocodile River system that forms the southern border of the Kruger National Park. The CSIR, in collaboration with DWAF, conducted the Reserve determination study for the surface water resources. The ecologists undertaking the study recommended the desired ecological state of the resource purely from an ecological perspective, representing mostly a need to improve the condition of the Crocodile and Elands Rivers, and a single Reserve scenario was determined for each of the Reserve determination sites in the catchment area.

In order to fast track the study and improve the confidence of the Reserve requirements for decision making, DWAF supported a request by SAPPI to co-fund the high confidence Reserve determination study, that included both water quality and quantity components. DWAF conducted the high confidence Reserve determination study of the Elands River as far as its influence can be observed in the Crocodile River. Social and economic aspects were included in the study to evaluate the potential impact of various resource protection scenarios in relation to economic output and social wellbeing, as well as the costs, benefits and risks associated with various protection scenarios.

Lessons learnt from the study were that:

1. Determination of protection scenarios is critical to allow societal input into the decision-making process
2. High confidence resource protection studies do not necessarily result in a change in the existing resource allocation realities that often prevail in water resources. In this case the dependence of the main stream of the Crocodile River on the flow contributions from the Elands River resulted in the reality that no more water can be allocated from the Elands River.
3. The relationship between Resource Directed Measures (RDM) and Source Directed Controls (SDC) requires substantial improvement. Variables of the importance in the aquatic resource are often not similar to potential harmful substances generated and discharged by industry that require control and management.
4. The requirements from the general public are often simply expressed as fishable and swimable rivers with an acceptable aesthetic appeal.
5. Private public partnerships can improve water resource decision-making processes in line with the principle that the polluter pays.

5.4. Mining

The mining sector is a very big contributor to the South African economy; it was the case in the past and will be for a long time to come in future. Mining have two major impacts on water resources. It needs water for production, but is also a major contributor to water quality problems.

Water is a scarce resource in the country as explained in other areas of the document. It is however also important that the mining activities mostly occur in the dryer areas of the country where water is even more scarce. This places a huge imperative on the mines to use water very efficiently to ensure that nothing is wasted.

Mining activities are scattered throughout the country, but major concentrations are supplied as follows:

- The Vaal River system supplies water to the coal and gold mines on the Mpumalanga Highveld, to the gold mines in Gauteng, the North West Province and the Free State, to the iron, manganese and diamond mines in the Northern Cape.
- The Crocodile (W) River supplies water to the chromium and platinum based mines in the North West and the iron ore mines in Limpopo and will in future supply the coal based developments on the Waterberg coalfields in the Limpopo Province.
- 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.

5.5. Energy

Information on the "26 key areas" in the NSDF covers the energy sector but, with energy as the country's most important strategic water user, this is given special attention.

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. Under pressure from the DWAF, with water no longer abundant and an acknowledgement of the high cost of providing water, Eskom has moved to dry-cooled systems which use water in the order of 6 million m^3/annum for a comparable 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 largest 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 of the same order as Sasol 2 and 3 at Secunda. The 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.

5.6. Agriculture

Agriculture forms a key, albeit small, part of the South African economy. It is, a crucial source of employment, particularly in rural areas. Agriculture is the sector that uses by far the most water in the country – nearly 60% of the entire water resource available. Compared to the world average of 70%, this percentage is still relatively efficient for a developing country such as South Africa. Irrigation makes up four percent of South Africa's GDP but employs approximately 15% of the work force. In addition, there are the agro-processing industries, which are also dependent on irrigation and make up 20% of South Africa's GDP, serving as an important source of foreign exchange earnings.

The biggest share of water in South Africa is used for comparatively low value agricultural production. The key contributions of agriculture to the economy lie in food production, creation of employment and earning of foreign exchange. Water use and food production must be analysed as a value-adding process (from farmer to consumer), with emphasis on the business and employment opportunities they generate.

Agriculture is the key sector to stimulate rural development. There are at least three imperatives for agricultural water use to contribute to growth and development of South Africa. These are:
(1) to use the existing capacity for cost-effective food production;
(2) to break down the inequalities regarding access to resources and access to the economy; and
(3) to ensure physical, legal and tenure security of water use to both subsistence, emerging and commercial farmers, as an incentive for investment and productive water use to the benefit of society as a whole.

However, water allocated to agriculture is experiencing growing competition from those who want to use it mainly for domestic and industrial purposes. The challenge lies in the production of more food using the same amount - or less – water. It is essential to raise the productivity of water, thereby improving the competitive advantage of agriculture in a global economy.

The new Irrigation Development Strategy by the Department of Agriculture proposes a 600000 ha additional irrigation scheme 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 will only be irrigated through inter-basin water transfers once potential waterworks are established on the Eastern seaboard

5.6.1. Water Allocation Reform (WAR)

In managing water demand for agriculture it may be necessary to shift water supply to a more productive use and in this regard the pricing strategy allows for an economic charge to be levied on water use. In implementing an economic charge in stressed catchments, irrigators may

consider increasing the efficiency of their water use or may even sell their water rights to those sectors that are willing to pay an economic charge.

This water market provides an economic instrument to drive water allocation reform and water use efficiency; however, the negative effects of the water market need to be administered, regulated and facilitated to ensure that license costs do not create a barrier for resource poor farmers to participate in irrigation farming. In this regard the Water Allocation Reform (WAR) program which is meant to redress past inequities in access to water must be fine tuned to ensure that water trading does not disadvantage poor irrigation communities.

In support of the WAR programme, the concept of the value chain can be used to better understand the links between farming and non-farming activities in agriculture. Recently completed research has highlighted the complexities of value chains (Annexures 1 and 2 – Inkomati and Mhlathuze case studies). Gaps in knowledge exist on the role of water in the value chain and how to optimise economically beneficial water use.

It must be further investigated whether emerging farmers, who are producing a combination of rainfed or irrigated field and vegetable crops, can obtain better market access through value chain analysis. A better understanding is also necessary of institutions, working rules, organisational relationships, culture, formal and informal group dynamics and existence of mutual trust which govern the effective functioning of value chains.

The sustainable long-term solution to enable agricultural water use (farming and non-farming) to contribute maximally to growth and development is to promote rural development on the basis of the food value chain. This requires a holistic approach to agricultural water management and a major focus of investment in human and social capital to include emerging farmers in the mainstream of the economy. It is this investment in people through training and skills development which will lead to true empowerment and enable choices by people themselves regarding the productive use of resources (land, water, capital, etc) in the whole value chain.

On the basis of water resources which are common to all, and water as a production input in farming and non-farming agriculture, it must be determined how emerging and commercial producers can be integrated through value chains and thereby promote economic development.

5.6.1. Pricing of Irrigation Water

The irrigation sector in terms of the water pricing strategy pays the following water tariffs:

- Water resource management charge, capped to 1.5 cent per cubic meter plus PPI from 2007/8. (previously capped at one cent)
- On government water schemes full cost recovery of:
  - § Depreciation charges, which is capped at 1.5 cent per cubic meter (previously capped at one cent) plus PPI using 2007/8 as base year; and
  - § Cost recovery on operation and maintenance charges limited to increases of no more than 50% p.a.

The income from the ROA is meant to be used for the refurbishment and development of future water infrastructure and one of the reasons for excluding the ROA charge to the irrigation sector is the fact that this sector does not drive demand for new infrastructure, and the fact that historical schemes developed for irrigation have long been paid for. The pricing strategy however states that should the irrigation sector utilize water from new schemes they will be liable for the ROA charge. While there is a need to at least recover the cost of supplying water, any significant water tariff increase to the irrigation sector must be viewed within the context of food inflation that is currently estimated at 17.8%.

Water resource development and use of waterworks refers to the planning, design, development, operation and maintenance, refurbishment and betterment (improvement) of Government water schemes. If water use charges are too low, they will lead to underinvestment, overconsumption and unwarranted fiscal subsidies. There is therefore a need to adjust to higher real prices over time to accommodate the cost of investing in supply capacity to meet rising demand and to refurbish existing infrastructure.

The following charges apply to all water users on existing schemes: Operation and maintenance, Depriciation and Return on Assets. Return on Assets is based on the social opportunity cost of capital to government and this should approach a level sufficient to fund the annual capital expenditure budget requirement for the development of new water works and betterment of existing infrastructure from the fiscus.

The Government waterworks supplying irrigation water needs major rehabilitation to meet water demands and limit water losses. Examples are the Gamtoos Irrigation scheme where more than R 200 million is required to rehabilitate the scheme; the Vlakfontein canal also requires more than R200 million. In other cases, such as the Koppies GWS (irrigation scheme), the condition of the scheme has deteriorated to such an extent that it may not be feasible to rehabilitate the infrastructure. Ongoing investigations indicate that it will be cheaper to purchase all the water entitlements and close the scheme. The current pricing strategy exempt the irrigation sector from paying for ROA on existing infrastructure, thus resulting in unwarranted fiscal subsidies to rehabilitate these schemes.

While there is a need to at least recover the cost of supplying water, any significant water tariff increase to the irrigation sector must be viewed within the context of food inflation that is currently estimated at 17.8%.

In general, capitalized marginal water value, which is the case in most parts of SA, increases in all regions when water tariffs are increased. This shows that increased water tariffs increase the scarcity value of water. This then allows other sectors who are prepared and capable of paying for the scarce resource to get it from the allocated users.

5.6.2. Water Use Efficiency

The inability of irrigated agriculture to schedule irrigation properly leads to inefficient water use. Further improvements in the enforceability of volumetric allocation are likely to improve the effectiveness of water use in all sectors, especially in irrigation, where water supply is constantly under pressure. Stricter enforcement and incentives for “water savers” should therefore be implemented.

Water (re-) allocation through pricing and markets is proposed, but only under certain conditions. For example, one condition will be to prevent subsistence farmers from selling water allocations for short-term gain and rather promoting the leasing of water entitlements that may enable these farmers to raise cash for development.

5.7. Forestry

South Africa’s forest resources are divided into three main components: woodlands, indigenous forests, and plantations. The 1997 National Forestry Action Plan estimated that between two to three million households gain significant benefit from forests. The commercial forest sector offers significant business opportunities for small-scale entrepreneurs, particularly for small growers, contractors and saw millers. It is also reported that there are more than 30 000 small growers, 240 small saw millers and 300 independent contractors, of which half are black emerging contractors. In addition to this the pulp and paper industry has created more than 10 000 income opportunities for waste paper vendors. The contribution of forests to poverty alleviation is more pronounced in

provinces such as Eastern Cape, KwaZulu Natal, Mpumalanga and Limpopo; these provinces have a substantive forest resource base.

DWAF is responsible for licensing new afforestation and facilitates the entire process and issues the co-operative governance licence. However, the department has regulatory influence only over the water use component of the license. For the water use component, DWAF only requires that sufficient water be available within the catchment, which is in line with the National Water Act. Macro planning as set out in the National Water Resources Strategy (NWRS) as well as Reserve determinations are pre-requisites for sufficient water assessment. Monitoring of cumulative development and impact is sometimes required in order to avoid negative impacts of afforestation.

Forestry suitability maps (FSM) are supposed to be used as a planning tool for the forestry sector, particularly small-scale communal plantations (up to 20 ha), and for decision makers in the licensing process. Maps cover several factors such as water, biodiversity, agriculture, and prepare the ground for co-operative licensing. This process has been completed for communal land in parts of KwaZulu-Natal and the Eastern Cape.

Summary

In the **domestic sector**, water has many uses, ranging from drinking water and food preparation, personal hygiene to washing, cleaning and other essential domestic chores. Water demand projections indicate that the majority of South Africa's larger towns will experience water shortages, unless urgent interventions are applied.

A shift in human settlement patterns (lower-income families are moving into city centres while affluent businesses and residents relocate to the outskirts; informal and backyard dwellers now exceed those living in traditional houses in rural areas; one third of the urban population live in informal houses) - indicates a change in service requirements and housing needs.

In both urban and rural areas, the necessary interventions include sustainable service delivery, demand and conservation management, waste water reuse, optimisation of local water resources including groundwater, infrastructure asset management as well as major water resource and associated infrastructure development.

To protect the Reserve (the water set aside for basic human needs and ecological sustainability), DWAF advocates an Integrated Water Resource Management (IWRM) approach. This refers to the coordinated development and management of water resources to maximise social and economic development, while ensuring equitable and sustainable utilisation of the water resource.

Resource Directed Measures (RDM) is a water resource management strategy that - together with the Source Directed Control (SDC) strategy - intends to ensure an integrated and balanced approach to water resource utilisation that takes into account the social, economic and environmental requirements. Meanwhile the River Health Programme (RHP) assists in classifying the health of water resources and delivers ecological information required to support the rational management of rivers and other water resources.

For the **industrial sectors**, water becomes increasingly more difficult to secure. It is therefore imperative that bulk users such as mining companies and electric power providers communicate their future requirements to DWAF early in the planning process. All sectors, but especially large industrial users such as mining and energy companies, will have to accept a much greater responsibility for potential water quality problems that they might cause. They will have to factor the cost of potential water pollution into the economic and financial viability of the economy. It uses more water than any other sector. The Water Allocation Reform (WAR) intends to redress past inequities in access to water, using a holistic approach to agricultural water management for farming and non-farming use.

In the forestry sector, DWAF has regulatory power over the water use component of the licence for new afforestation. In line with the National Water Act, sufficient water needs to be available within the catchment. Macro planning as set out in the National Water Resources Strategy (NWRS) as well as Reserve determinations are pre-requisites for sufficient water assessment. In future, forestry suitability maps that cover water as well as aspects such as biodiversity and agriculture, will be used as a planning tool for the forestry sector, particularly small-scale communal plantations.

SECTION 6 – CURRENT INTERVENTIONS

Water availability and use need to be measured and monitored continuously for DWAF to be able to react to rapid economic growth, increasing water requirements, shifting expectations and a changing climate. Plans need to be adapted and updated accordingly. This section explains why the entire country needs to recognise the limitations to our water resources.

The first part describes how existing legislation, policies and strategies will support the WfGD programme, notably the National Spatial Development Perspective (NSDP), National Water Resource Strategy (NWRS), Strategic Framework for Water Services (SFWS) and Internal Strategic Perspectives (ISPs). Four case studies illustrate the Reconciliation Strategies for Larger Metropolitan Areas (and All Other Towns), which is used to develop future water requirement scenarios for and with the area concerned and offer a system for continuous updating.

The second part of this section deals with the water services infrastructure in South Africa and the importance of an Infrastructure Asset Management Strategy (IAM) to prevent the water services infrastructure from deteriorating to crisis level.

The third part informs about much needed skills development initiatives in the water sector that are beginning to show results in a large range of technical jobs.

The fourth part deals with raw water quality and a shift in the DWAF approach to non-compliant municipalities and industrial water users, who will now have to pay for any water pollution they may have caused.

The fifth part looks at the three different types of water use charges for raw water supply.

The sixth part highlights social development in the water sector, as for example the Working for Water programme that combines alien vegetation control with socio-economic upliftment of local communities, and the Large Water Resource Development projects such as the Thukela Water Project and the De Hoop Dam Project.

The section ends with information on shared watercourses, as South Africa shares four major river systems with neighbouring countries and has to take international requirements into account when considering options for water supply for national growth and development initiatives.

6.1. Planning of Water Supply

The planning of water supply for growth and development is already being conducted in a structured but flexible way. However, the planning process needs to be supported by rigorous implementation programmes to ensure that enough water is supplied for growth and development and to prevent water from becoming a serious growth inhibiting factor. The current focus is on ensuring that identified growth areas have enough water to continue growing. The whole country needs to recognise the limitations to our water resources. Implementing water use efficiency measures will have to receive special attention and will also require full political support at all levels of government.

The WfGD programme is supported by the following existing legislation, policies and strategic intent of government:

- Constitution
- RDP
- GEAR
- White Paper on Community Water Supply and Sanitation
- White Paper on a National Water Policy for South Africa
- Water Services Act
- National Water Act
- Strategic Framework for Water Services
- National Water Resources Strategy

No policy or legislative revision is necessary for the adoption of the WfGD programme. However, the programme is in line with the provisions of the SFWS Strategic Framework for Water Services and the National Water Resources Strategy NWRS and will require political endorsement.

National development plans as for example, the Provincial Growth and Development Strategies (PGDSs) and Integrated Development Plans (IDPs) of the municipalities, development programmes and initiatives (such as the production of bio-fuels) and government agencies need to understand the constraints imposed by a lack of water, so that needs and supply can converge.

Planning includes an investigation of the technical and economic viability of proposed schemes, and concomitant factors such as the labour content of alternative construction methods, the number of jobs that can be created per capital employed, the socio-economic issues and environmental impacts. Water planning studies are undertaken in three disciplines:

(1) To provide a broad strategic overview/framework for water resource reconciliation;
(2) Undertaking detailed studies to recommend development/management solutions for implementation; and,
(3) The provision of technical support to the above-mentioned disciplines to, for example, optimise the operation of existing Government Water Schemes.

6.1.1. The National Spatial Development Perspective (NSDP)

A review and update of the 2003 NSDP, undertaken in 2006 and made available in 2007, was predicated by:

(i) new data on socio-economic trends;
(ii) the development of IDPs and PGDSs and the need for alignment; and
(iii) a renewed focus on decisive interventions to ensure accelerated and shared economic growth.

The NSDP concluded that it "…should be understood both as a policy directive in terms of its methodology and an indicative tool in terms of its content. That is: ***The principles and methodology of the NSDP should inform the development plans, policies and programmes of all spheres and agencies of government as a matter of policy***". DWAF planning has taken its cue from this.

The NSDP identified 26 areas in the country that produce 77% of the Gross Value Added (GVA) and where 53% of the poor people in the country live (persons living below the Minimum Living Level or MLL). These are considered to be the key national growth points. Detailed reconciliation strategies have been or are being developed for the bulk of these 26 areas in the DWAF Reconciliation Strategy Studies for the large metropolitan areas. More details on these studies are given in paragraph 6.1.6. These planning studies will be further expanded in a systematic, prioritised way to cover the whole country, starting firstly with those "growth zones" not yet covered in the Metropolitan Studies. The next round of planning is intended to address all the towns that generate 96% of the Gross Value Added (GVA) and include 77% of people living below the Minimum Living Level (MLL).

The remaining 4% of the GVA and a very significant 23% of people living below the MLL, will then be addressed. These would be agricultural and deep rural areas. There is equal concern about these areas and provision is made for an alternative range of strategies to improve livelihoods. These include initiatives such as rainwater harvesting, more effective and efficient groundwater abstraction, small-grower forestry and other forms of small-scale use.

6.1.2. The National Water Resource Strategy (NWRS)

The first edition of the NWRS (2004) provides a clear indication of the overall state of the country's water resources. Many catchments are under stress, with water requirements and existing allocations to users exceeding the available supply. This makes it imperative that socio-economic developments, and the implication of increasing water requirements, be very carefully planned for, and be aligned with economically viable options for increasing the supply. A number of sub-strategies follow fom the NWRS. Among others, these include: Catchment Management Strategies, Resource Protection Strategies, Water Pricing Strategy, etc.

There are a number of measures that can be adopted to optimise and extend the availability and use of our water, with the following listed in the NWRS:

- water demand management (users to be more careful) and conservation (e.g. repairing leakages in pipes and canals);
- surface water resource management (focus on efficient operation of dams);
- use and management of groundwater;
- re-use of water (recycling of treated effluent);
- eradication of invading alien vegetation;
- re-allocation of water (trading between sectors for optimal benefit);
- development of additional surface water resources (e.g. dams); and
- transfers of water from one area to another.

6.1.3. Strategic Framework for Water Services (SFWS)

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. Water and wastewater services are essential for health and life. They are also essential for businesses and industries. Efficient provision of these services can help to eradicate poverty and promote economic development.

The SFWS sets out a comprehensive approach with respect to the provision of water services in South Africa, ranging from small community water supply and sanitation schemes in remote rural areas to large regional schemes supplying water and wastewater services to people and industries in our largest urban areas. It outlines the changes of approach needed to achieve our policy goals as a result of the progress South Africa has made in establishing democratic local government and developments in the sector since 1994.

In 2001 there were 44.8 million people living in South Africa, all of whom used domestic water services of some kind, but 5 million (11%) had no access to safe water supply and a further 6.5 million (15%) did not have access to acceptable service levels. 18.1 million people (41%) did not have adequate sanitation services (2001 Census). Of the total water use in the urban, industrial and domestic sectors, 72% is core urban and peri-urban areas, 12% is surrounding areas and 16% is business and industrial.

DWAF currently works together with other sector role-players to implement this Strategic Framework. DWAF, as sector leader, assumes responsibility for ensuring the development of detailed strategies to give effect to this framework. These include the following key components (amongst others):

· Review of the legislative framework affecting water services provision, including the Water Services Act and the regulations made in terms of this Act;

· Development of a *national institutional reform strategy*;
· Development of a *regulatory strategy*;
· Development of a *support strategy*;
· Development of a *monitoring and evaluation strategy*; and
· Refinement and expansion of a suite of *water services guidelines and tools.*

6.1.4. Internal Strategic Perspectives (ISPs)

The NWRS provides a broad picture of the national water resources situation and offers strategies towards equitable, sustainable and efficient use in line with principles set out in the NWA. The detail, however, is not sufficient to inform actual management required in the 19 individual Water Management Areas (WMAs) of the country. DWAF and the Catchment Management Agencies (CMAs) of the future will require more precise direction and information. This encouraged the preparation of an Internal Strategic Perspective (ISP) for each of the 19 WMAs, the purpose being to refine the water resource information and to review each area from a resource availability and management point of view.

The ISPs can be viewed as regional strategy tools. In the ISPs the water resource situation was, in most cases, analysed to a far finer level of detail than in the NWRS, with information integrated in a framework allowing for informed strategic decisions to be taken. However, even with the ISPs in place, managers may have difficulty making operational decisions – and further systems modelling and evaluation are frequently required. Nevertheless, the ISPs provide a more detailed and intensive situational assessment - again indicating that water stress (where water requirements exceed supplies) is largely prevalent throughout the country and puts us in a situation where water resources need to be stringently managed. It is therefore very important that the ISPs and their strategies are updated on a regular basis.

The first ISPs, completed in 2005, pointed to the need for water reconciliation strategies for all of the country's major metropolitan areas, these being the recognised engines of the economy. Reconciliation strategy studies have been, or are being, undertaken, as set out below.

6.1.5. Reconciliation Strategies for Large Metropolitan Areas

The reconciliation strategies are essentially about balancing current and future water requirements with the available and potential water resources. The areas that are covered under the metropolitan area studies covers, according to Table 26 of the NSDP, about 72% of the country's economy and 54% of the population. Included in this population are a large number of people with income below the Minimum Living Level (MLL), 38% of the poor people in the country.

The objectives of the reconciliation studies are to:

- develop future water requirement scenarios for and with the metropolitan area concerned;
- investigate all possible water sources;
- investigate all possible methods for reconciling the requirements for water with the available resources,
- provide recommendations for the development and implementation of interventions and actions required; and
- offer a system for continuous updating into the future.

A number of studies have commenced, and some completed, as follows:

- Completed studies
  - *Western Cape Water Supply System: Reconciliation Strategy Study*, covering the City of Cape Town and certain Overberg, Boland, West Coast and Swartland towns, as well as irrigators along the Berg, Eerste and Riviersonderend rivers.
  - *Reconciliation Strategy for the Amatole Bulk Water Supply System*, which provides water for urban, rural and agricultural users in the catchments of the Buffalo and Nahoon rivers,

including the Buffalo City Municipality as well as King William's Town, Bisho and Stutterheim.

- Studies in progress
  - *Vaal River System: Large Bulk Water Supply Reconciliation Strategies*. The Vaal River System supplies a vast area covering the Eastern Highveld of Mpumalanga, Gauteng, the North West Goldfields around Klerksdorp, the Free State goldfields around Welkom and down to Kimberley in the Northern Cape. The study is essentially completed and the reports are being finalised.
  - *Crocodile (West) Reconciliation Strategy Study* covering the northern areas of Gauteng, the platinum mines and other developments around Rustenburg and Brits and further north to Thabazimbi. Preliminary results are available and the study will be finalised towards the end of 2008.
  - *Water Reconciliation Strategy Study for the KwaZulu-Natal Coastal Metropolitan Areas*. This essentially covers the KwaZulu-Natal North Coast to the Mgeni System (including the Mooi-Mgeni Transfer) with a planned export of water to the South Coast. The area includes portions of the Umgungundluvo, iLembe and Ugu District Municipalities, the Msunduzi Local Municipality and the eThekwini Metropolitan Municipality's area of jurisdiction (which includes the City of Durban). The study was commissioned in December 2006 and is scheduled for completion by October 2009.
  - *Algoa Water Supply Area*: This area covers the Nelson Mandela Bay Municipality and surrounding areas, including the large irrigation schemes. This study has started in June 2008 and will produce a first order strategy by February 2009.

- New studies
  - A study for the *Mangaung Municipality (Bloemfontein area*) will start during 2008.
  - A study for the *uMhlathuze Local Municipality*, which includes the town of *Richards Bay,* will start in 2009.

These studies have managed to facilitate co-operative governance and DWAF is receiving excellent co-operation from municipalities, provinces and other water management institutions. There are many uncertainties that must be dealt with in the planning process and these institutions are all contributing towards the formulation of the planning scenarios required.

The development of reconciliation strategies is very important, but the strategies will have to be adjusted as the future unfolds. The process does not stop with the publication of reports, but will be taken forward by Strategy Steering Committees, which will include the important stakeholders. The committees will monitor the actual water use, assess the results from further planning studies and make recommendations on the implementation of interventions. Below are some reconciliation strategies and their main findings:

1. Western Cape Water Supply System

The Western Cape Water Supply System (WCWSS) serves more than 3 million people and provides water to the communities of the City of Cape Town (CCT) and certain Overberg, Boland, West Coast and Swartland towns, as well as the irrigators along the Berg, Eerste and Riviersonderend Rivers. This area is the second largest contributor to the national economy and houses the third largest population concentration in the country. It is the economic hub of the Western Cape and is very important for the economic well being of the province. Urban use within the CCT (comprising of 63% of the usage) is the largest water use from the WCWSS. Approximately 32% of the total volume of water supplied by the WCWSS is used by irrigators. The growth in the water requirement of the area served by the WCWSS is driven by population growth and strong economic growth within all sectors.

The main findings of the reconciliation strategy study were

- The City of Cape Town's WC/WDM strategy must be implemented. This aim at reducing the water requirements by up to 30%. This must be mirrored by the other municipalities in the supply area. The DWAF will also have to give significant support to the municipalities.
- A strategic assessment of the potential for the use of treated effluent must be completed by March 2009 and be followed by feasibility studies. This is a very important potential resource that could make a major impact on the availability of water.
- Complete the feasibility assessment of the groundwater resource of the Table Mountain Group sandstones. This could be a very significant resource supplying Cape Town for many years to come.
- The CCT must undertake a feasibility study of the smaller resources of small coastal rivers and significant primary (sand) groundwater aquifers
- The DWAF to do a feasibility study to investigate the development of further surface water resources. A number of options are available and would be compared and prioritised for implementation.
- The CCT to implement their proposed pilot desalination plant. This would serve as a valuable experience in the move to large scale desalination that may have to be applied in future.

2. KwaZulu-Natal Coastal Metropolitan Area

The KwaZulu-Natal Coastal Metropolitan Area covers the area from Pietermaritzburg to Durban from west to east and from KwaDukuza (Stanger) in the north to Amanzimtoti in the south. It includes the eThekwini Metro, and the Umgungundlovo, Msunduzi and Ilembe municipalities. This metropolitan area is the third largest contributor to the national economy and has the second largest population concentration in the country. It is the economic hub of KwaZulu-Natal and is obviously very important for the economic well being of the province. This area is experiencing rapid growth in water demand because of the influx of people from the rural areas, economic growth, and development initiatives like the Dube Trade Port.

The main findings of the reconciliation strategy study were

- An operation management forum, consisting of all the main role players, must be formed by November 2008 to ensure optimal operation of the supply system and to prepare for the implementation of water restrictions that may be required soon in this area.
- The Mooi-Mgeni Transfer Scheme (Springgrove Dam) must be implemented urgently.
- eThekwini Metro and all the other municipalities must implement further WC/WDM measures with the aim of reducing the current and future requirements by about 15%. A detailed action plan to achieve this must be ready by March 2009.
- The raising of Hazelmere Dam must be implemented without delay, as well as the infrastructure to utilise this water.
- Rain water harvesting, especially the utilisation of roof water through rain water tanks to supplement the municipal supplies, must be actively encouraged.
- A feasibility study must be commissioned to study the use of treated effluent for the North Coast and the Mgeni River system.
- The feasibility study to develop the Mkomazi River and to transfer water to the metropolitan area must proceed.
- Various studies should be done to ensure water to the North Coast area, covering the Thukela and Mvoti as resource, as well as the required infrastructure to transfer the water.

3. Crocodile (West) supply area

This supply area covers the Crocodile (West) catchment (which covers parts of Gauteng, North West and Limpopo provinces), as well as transfers to the developments on the Waterberg Coalfield in the vicinity of the town of Lephalale (in the Limopo province). The urban areas of northern Gauteng is experiencing a huge growth in population and the economy, new mines are being developed in the middle part of the catchment and huge developments are being done and planned in the Lephalale area.

The main findings of the study were

- The northern Gauteng area in the south of the catchment must continued to be supplied by Rand Water from the Vaal River system (see Vaal System below)
- A well structured water conservation and water demand management programme must be implemented in this area with a focus on water losses in the supply system as well as in individual houses with a target to reduce the current and future water requirements by 15%. The various municipalities are responsible for this implementation that needs to start before the middle of 2009 with completion by middle 2013. Support will be given by DWAF.
- The effluent from the northern parts of Gauteng must be treated and utilised to supply the growth in water requirements north of the Magaliesberg. The main growth is water requirements for the mines, as well as the larger towns in the area.
- Groundwater must be further developed for the rural water requirements
- The excess treated effluent must be transferred to supply the developments on the coalfields around the town of Lephalale. A feasibility study on the transfer scheme is being conducted.
- All effluent in the Lephalale area must be treated and used with the aim to have a zero net effluent production.
- In some development scenarios the treated effluent from the northern Gauteng area will not be enough to supply the development on the coalfields and water will then have to be transferred directly from the Vaal River system to support this area. It is possible to transfer the required water in the form of treated effluent from the sewage works close to the divide between the Vaal and Crocodile catchments. A feasibility study for this transfer will start early in 2009.

4. Vaal River System

The Vaal River System with the various interlinking transfer schemes supplies water to an area that economically produces 60% of South Africa's Gross Domestic Product (GDP) and is inhabited by more than 45% of the country's population. This includes water supply to the highly urbanised Gauteng Province, the goldfield in North West and Free State provinces, strategic power generation and coal-to-liquid industries located on the coalfields of the Mpumalanga Highveld as well as irrigated agriculture including Vaalharts in the Northern Cape province, the largest irrigation scheme in the country.

Over decades the water resources of the Vaal River System were augmented to match the growing water requirements and major inter-basin transfer schemes were developed to convey water into the system from the high rainfall regions of the upper Thukela and Usutu rivers as well as from the headwaters of the Orange River in the Highlands of the Kingdom of Lesotho.

Gauteng and adjacent urban areas continue to experience rapid growth in water demand because of the in-migration of people into the province which is due to the strong economic activity and prospects of improved socio economic conditions. It is projected that the population in Gauteng could increase by more than 30% in the next twenty years and significant intervention measures are necessary to ensure sufficient water of the required quality is made available to support this water needs of the people and the associated water requirements for energy generation.

The main findings of the study were

- There is a huge amount of unlawful water use in the catchment of the Vaal Dam that may be using as much as 180 million m^3 of water per annum. This is a substantial portion of Phase 1B of the LHWP. This use has pushed the use from the system above its supply capability and need to be removed as soon as possible in order to bring the risk of assurance to the lawful users back to the correct levels. DWAF is putting a programme in place to have this unlawful use removed by 2011.
- A well structured water conservation and water demand management programme must be implemented in this area with a focus on water losses in the supply system as well as in individual houses with a target to reduce the current and future water requirements by about

15%. The various municipalities are responsible for this implementation that needs to start before the middle of 2009 with completion by middle 2013. Support will be given by DWAF.

- Effluent from the mines and treated effluent from sewage works is flowing down the Vaal River and is being used by users downstream. This is causing salination and other water quality problems which are alleviated by releasing clean water from Vaal Dam to blend with the poorer quality effluent. The growth in the effluent from the growth in water use will mean that water will be lost from the Vaal River system to the Orange River and the ocean from about 2012 onwards. The water quality problems need to be solved and the excess water utilised and a reconnaissance study will be completed by October 2009 to investigate the treatment and use of the effluent for urban purposes. The target date for implementation is 2014.
- Another augmentation scheme may have to be ready to deliver water by 2019 for the high water requirement scenario. The two options that are being compared presently are a further phase of the Lesotho Highlands Water Project, as well a further phase of the Thukela Water Project. Preparation for the next augmentation project must proceed with the aim to deliver water in 2019, but the final decision to implement should be delayed until after the design phase. Information on actual water use and the impact of other measures that is gained during this period may lead to the delay of costly infrastructure.

6.1.6. Reconciliation Strategies for All Other Towns

The next major undertaking is to extend the structured planning process to cover all towns in the country. This will focus firstly on priority areas highlighted in the NSDP, but which are not included in the metropolitan area studies. Once completed, it 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 and is essential for proper water resource planning for the WSDPs and IDPs.

Towns will be studied at different levels of detail, depending on the nature and extent of the water resource problems and levels of difficulty in reaching a workable solutions. Elements of each study will include water requirements, resource management options, source development options (surface water, groundwater, return flows), and approaches to reconciliation. Additional elements to address will be water quality and the state of water services infrastructure.

6.2. Water Services Infrastructure

The recent work by the Department of Water Affairs and Forestry and others 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, and the importance of it being programmed, budgeted for, and implemented without delay. Water services infrastructure cannot be allowed to deteriorate to crisis levels, impacting and affecting national government's growth and poverty reduction targets.

Their were 400-plus generic challenges identified in this work and proposed solutions enabled classification of these solutions into one or other of 9 “solution types”, as indicated in the table below (the table also shows the WSI count of solutions per solution type):

Solution type	Count	% of total
Awareness	27	7%
Finance	57	14%
Guidelines	26	6%
Human resources	119	29%

Legal and procurement	34	8%
Monitoring and evaluation	12	3%
Management and leadership	61	15%
Operation and maintenance	31	8%
Technical	38	9%
TOTAL	405	100%

The table shows that much needs to be done on the human resources, skills development and capacity building aspects. While the focus of capacity building is on WSI capacity building, capacitation must also include DWAF and other national and provincial role players that have to manage the process and regulate effective service delivery.

Management and leadership is another important area. Specific actions need to be taken by DWAF, as sector leader, and by water sector managers and their political leaders in general. To make a strategic intervention of this kind, it is essential that politicians and senior managers fully understand, appreciate and support IAM.

Financial solutions came up third in the order of frequency. This implies that finance, also, is a very important intervention area and a key success factor for sustainable IAM. The solutions include, amongst others, improved budgeting and allocations for IAM, financial incentives for effective IAM performance, cost recovery, and various other planning, regulation and administration issues.

Operation and maintenance (O&M) ranked only fifth among the solution types. However, this is a result of the way the solution types were defined, because O&M problems were classified under “human resources” or “leadership” and not under “operation and maintenance”. Other key O&M solutions can be found under finance, management and technical.

6.3. Skills Development Initiatives

A number of skills development initiatives have been put in place in the water sector. While current initiatives are beginning to bear fruit in terms of training in scarce skills, there are still significant challenges, not only in the overall number of staff required, but more importantly, in finding trained and experienced technical staff. It is important to note that the required skills range from civil engineers and municipal finance experts to process controllers, operators and technicians.

A Water Sector Support Coordinating Unit (WSSCU) was established within the Department of Water Affairs and Forestry in 2007, by agreement between DWAF, , Provincial and Local Government, the National Treasury, SALGA and DBSA. The unit 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, which is known as ENERGYS (Engineers Now to Ensure Roll-out by Growing Young Skills), and the Masenzeni Management Support Contract.

Regional deployments are in place in seven regional offices and will follow in the remaining two provinces. However, additional needs relate to leveraging funding other than the municipal infrastructure grant (MIG); high level financial management skills; project packaging; investment planning and risk management.

The Water Sector Support Coordinating Unit (WSSCU) has now begun an exploration of partnership arrangements with the Water Infrastructure Solutions Alliance (WISA), the East Rand Water Care Company (ERWAT), the South African Association of Water Utilities (SAAWU) and the South African Association of Consulting Engineers (SAACE). It has established a relationship with the DWAF Forestry and Water Learning Academy to identify how short-term deployments in the sector can be linked with on-site training programmes. Hands on support (in addition to the one provided by DBSA) was given to participants in North West, Gauteng and the Eastern Cape. The total number of deployments from the WSSCU to municipalities is 32.

6.4. Raw Water Quality Management and Pollution Control

Water pollution arising from discharges by municipalities and industry that do not meet compliance standards is a severe problem that must be addressed. This requires a shift in approach from DWAF to non-compliant municipalities. In the past non-compliant municipalities received support to improve their ability to manage their Waste Water Treatment Works, but it is now time to take strong action, particularly where there is evidence of negligence.

DWAF is developing its small Compliance, Monitoring and Enforcement (CME) Unit into a stronger and more effective one. As CMAs are established, the regional teams will move directly to these agencies. The budgetary requirements for this function will be included in the 2009/10 MTEF submission.

Currently the CME unit is taking action against a number of illegal water users. However, the unit has a poor track record in successfully completing cases against offenders and the boistering of the unit is necessary to turn this around.

The CME unit is working in partnership with SAPS, DEAT, NIA, SARS, and DoA and is part of the Environmental Prosecuting Forum lead by the NPA. The National Environmental Management Act (NEMA) is currently being amended to enable the appointment of DWAF officials as environmental management inspectors (EMIs) with the associated powers. This will add to the powers they already possess under the National Water Act.

In terms of unlawful agricultural use in the Vaal, action can be expected against around 300 unlawful users from October 2008 in the Upper Vaal area.

6.5. Pricing for Raw Water Supply

The NWA provides for three types of water use charges: funding water resource management, including activities such as water resource protection and monitoring; funding water resource development and use of waterworks; and economic incentives to encourage the equitable and efficient allocation of water. The objective of the water use charges is to contribute to achieving equitable and sustainable water use by promoting financial sustainability and economic efficiency in water use.

Currently water use charges are in place for the abstraction and storage of water, and for stream flow reduction activities (commercial forestry) in order to encourage more efficient water use and not place unnecessary demand on water resources, thereby protecting the resource. The charge system for waste discharges is currently being developed. It will deal with charges for all aspects of waste discharges, such as the irrigation of wastewater, the discharge of waste or water containing waste into a water resource and the disposal of waste in a manner that may detrimentally impact on a water resource.

Water resource development and use of waterworks refer to planning, design, development, operation and maintenance, refurbishment and betterment (improvement) of Government water schemes. If water use charges are too low, they will lead to underinvestment, overconsumption

and unwarranted fiscal subsidies. There is therefore a need to adjust to higher real prices over time to accommodate the cost of investing in supply capacity to meet rising demand and to refurbish existing infrastructure.

The following charges apply to all water users on existing schemes: Operation and maintenance, Depriciation and Return on Assets. Return on Assets is based on the social opportunity cost of capital to government and this should approach a level sufficient to fund the annual capital expenditure budget requirement for the development of new water works and betterment of existing infrastructure from the fiscus.

The Government waterworks supplying irrigation water need major rehabilitation to meet water demand and limit water losses. Examples are the Gamtoos Irrigation scheme where more than R 200 million is required to rehabilitate the scheme; the Vlakfontein canal also requires more than R200 million. In other cases, such as the Koppies GWS (irrigation scheme), the condition of the scheme has deteriorated to such an extent that it may not be feasible to rehabilitate the infrastructure. Ongoing investigations indicate that it will be cheaper to purchase all the water entitlements and close the scheme.

The current pricing strategy exempt the irrigation sector from paying for ROA on existing infrastructure, thus resulting in unwarranted fiscal subsidies to rehabilitate these schemes.

While there is a need to at least recover the cost of supplying water, any significant water tariff increase to the irrigation sector must be viewed within the context of food inflation that is currently estimated at 17.8%.

In general, capitalized marginal water value, which is the case in most parts of SA, increases in all regions when water tariffs are increased. This shows that increased water tariffs increase the scarcity value of water. This then allows other sectors who are prepared and capable of paying for the scarce resource to get it from the allocated users.

6.6. Social Development

Since 1994, government has implemented various policies and programmes with associated funding to support service delivery, job creation and poverty alleviation, as for example EPWP, MIG, DoRA and CIP. The water sector has implemented programmes with the same intent, 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 implementation of the WfGD programme.

Through these and other programmes the water sector has realised successes in the establishment of Catchment Management Agencies, WAR, improvement in Raw WQ 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.

The WfGD programme would require that the scope of certain programmes are expanded while others remain the same. The important factor is that there are programmese in place that can support the implementation of the WfGD programme.

6.6.1. Working for Water

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. This is done to enhance the conservation and

management of our natural resources (land, water and natural diversity) and to promote socio-economic development as part of the EPWP.

The programme was launched to control the alien invasive plant problem, in particular the impacts of these plants on the water resources. A combination of methods such as manual clearing, chemical and biological control is being used. Biological control of invasive alien vegetation, using insects and fungi, is a long-term, self-sustaining and environmental friendly mechanism to slow down the spread of invasive weeds and reduce re-invasion into cleared areas.

The Working for Water programme has played a pivotal role in making people aware of the impact of invasive alien species on aquatic ecosystems and has created many job opportunities for people removing alien vegetation from the riparian zones of rivers in South Africa.

Since its inception, WfW has generated employment opportunities through more than 300 projects in all of the country's provinces. During the last few years WfW also supported some value added industries projects with the development of capacity and exposure during WfW exhibitions at trade shows and other events. Of these two projects, Vulindlela in Mpumalanga and Qolora in the Eastern Cape are still being supported by the programme.

Three other projects, Planet Wise and Genadendal Natural Products in the Western Cape and Invader Craft in Limpopo are running as independent businesses. Planet Wise and Genadendal Natural Products are employing more than 100 people in the projects producing garden products. The programme has also had its first success, testing the true impact on improving the productive potential of land after clearing dense stands of Acacia at Cape St. Francis in the Eastern Cape.

6.6.2. Socio-Economic Benefits of Large Water Resource Development Projects

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

During the planning phase, as well as during actual implementation phase, close consultation with local and provincial government takes place to identify additional opportunities created by a large water project to enhance local economies and improve the quality of livelihoods in the vicinity of a project. These may, for example, relate to the way the tendering opportunities are created, housing is being planned and developed or roads are routed. Two case-studies are presented below:

The Thukela Water Project

The Thukela Water Project Feasibility study, for example, identified the following spin-offs of the project to the regional development:

- Creation of 4000 construction jobs in the region and additional 2000 jobs in KZN, accompanied by skills training and capacity building.
- Gross Geographic Product in the region will increase by at least 10% and in the KZN by 0.5%.
- Acquired skills of construction workers will enable them to secure permanent higher paid jobs and increase the living standards of their families.
- Increased incomes will boost commerce, businesses and services, thus creating more jobs and further boosting the economy.
- Infrastructure like roads, electricity supply and communications built to service the construction will be left to service the local communities.
- The development of two major water bodies (dams) will generate tourism and create more jobs.

The De Hoop Dam Project

A Charter setting targets for Social and Economic Development was adopted for the project. This provides guidelines for minimum employment and service provision levels aimed at bringing benefits to individuals and enterprises from the area close to the dam. Targets for training and capacity building, employment of women, Youth and workers from local communities were also set. These provisions have been included in all contracts issued to date.

Through the establishment of an Authorities Coordination Committee the development activities in the vicinity of the dam are coordinated. This ensures the pooling of available resources to optimize efficiency in execution. Basic services and health facilities in the vicinity of dam are addressed.

For the housing of construction staff a township is being established on a site overlooking the dam with the potential to serve as a tourism hub for the Steelpoort valley. In the planning thereof provision is being made for future expansion. Upon completion of construction the township will be handed over to the District Municipality which is obliged, according to an agreement, to apply any revenue received from the sale of property for developmental benefits for the local communities.

The establishment of a conservation area for the Sekhukhune Land Centre of Plant Endemism offers opportunities for research and conservation jobs. An Information Centre is to be established near the dam site and will focus on engineering aspects of the project, various aspects of the activities of the DWAF,and also with displays of archaeological artefacts, cultural sites, tourism attractions, mining and Eskom displays relevant for the area. The centre will be equipped to serve an educational purpose for sholars and tourists. Space will be allocated for entrepreneurs to manufacture and sell handicraft artefacts.

6.7. International Rivers

Rivers do not respect international boundaries. Many cross national boundaries (trans-boundary rivers) and some form the boundary between countries (contiguous rivers). South Africa shares four major river systems with neighbouring countries:

- The Orange/Senqu system is shared with Lesotho (trans boundary) and Namibia (contiguous)
- The Limpopo River is shared with Botswana and Zimbabwe (contiguous) and Mozambique (trans-boundary)
- The Incomati system is shared with Swaziland and Mozambique (trans-boundary)
- The Usutu/Pongola-Maputo system is shared with Mozambique and Swaziland (trans-boundary).

The Revised Protocol on Shared Water Courses in the Southern African Development Community provides the framework for the management of these rivers, whilst the National Water Act gives international requirements a priority that is second only to basic human needs and the ecological Reserve.

This requirement needs to be kept in mind when considering options for water supply for South African growth and development initiatives.

SECTION 7 – RECOMMENDATIONS

In addressing the risks, threats and challenges to the WfGD programme, there are mitigation actions that must be aggressively driven by the DWAF, as sector leader. To be effective, these actions must be supported by South African society as a whole, including all spheres of government, the various economic and other sectors and civil society. Furthermore, while some actions and recommendations are reactionary, there are others which are more responsive and proactive.

7.1. Water Conservation and Water Demand Management

7.1.1. Reducing Water Losses

Current levels of leakage in most municipalities are very high. The Non-revenue Water in the municipalities have been found to range from 20% to 60% of the current system input volumes in some of the urban areas. It has also been found that the condition of the water supply infrastructure is a major factor contributing to the high water losses because of lack of capacity, and resources to develop and implement water infrastructure management planning. This also applies to the bulk water supply infrastructure providing water to the irrigation sector. The condition of the conveyance infrastructure such as canals in most irrigation areas were found to be poor resulting in the water not reaching the irrigators and being "lost" in the system although some of the resource returns into the rivers and streams for use by downstream users.

Given the inefficiencies and wastages taking place in the municipal sector while there is significant growth in urbanisation, the use of the existing water resources needs to be urgently addressed. DWAF's strategic imperative to improve water use efficiencies and reduction in water losses is key. There are a number of interventions measures that are required at the Water Services Authority level. Priority must be given to not only developing strategic WC/WDM business plans but actually implement these intervention measures. It has been proven internationally that implementation of WC/WDM measures provides the least cost compared to implementing supply side management. The average incremental cost of augmenting water supplies were found in recent studies conducted in the Olifants and Inkomati to range between 2 to 4 times the AIC of water conservation and demand management options.

To date a number of the WC/WDM options have not yielded positive results because of a number of factors which have been discussed in the previous chapters. In order to reduce water losses and delay capital investment in water resource infrastructure development the following management actions need to be considered:

- Develop a water use efficiency best management practice (BMP) which is monitored on an annual basis;
- Determine the leakage levels and establish leakage targets based on the BMP and the economic level of leakage; and
- Determine annual leakage targets for the different municipalities based on their organisational and administration capacity to implement.

In order to ensure that WC/WDM options are implemented in the growing urban and non-urban areas, consideration must be made to areas where incentives can be provided to the consumers and these are included in the bylaws.

In a number of the growing metropolitan areas and urban centres, although opportunities exist in implementing WC/WDM measures, it is unlikely to meet all the future water requirements. Augmentation of existing water supplies therefore remains critical.

7.1.2. Water Use Efficiency

The water use efficiency in the municipal sector has been found to be low, with per capita consumption in metropolitan and urban areas ranging from 250 litres per capita per day to 450 litres per capita per day. The low water use efficiency in the domestic sector can be attributed to the current pricing structure and the lack of incentives and regulatory measures to reduce consumption.

In order to improve water use efficiency in the domestic sector the following management actions must be considered for implementation

- Establish water use efficiency benchmarks for the different consumer categories in the municipalities
- Set targets for consumer use reduction on an annual basis and monitor compliance with set targets
- Review the current pricing strategy to ensure that the full marginal value of water is taken into account when determining the water tariffs. The tariffs must be based on increasing block tariff (IBT) in order to achieve efficiency objectives while ensuring equity in water use. This can be an effective economic instrument for implementing consumer use reduction, thereby delaying augmentation and reducing the capacity of the augmentation schemes over the same planning horizon.
- Conduct extensive consumer education and awareness about the fact that South Africa is a water scarce country
- Ensure that the current water services bylaws are updated to include incentive for consumers to reduce their water use
- Implement retrofitting programmes within the residential households

Irrigation agriculture is a major water user (accounting for 62% of the water demand) and given the current allocation approach which is area based, it has been found that there is significant scope in improving irrigation water use efficiency. A small percentage improvement in irrigation water use efficiency will translate into significant savings in water use to meet other demands such as the growing urban demands as well as meeting the needs for redress within the irrigation sector. As an example a 2% savings in irrigation equates to 160 million m^3 per year, enough to meet Eskom water supply requirements for the new power stations.

The improvement of water use efficiency levels in the IMP sector, in the final analysis, distils into two primary focus areas:

- At-source reduction of water use within individual processes, effectively reducing the amount of water used in each process for the equivalent economic output
- Recycling of process water, with or without intermediate treatment, thereby reducing the amount of fresh water used

Sites which achieve benchmark levels of water use efficiency performance generally employ both of these approaches in tandem. Water use in this sector is typically expressed as the volume of water used per unit of production, which is called the *specific water consumption*.

The IMP sector has a few characteristics which differentiate it markedly from both the domestic and the irrigation agriculture sectors. These differentiating factors make it amenable to water use efficiency interventions which can potentially result in significant, sustainable water savings. In brief, these characteristics are the following:

- The sector is not as fragmented as irrigated agriculture or the domestic sector. Most of the water use in the sector is concentrated within a few major water-intensive industry groupings. Engaging with these groupings can result in significant reductions in water use for the entire sector.
- The sector is endowed with the capacity to implement water-saving initiatives. Particularly in the case of large corporate entities, technical and project management expertise exists to implement the capital projects and process plant optimisation techniques necessary to reduce water consumption.
- There is growing awareness of the need to implement sustainable business practices by sector participants. Many IMP sector players have established entire departments to focus on sustainability issues, of which water is a key focus area.
- While benchmarks and best-practice standards exist, the specific nature of each operation influences what actions may be taken to conserve water. Injudicious water saving initiatives can compromise product quality, employee safety, production costs and throughput. This means that water use efficiency initiatives must be undertaken with extensive input from process owners.

A significant barrier to increased levels of water use efficiency in the IMP sector is the fact that often the price of water does not reflect its full value. This makes many of the interventions required to increase water use efficiency unjustifiable from an economic perspective. Approaches that could be used to counteract this challenge include:

- A review of tariffs applied for IMP users e.g. use of a rising block tariff system which inhibits excessive water use.
- Promotion of life cycle costing for evaluation of water-related investments. Often the costs include many other costs besides simply the savings in terms of reduced water use. For example, higher water use generally means increased effluent generation rates, and hence increased operating costs for effluent treatment.
- The use of non-financial instruments to drive water use efficiency. For example, best practices could be built into water use license conditions, taking careful consideration of economic consequences.

There are significance linkages between water and energy. Improving water use efficiency and reducing water losses in all sectors will reduce the energy required to pump the water. On the other hand improving energy efficiency will reduce the generation capacity to meet the demand which will reduce the water required for electricity generation particularly in fossil fuel power generation.

Opportunities to reduce current water use for power generation have been identified in existing power stations particularly the wet cooled power stations. The following management options for improving water use are critical:

- Continuing review of water use systems.
- Brine concentrators/crystallizer systems.
- Investigating benefits of installing hybrid cooling systems on existing wet cooled.
- Technologies to reduce water uses.

There are also opportunities of using mine water. This will require treatment for some of the uses in the power generation.

Current levels of water use efficiency are very low in both the residential and non-residential consumers. The water losses in the municipalities have been found to range from 20% to 60% of the current system input volumes in some of the urban areas. It has also been found that the condition of the water supply infrastructure is a major factor contributing to the high water losses because of lack of capacity, and resources to develop and implement water infrastructure management planning.

Given the inefficiencies and wastages taking place in the municipal sector while there is significant growth in urbanisation, the use of the existing water resources needs to be urgently addressed. DWAF's strategic imperative to improve water use efficiencies and reduction in water losses is key. There are a number of interventions measures that are required at the Water Services Authority level. Priority must be given to not only developing strategic WC/WDM business plans but actually implement these intervention measures. It has been proven internationally that implementation of WC/WDM measures provides the least cost compared to implementing supply side management. The average incremental cost of water conservation and demand management options were found in recent studies conducted in the Olifants and Inkomati to range between 2 to 4 times the AIC of augmenting water supplies.

To date a number of the WC/WDM options have not yielded positive results because of a number of factors which have been discussed in the previous chapters. In order to unlock the opportunities presented by implementing WC/WDM the following management actions need to be considered:

- Develop a water use efficiency best management practice (BMP) which is monitored on an annual basis.
- Determine the leakage levels and establish leakage targets based on the BMP and the economic level of leakage.
- Ensure that the current water services bylaws are updated to include incentive for consumers to reduce their water use.
- Review the current pricing strategy to ensure that the full marginal value of water is taken into account when determining the water tariffs. The tariffs must be based on increasing block tariff (IBT) in order to achieve efficiency objectives while ensuring equity in water use. This can be an effective economic instrument for implementing consumer use reduction, thereby delaying augmentation and reducing the capacity of the augmentation schemes over the same planning horizon.
- Conduct extensive consumer education and awareness about the fact that South Africa is a water scarce country.

In order to ensure that WC/WDM options are implemented in the growing urban and non-urban areas, consideration must be made to areas where incentives can be provided to the consumers and these are included in the bylaws. In a number of the growing metropolitan areas and urban centres, although opportunities exist in implementing WC/WDM measures, it is unlikely to meet all the future water requirements. Therefore augmentation of existing water supplies.

7.2. 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 Authority derives the most benefit from its investment. This 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 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. The consequence of not managing the bulk water infrastructure will include increasing the inefficiency in the following:

In order to ensure that the existing water infrastructure are managed effectively and efficiently, the development of comprehensive Asset Management Programs will be required to be developed 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 as well as asset management skill requirements to ensure programmes are sustainably implemented.

7.3. Supply Side Management

7.3.1. Desalination

There is increasing evidence that desalination presents a viable option for providing alternative water sources in South Africa to supplement the country's dwindling water resources. The capital and operating costs of desalination plants have reduced significantly in the last two decades, mainly due to the improvements made in the membrane technology available. In certain areas in South Africa small-scale desalination plants have proved to be more cost-effective than transporting freshwater over long distances. This has been done in the Western Cape. However, there are no large scale desalination plants constructed in South Africa to provide big demands such as coastal towns.

Desalinated seawater is increasingly used worldwide for the supply of safe drinking water. As it is not dependent on climate change or rainfall, it also represents a more secure supply of water to the coastal towns

While seawater is high in salt, desalination technology can effectively remove salt and other impurities. The volume of seawater that could be made available to the coastal towns would be limited only by the cost and energy usage which is high compared with other water sources. However, there could be environmental concerns over the greenhouse impacts and disposal of highly saline waste streams from the desalination process

DWAF must take a proactive and aggressive policy on promoting construction of desalination plants in order to provide coastal towns and other industries and thereby add to the total fresh water availability of the country. Although the cost of desalination is becoming competitive (cost of desalination ranges between R4.00 to R10 per m^3) compared to supply side management, further research in the technology to be used on a large scale needs to be conducted.

7.3.2. Water Recycling

The metropolitan areas of South Africa produce between 50% and 70% of treated effluent of varying quality which is returned to the rivers and streams. In Gauteng, the return flows are used by the downstream water users. In the case of the Crocodile (West) River system, there are plans to provide the water requirements for future power generation in the Mokolo River catchment from the significant return flows There is potential to increase the water recycled particularly in the industrial sectors not requiring good quality water for cooling and plant uses.

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 incourage the commercial use of this valuable water resource while ensuring the highest environmental standards in land-use and recycled water management.

The approach to water recycling will ensure that recycled water projects are:

- Sustainable – environmentally, economically, technically and socially.
- Commercially viable.
- Economically viable so that the outcome is beneficial to water authorities, the recycled water customer and the environment.

As part of the recommendations, DWAF will encourage the use of recycled water by:

- Actively promoting community awareness of the value of recycled water.
- Identifying potential viable markets for recycled water.
- Providing information to prospective customers on requirements for recycled water
- projects, including the quality of the product that can be supplied.
- Investigating recycled water quality improvement technologies.
- Facilitating demonstration/research trials on the use of recycled water.
- Maintaining a Trade Waste Policy that protects the quality of recycled water.
- Actively investigating opportunities for water recycling projects.

For the major inland cities and towns, some of which are facing the water scarcity due to growing populations, rapid urbanisation and a growing economy, recycled water and purchase of irrigation entitlements may be among the few alternative water supplies available

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; Place like Richards Bay, Durban and other coastal towns can benefit from water recycling instead of the water being discharged into the seas where it will not be recovered.
- ***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;
- ***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.

7.3.3. Development of New Water Supplies

The initial easiest solution to meeting the new demands of the water intensive industries, mining and power generation due to the growing economy is to increase water supplies (mainly by storing water during the winter months and by releasing it during the scarcity season) and allocating the additional supplies to these increasing demands. Development of new water supplies requires a long lead time for planning, identification of the most technically feasible and financially viable opportunities to implement. However, there is changing paradigm in water

resource management with the construction of new reservoirs most often precluded by fiscal and budget constraints.

However, for the Vaal River Supply Area which is the economic hub of South Africa, even if water conservation and demand management intervention measures were implemented and are successful, it is highly unlikely that the water demands for the areas can be met in the future. Therefore development of new water supplies to meet the growing needs of the Vaal River Supply Area (VRSA) because of its economic significance is a major imperative. This requires long term planning and flexibility in planning to account for different social and economic growth scenarios. Currently DWAF have investigated several augmentation options ti meet the future growing water requirements of the VRSA. These include the Thukela Water Project which involves transfer of water from the Thukela River, or developing of the next phase of the Lesotho Highlands Project. There is flexibility in the current planning to meet the future water requirements of the VRSA. However this is premised on achieving significant savings in water losses and improvement in the current water use efficiency in the area. The will provide the lead time required to finalise the planning for additional supplies and implementation of the most viable next augmentation option.

7.3.4. Conjunctive Use of Groundwater and Surface Water

Groundwater is stored in natural underground water storages known as aquifers and is pumped to the surface from boreholes or flows into rivers. Although there is use of groundwater as a local source of supply for rural areas and for supplementing irrigation surface water by some irrigation, the extent of the groundwater potential in the country is not very well known. There are opportunities for utilising groundwater during drought periods. This requires further investigation of the potential for groundwater use in the country. A deep largely unused groundwater storage is located in the Table Mountain aquifers. Little is known about this groundwater source and further investigation would be required to determine if there were sustainable volumes that could be extracted without affecting surface water flows or triggering ground subsidence and this source of supply could be used conjunctively with the surface water supplies to areas in the Cape. The quality of the groundwater needs to be investigated.

Groundwater can vary in quality as a result of salinity and contamination caused by nearby urban or rural activities and would need to be treated before being used for drinking. It is likely that the quality of the groundwater from the Table Mountain group would also require desalination. There are opportunities for aquifer recharge that can also be used to store water, including stormwater and recycled water. However, this will require research to investigate aquifer storage opportunities in 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 ways forward, but there is much that can be addressed immediately:

- 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, requiring 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.

7.4. Water Quality Management and Pollution Control

7.4.1. Waste Discharge Charge System

DWAF has already developed a Waste Discharge Charging System which will assist in managing this problem through reducing pollution levels and raising revenue for mitigatory measures to be put in place. At the same time, better regulation of effluent discharge, including the enforcement of discharge standards and rehabilitation of waste water treatment works and networks is necessary to get the problem under control. A phased implementaion of the waste discharge charge system in areas that poses a serious threat with respect to pollution incidents should be applied.

7.4.2. River Health, Compliance Monitoring and Enforcement

The River Health programme and compliance monitoring must be adequately maintained and rolled out nationally as it forms the basis of a public education programme about the health of South African rivers and issues pertaining to pollution and habitat destruction. The development of cooperative instutional capacity across the water sector, to deal with compliance monitoring and enforcement is crucial in reducing the level of pollution of South African rivers, groundwater and estuaries. In this instance, DWAF will ensure sufficient funding is made available to support the development of a strong Compliance, Monitoring and Enforcement function to prevent and control unlawful raw water use and pollution.

An Asset Forfeiture Unit should will be considered by DWAF for the possibility of retaining assets seized during action against non-compliant water users. The National Environmental Management Act should to be amended to make provision for powers to appoint DWAF compliance and enforcement officials as Environmental Management Inspectors so that they are empowered to take compliance action under both NEMA and the National Water Act.

7.4.3. Source Directed Control and Resource Directed Measures

Source Directed Controls (SDC) are the measures primarily designed to control water use activities at the source of impact, such as water use licencing. In practice, the SDCs will be the main focus of effort in giving effect to Resource Directed Measures. The managgement class, the Reserve and resource quality objectives (RQOs) of water resources must therefore guide SDCs in both a proactive and reactive manner:

- Proactive management focuses on measures that will prevent or minimise future water quality problems and the over allocation of water. For example, this involves the DWAF and/or CMAs in using the management class of the water resource, Reserve and RQOs to assess future developments that may impact on water quality and/or quantity, and
- Reactive management that focuses on managing existing water resource problems to achieve the management class, Reserve and RQOs.

Just as the quantity of water can be used, so can water quality. In order for a decision to be made regarding the discharge of wastewater, the receiving water resource and the “allocable water quality” needs to considered. The receiving water resource needs to remain "fit for use" for a number of different users of a resource, where the water quality needs to satisfy the most demanding water quality requirements of those users. Once the water user requirements (from the water resource) as well as the ecological quality requirements have been determined in terms of the Reserve, these can be used to provide RQOs, after which the "allocatable water quality" can be determined. A water resource is considered "stressed" in respect of a water quality if, for certain water quality constituents there is no allocable water quality.

In catchments with no water quality stress, a precautionary approach should be applied by enforcing, particularly in respect of point waste discharges, uniform national minimum requirements or standards. However, these may be relaxed in special and equitable circumstances provided that the RQOs attached to a desired management class are maintained. In catchments with water quality stress, it is policy to (a) consider stricter requirements and/or (b) strictly regulate or prohibit unsustainable practices in order to comply with RQOs to achieve the desired management class.

Compliance or 'end-of-pipe' monitoring for both the wastewater discharge as well as in affected resources should to be included in water use authorisations when appropriate. These need to be closely aligned with RQOs relating to water quality and source management objectives. Such monitoring provides an important information base for subsequent well-focussed corrective actions in cases where non-compliance is evident.

The National Water Act also makes provision for three types of water use charges: funding water resource management, including activities such as water resource protection and monitoring; funding water resource development and use of waterworks; and economic incentives to encourage the equitable and efficient allocation of water. The objective of the water use charges is to contribute to achieving equitable and sustainable water use by promoting financial sustainability and economic efficiency in water use. Currently water use charges are in place for the abstraction and storage of water, and for stream flow reduction activities (commercial forestry) in order to encourage more efficient water use and not place unnecessary demand on water resources, thereby protecting the resource. The waste discharge charge system on the other hand, will deal with charges for all aspects of waste discharges, such as the irrigation of wastewater, the discharge of waste or water containing waste into a water resource and the disposal of waste in a manner that may detrimentally impact on a water resource.

7.4.4. Freshwater Biodiversity

Practically it is not possible to afford all water resources throughout the country a high level of protection, without prejudicing social and economic development. It is also not desirable for all resources to be classified at a uniformly low level so as to permit maximum use, compromising the long term sustainable utilisation of that resource.

An *ad hoc* approach to resource protection and specifically biodiversity conservation fails to address the variability among living organisms and their habitats that are required to represent all aspects of biological diversity. As a result, a holistic, systematic and strategic approach is crucial to ensure that the biodiversity conservation that is required to conserve representative diversity and ecological functioning of South Africa's water resources, is achieved. The first steps have been taken in the development of shared policy objectives and guiding principles that can contribute towards co-operative implementation of freshwater biodiversity conservation in South Africa. Cross sector policy objectives and implementation principles have been determined, and are summarised in the table below.

Freshwater biodiversity conservation objectives and implementation principles

Objective	Implementation Principles

Description	
Objective 1: Set and entrench quantitative conservation targets for freshwater biodiversity	• set and endorse national targets for conservation of freshwater biodiversity, • cascade the national targets differentially to sub-national implementation levels, and • improve and refine national and sub national targets over time.
Objective 2: Plan for representation of freshwater biodiversity	• use surrogate measures as indictors to describe and classify freshwater biodiversity, • define the appropriate scale, • incorporate local ecological knowledge.
Objective 3: Plan for persistence of freshwater biodiversity	• select freshwater ecosystems of high integrity; • ensure connectivity; • include large-scale ecosystem processes; and • select areas of sufficient size.
Objective 4: Establishing a portfolio of freshwater conservation areas (FWCAs)	• legislate FWCAs through complementary legal mechanisms, • strive for optimal land-use efficiency, • prioritise and initiate conservation actions timeously, • conserve first where appropriate, rather than restore later, and • provide explicit selection options and management guidelines.
Objective 5: Enable effective implementation	• facilitate stakeholder adoption of freshwater conservation targets and priority areas, • reflect the conservation of freshwater ecosystems as an explicit function in institutional design, • enable cooperative governance in the conservation and management of freshwater biodiversity, • facilitate a science-management continuum, and. • promote discovery, inventory and improved understanding of freshwater biodiversity.

The quantitative target for freshwater biodiversity conservation in South Africa should be to maintain, and restore where necessary, at least 20 % of each inland water ecosystem type (determined at the appropriate scale) in a near natural condition. In order to give effect to this initial agreed upon target, national government departments responsible for water resource management, biodiversity conservation, land management and integrated planning should officially endorse the national conservation target for freshwater and integrate this target into their respective policy and strategic processes. National government is, and should remain, accountable for achieving the 20 % conservation target. However, all spheres of government (national, provincial and local) should have a role in prioritising freshwater ecosystems for conservation, and share a responsibility for achieving effective conservation of identified systems. This would require effective collaboration between at least all three spheres of Government and all water management institutions involved in water resource management and protection decision-making processes.

7.5. 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 where there will be increased rainfall intensity in some parts of the country and longer and extreme drought periods. As are result of climate change, the reliability of supply to water uses 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.

7.6. Institutions and Governance

The challenges in meeting the growing socio-economic demands of South Africa need to be met with a firmly established and resolute institutional framework. Checks and balances with clear lines of accountability need to be the order of the day in order to ensure, on the one hand, that there is delivery, whilst on the other hand sustainability. This is a critical part of ensuring water for growth and development. It will therefore, be incumbent upon the DWAF to provide, via the institutional re-alignment process, an institutional framework that is meaningful and relevant. Sector partners need to buy into this and have a clear understanding of the various roles and relationships.

Reporting on, and accountability for, the various roles that institutions play as 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 pull together to develop the necessary skills and competencies to ensure that these institutions have the required capacity to ensure delivery upon their mandates.

7.7. Use of Economic Instruments

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

7.7.1. 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.

7.7.2. Revenue Stability

Total losses from municipal water reticulation system for the whole of South Africa in 2005 was in the order of 1150 million cubic meters, which is equivalent to 28.8% of the approximately 2 000 million cubic meters of total municipal system water input at that time. Revenue instability is the most frequently cited problem that is used to negate suggestions 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.

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 the agro processing sector which is an important foreign exchange earner. However this is the sector with the highest water usage and a small savings in this sector could have significant impacts on water conservation.

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. Irrigation 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%, irrigation is exempted from this

charge). 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.

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. The following management actions are therefore critical:

- Water tariff 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.

- 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.

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

PRIORITY	OBJECTIVE	ACTION REQUIRED	SECTOR INVOLVEMENT	DEPARTMENT RESPONSIBLE	TIMEFRAME	IMPLICATIONS
Desalination	1. Increased water availability from alternative sources	1. Desalination targets set for coastal municipalities 2. Required for inland areas where large volumes of saline water resources occur (eg, discharges from mines or groundwater)	All sectors – national, provincial and local. International community.	DWAF	Immediate	
Surface Water Resources	1. Better water supply in under-developed areas	1. Augmentation especially in under-developed areas 2. Multi-purpose use of water infrastructure	All sectors – national, provincial and local.	DWAF	Revise NWRS timeframes	
Groundwater	1. Easier access to more water for small-scale and localised uses 2. Reduced requirement for additional surface water supply infrastructure	1. Groundwater resources must be better exploited in surface-water dependent areas of the country 2. Conjunctive water uses encouraged in support of expansion of SMMEs in the developing economy, especially where surface water resources are not available				

Return Flows	Better utilisation of, and benefits from, return flows as source of supply	1. Use of return flows as source for power stations and coal-to-liquid fuel plants				
Water Conservation and Water Demand Management	1. Offset immediate needs for infrastructure development for supply purposes 2. Entrench the reality that South Africa is a water scarce country 3. Result in water savings through managed water demands	1. This is a non-negotiable requirement in the country 2. Sector-specific geographical targets will be set 3. Will be achieved through regulation, by public awareness campaigns and the use of economic instruments				
Water Loss Control	1. Reduced water losses in water supply systems 2. Achieve water loss target limits set	1. Enforcement of water loss control to be applied to all municipalities 2. Set high target limit on water loss control as a condition for all sectors				
Promote Water Use Efficiency	1. More efficient use of water by all sectors 2. Achieve sectoral water use targets	1. Apply sectoral bench-marking 2. Set sectoral water use targets				
Infrastructure	1. Greater structural water security 2. More efficient performance, storage and delivery	1. The construction of inter-basin transfers and multi-purpose dams will be promoted in accordance with strategic development				

	infrastructure systems 3. Less pollution and more water availability	initiatives 2. Infrastructure development will be prioritised according to needs 3. Operation and maintenance of ageing infrastructure				
Unlawful Water Use	1. Increased civil obedience 2. Improved management of competing water uses	1. Will be clamped down to increase water security 2. Stressed catchments will receive priority attention				
Irrigated Agriculture	1. Better utilisation of existing water allocations and reallocation of water to other priority requirements	1. No further allocations except for new entrants linked to the Water Allocation Reform programme 2. Reduce total water use and set targets				
Afforestation Expansion	1. Optimisation of an important economic sector in appropriate areas of the country 2. Support poverty alleviation in rural communities	1. Promote afforestation in line with long-term mitigation scenarios (LTMS) and prioritise Eastern Cape and KwaZulu-Natal provinces 2. Intergovernmental processes will be streamlined to facilitate the expansion				
Aligned Planning	1. Improved planning dialogue 2. Converged and	1. Existing misalignments with national (NSDF), regional (PGDPs) and				

	coherent planning between land-use and water management 3. Increased opportunities for enhancing ecological sustainability	local (IDPs, LEDPs) land- and water spatial planning will be rectified 2. There will be a continued responsiveness to, and encouragement of, joint planning initiatives 3. Water is central to all planning				
Water Quality Management and Pollution Control	1. Polluters bear the major cost for pollution 2. Less pollution, improved river water qualty and better functioning ecosystems 3. Reduced risks to public health	1. Roll-out of the water resource classification system will be expedited to establish the required levels of environmental and water resource protection 2. Adherance to licence waste discharge standards and conditions will be rigorously monitored and enforced to minimise pollution and manage water quality				
Climate Change	1. Improved water security	1. Develop mitigation and adaptation plans for the water sector				
Poverty Responses	1. Minimised vulnerability and risks to the water dependent SMME sector	1. All water planning will take into account the water requirements and impacts of the 2nd economy				

		2. Accelerate access to water 3. Invest and develop community benefits around dams 4. Massification of the EPWP, WfW and related programmes 5. Development of value added industries from cleared biomass				
Skills Development and Retention						
Domestic Water Re-use						
Communications Between and Across Role-Player and Stakeholder Groupings						

SECTION 8 – CONCLUSION

Historically, water resource managers in South Africa met rising water demands through the establishment of a complex system of engineering supply-side solutions. However, due to their increasingly higher associated marginal costs and limited exploitable potential, these supply-side solutions are becoming less viable, and water managers are turning to the attractive solutions offered by demand-side management. In support of this, the National Water Act makes provision for the use of economic instruments, such as pricing, to manage water more efficiently and equitably.

In general, capitalized marginal water value, which is the case in most parts of SA, increases in all regions when water tariffs are increased. This shows that increased water tariffs increase the scarcity value of water. This then allows other sectors who are prepared and capable of paying for the scarce resource to get it from the allocated users.

WfGD acknowledges that water, as a scarce and limited resource, has and will continue to be the cause of competition and conflict in many areas of South Africa where high levels of socio-economic development are planned. Depending on the nature of the conflict, the response to such situations has, and will be through social, technical and systems interventions and many in the past have been successfully resolved.

The programme has also identified the need for clearly defined and well articulated efforts to be made towards the following:

- Reversing behavioural trends towards the resource (proactively through regulatory mechanisms and awareness programmes; and reactively through punitive measures including enforcement and financial disincentives);
- Setting recycling targets (reuse and multiple use systems);
- Extending groundwater use;
- Defining desalination targets;
- Achieving sectoral WC/WDM targets (water loss control and continuous efficiency improvements);
- Continued interbasin transfers;
- Determining the appropriate location of future dams.

It is apparent though that there is enough water, if we use it carefully. However, we cannot escape the need for a wide range of approaches that have to be used in its management – some of these are rudimentary, while others will be very sophisticated.

While planning is a critical element of our water use and management and this document has presented substantial evidence to show the extent of planning to date; **the key to prevent a crisis is IMPLEMENTATION!** This is where bold and informed decisions must be taken at critical junctures during planning to avert crises. This also projects an image of proactive management and effective and decisive leadership.

A final, but critical success factor for the Water for Growth and Development programme is the need for **collaboration in the use and management of our scarce resources for the best benefit of all citizens in the country.**

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ANNEXURE 1:
WATER ALLOCATION REFORM - INKOMATI WATER MANAGEMENT AREA

Overview of the Approach

In allocating water in the Inkomati Water Management Area under compulsory licensing, Principle 3 refers to the use of water efficiency criteria. In this regard, water allocations will be done against water use efficiency benchmarks for sectoral or sub-sectoral use. For example, allocations for irrigated agriculture will be based on benchmark volumes of water per hectare and per crop, while urban domestic water use will be benchmarked according to the demographic profile of the town, and whether industry is supplied. These benchmarks were determined after considering the local climate conditions, the crop watering requirements, and actual current local and international best practice.

Efficient water users (already close to the benchmark) will therefore lose very little water, whereas inefficient users will lose more water. However, these users could lose very little on overall productivity if they became more efficient. This approach implies that water use must be monitored and measured and installation of some form of water metering and reporting will be a condition of all licenses issued under the compulsory licensing process. However, recognizing that there may be significant capital investments required to become more efficient, users will be given a period of time to become efficient.

Should any particular enterprise be unable to meet the efficiency benchmarks, they will have to motivate why this is the case and why they should be allocated water at a rate higher than the water use benchmark. The efficiency benchmarks for the whole water management area are outlined below. More details are given in the report "Water use efficiency benchmarking for use in the development of a framework for water allocation to guide the Compulsory Licensing Process). Sub-catchment specific benchmarks are given in the sections dealing with the sub-catchments.

Approach to benchmarking water use by irrigation agriculture

Irrigation water use currently accounts for over 85% of water use in the Inkomati water management area. As a result, improvement in water use efficiency in irrigation water use, no matter how small, will have a significant impact on the water available for allocation. The total area under irrigated agriculture is estimated to be **121 805** hectares, with the Komati and Crocodile the main sub-catchments where irrigation is taking place. The main irrigation systems currently in use are overhead sprinkler irrigation which accounts for approximately 78% of the area under irrigation, and drip irrigation which accounts for 19% of the area. There is very little flood irrigation (approximately 3% of the irrigated area) taking place in the Inkomati WMA, and most of the flood irrigation that is taking place is located in the Sand river catchment. Flood irrigation is the least efficient system, moving through sprinkler systems, mechanical systems to micro systems which are the most efficient.

Given the scarcity of water in the WMA, there is potential to improve irrigated agriculture efficiency considerably. The approach taken in benchmarking irrigation agriculture has been to determine the water e4fficiency as well as the crop water productivity. The water use efficiency is defined as the ratio of the *crop water requirements to the volume of water released at the headworks minus the return flow,* while the crop water productivity defined as the yield per crop water requirements. The aim of the irrigation water use benchmarking was to establish the best practices in the sector by maximizing the water productivity.

The current weighted average water use efficiency was found to be approximately 69%. This could be improved to approximately 85% which means that water use by irrigated agriculture can be reduced by around 16% from current use for the whole catchment. The benchmark application rate for irrigation ranges from 8 500 m3 per hectare per annum to 13 000 m3 per hectare per annum with the current weighted average application rate of 11 239 m3 per hectare per annum.

The average water use includes both the conveyance losses and the evaporative losses due to on farm application practices.

Through compulsory licensing, water shall only be taken and used for irrigation so that the use of that water achieves an irrigation efficiency of not less than 85%. The average application rate taking into account conveyance losses will be benchmarked at 9 500 m3/ha in the water allocation framework. However, this will vary with the crop types, the soil holding capacity, climate and the topography. Over time the application rate will be further reduced from an average of 9 500 m3/ha to 7 500 m3/ha. Crop and area specific benchmarks are provided in each of the sections below.

Benchmarking water use in domestic sector

Domestic water use accounts for just over 2% of the total water use in the Inkomati WMA with the Crocodile Catchment (CAR; 2006). A recent assessment of current water use in the high income areas such as Nelspruit, indicates that average consumption is 315 1 per capita per day at the consumer end as a result of inefficient use in the household while it is 607 1 per capita per day at the abstraction point. There are thus significant unaccounted for water losses.

Consumption at the abstraction point for high income areas has been benchmarked at 300 1/c/d and for the low income areas the water use benchmark has been set at 145 1/c/d taking 15% as acceptable water losses included in this amount.

Industrial water use

There are various industries in the Inkomati water management area. It is not possible to provide benchmarks for each different industrial process, but the highest water users in the catchment have been identified and water use efficiency benchmarks developed, as set out below.

- Water use in pulp and paper mills

The pulp and paper mill in the WMA was benchmarked using the international best practices. However, the age of the plant and the production process was taken into account in the process benchmarking. The water use per air dried tonne was used to determine the water allocation to any pulp and paper mill in the Inkomati WMA with a product mix as is the case for Sappi Ngodwana mill. The total benchmarked water requirement for Sappi Ngodwana, excluding the township, is therefore their current use of 36M1/d or 13.14 million m3/a.

- Water use benchmarking in sugar mills

The current water consumption in the production of sugar at Malelane, is 13.95 m3 per ton of crushed cane compared to water use of 0.17 m3 per ton of crushed cane in other mills. The huge difference is because Malelane Mill does not have cooling towers and does not practice recycling of effluent.

The sugar mills have been benchmarked at 0.15 m3/ton of crushed cane if cooling towers and effluent reuse are constructed and implemented. Because Malelane mill is very old, it is unlikely that the above benchmark can be achieved. The best practice has been revised to take this into account and is therefore set at 2 m3 per ton.

Protecting and Supporting Water for Redress

Empowerment of resource poor farmers or entrepreneurs is not an overnight process. It often takes considerable support and many years for new entrants to become established farmers, and there will be some who do not succeed. There is thus a need firstly, to ensure sufficient support to resource poor farmers or new water users to enable them to become effective and self-sufficient. There is also a need to ensure that water that is made available for redress purposes does not easily revert to white users. This poses a tension between the need for resource poor farmers to be able to trade their water entitlements as would any other water user and the need to

ensure that such water remains in the hands of black users. The sections below address these two issues. To protect access to water resources for emerging users using the water for beneficial purposes.

Trading of redress licences

It is important to maintain and where possible improve the quantity of authorized water use in HDI hands. It is thus recommended that trading of water use licenses issues to

new black users be regulated carefully, and that for a period of ten years, water licenses issued to black users can only be traded to enterprises with a similar or greater level of HDI ownership and empowerment. This also affects the ability of HDI's to use the license as collateral.

Support to resource poor farmers

Structured support must be put in place to ensure that resource poor farmers and new water users are able to succeed in the water using ventures. To assist in this process, business plans have been developed for the most viable opp0ortunities for HDI involvement in the water management area. These business plans are contained in the *** report.

The business plans set out the constraints, opportunities and actions required of government in order to provide the necessary support to these activities. Such support includes financial support, development of markets, technical support etc.

Managing potential negative impacts

The curtailment of water use in the Inkomati water management area, particularly in the Crocodile catchment, has the potential to impact negatively on poor households in the area. This arises from the possible loss of jobs on farms where water use is curtailed.

Recommendations

The development of the framework for water allocation to guide compulsory licensing in the Inkomati WMA has been done using the best available information at the time. However, the following is recommended:

- *Water use efficiency performance benchmarks* – The water use efficiency benchmarks must be agreed by stakeholders before these can be finalized and used to determine the water allocation. Furthermore the key performance indicators and annual performance targets must be developed that can be used to monitor the improvements over time.

- *Ecological water requirements* – The water requirements for the ecological Reserve for the Crocodile catchment is unlikely to be achieved in the near future. It is recommended that a comprehensive Reserve is undertaken which provides scenarios for different levels of protection taking into account the need to balance ecological objectives with the need to sustain the economic activities of the catchment. A monitoring programme must be developed to determine the impact of a proposed management approach to implementing the Reserve in the Crocodile catchment.

- *Demand/supply analysis* – The water availability is based on the latest available hydrology. The demand supply based on the target assurance must be updated once the water resources yield model (WRYM) has been set up for the Inkomati WMA. The figures are however not expected to change but this must be confirmed.

One of the key challenges of compulsory licensing will be post transfer support to emerging user. It is important that DWAF and the ICMA develop an interdepartmental support programme for resource poor farmers in particular to provide the support needed for them to

be successful once land and water have been transferred to them. It is re4commeded that an intergovernmental agreement or MOU be signed with other departments and agencies to make this support programme effective. Local water user associations and farmers can also be brought into this plan where willing to assist.

ANNEXURE 2:
WATER ALLOCATION REFORM - MHLATHUZE CATCHMENT

Goals and Objectives

There are growing demands for Government to redress inequities in the allocation of water for economically productive purposes. While Accelerated and Shared Growth Initiative of South Africa (ASGISA) provides a basis for addressing economic growth challenges, the Water Allocation Reform programme will, in support of Government's socio-economic transformation imperatives including ASGISA, address access to water, in particular to stimulate *inter alia*, small scale water using enterprises. It is therefore critical to re-look at the way in which water is allocated in the Mhlathuze catchment so that we can;

- Take proactive steps to help the poor find ways to use water to generate incomes;
- Use cooperative governance to help build capacity to use water productively;
- Promote the sustainable use of water resources; and
- Promote the beneficial and efficient use of water in the catchment.

The Department of Water Affairs and Forestry will be initiating the compulsory licensing process in the Mhlathuze catchment to help realise these goals. The process seeks to redress the results of past racial and gender discrimination in accordance with the constitutional mandate for water reform, while minimising potential negative impacts on existing lawful users and the economy. Its further intention is to encourage and stimulate economic development in support of specific social development objectives (poverty alleviation, job creation and local economic development). The compulsory licensing process in the Mhlathuze catchment will only deal with water abstraction, water storage and stream flow reduction activities (forestry).

Catchment Description

The Mhlathuze catchment is 4 209 km² in size and has three major towns, Richards Bay, Empangeni and Melmoth. There are several smaller towns in the catchment, including Nseleni, kwaBonambi, Felixton, Nkandla and Babanango. The catchment lies within the Uthungulu District Municipality, and includes the uMhlathuze, Mthonjaneni, and Nkandla Municipalities.

Current population estimates for the catchment vary, but is about 525 000 people. However, water from the Mhlathuze system is used to supply people beyond the borders of the catchment. The black population makes up 92% of the people living in the catchment, while the white population makes up 5%, with the Indian and Coloured population making up the remaining 3%.

From a socio-economic perspective, the catchment can be broadly divided up into a number of areas. The Richards Bay and Empangeni areas (the uMhlathuze Municipality) are urbanised and water use is primarily for domestic and industrial purposes. The remainder of the catchment is largely rural, and can be divided into the commercial farming area (predominately "white") with irrigation and forestry making up the majority of the water use, and subsistence farming areas (predominantly "black") with very little formal water use.

The studies in the catchment, undertaken mostly downstream of the Goedertrouw Dam, show that aquatic systems range from only slightly modified from natural conditions, to systems where ecological functioning has been severely modified from the natural state.

These problems stem both from the reduced flow, as a result of water abstraction, but also from habitat destruction. The following factors have contributed to this loss of ecosystem functioning in the river systems;

- Grazing, trampling and local disturbances in the tributaries.
- Alien vegetation in all areas – but also removal of natural vegetation.
- Construction activities upstream of the Goedertrouw Dam.
- Changes in flow regimes and present operation downstream of the Goedretrouw Dam.

- Sand mining.

Similar studies of the estuary and coastal lakes have indicated that these systems range from slightly to significantly modified from the natural ecological functioning. More importantly, these systems are currently degrading even further, mostly due to;

- Extensive loss of swamp lands and indigenous vegetation.
- Population pressures of surrounding urban and rural communities.
- Loss of a connection between the sea and river systems due to weir construction.
- Loss of important species.
- Water level regulation.

These studies have therefore indicated that the loss of aquatic ecosystem functioning in the Mhlathuze catchment is not only due to the modified flow regimes as a result of overabstraction of water, but also to habitat destruction.

Water quality in the catchment is generally good, although localised problems may occur. Most of the intensively developed areas in the catchment lie close to the coast, and urban waste is discharged out to sea. Some water quality problems may, nevertheless, occur in and around the Empangeni/Richards Bay areas, and in the coastal lakes. Similarly, some nutrient and biocide problems may occur in the intensively cultivated areas.

It is not anticipated that changes in consumptive water use patterns will impact negatively on water quality in the catchment. However, intensive irrigation development upstream of Geodertrouw Dam may increase salinity slighty.

Water Supply and Sanitation Services

While government has made significant progress in meeting the basic water and sanitation needs, there is still a backlog in the Mhlathuze catchment where about 21% of the population still lacks basic water services, and about 45% lack adequate sanitation services, as shown in the tables below.

The water required to meet these basic water needs continue to receive the priority allocation, and at least that water required to meet basic human needs, i.e. 25L per person per day, forms part of the Reserve which must be provided before water can be allocated to other needs.

This Basic Human Needs (BHN) Reserve will require 4.7 million cubic meters of water per year, or some 1.8% of the total water available in the catchment. The BHN Reserve does not therefore constitute a significant portion of the water in the system.

However, as many people confuse the potable water supply with the water they may need for productive purposes, it is often difficult to initiate small scale commercial raw water using enterprises in under-serviced areas. Similarly, in areas where there is a potable supply from local government, people may start using these supplies for small scale commercial purposes. If the costs of this water use are not recovered, local government finances may be compromised.

The provision of potable water in the Mhlathuze catchment

Local Municipality	Total Pop.	% Below RDP Water	No Formal Water Infrast.	Piped water inside dwelling	Piped water inside yard
uMhlathuze Municipality	329,562	11.02%	2.82%	43.45%	31.19%
Mthonjaneni Municipality	53,891	36.09%	29.49%	26.61%	19.13%
Nkandla Municipality	142,796	38.30%	28.11%	13.94%	9.99%
Total	**526,249**	**20.99%**	**12.41%**	**33.72%**	**24.21%**

The provision of sanitation services in the Mhlathuze Catchment						
Local Municipality	**Total Pop.**	**% Below RDP Sanit.**	**% with Flush toilet**	**Chemical toilet**	**Pit latrine (VIP)**	**Pit latrine without vent.**
uMhlathuze Municipality	329,562	35.85%	53.09%	6.74%	11.06%	20.56%
Mthonjaneni Municipality	53,891	61.38%	30.75%	3.03%	8.24%	34.15%
Nkandla Municipality	142,796	63.10%	16.46%	3.84%	20.59%	26.52%
Total	**526,249**	**45.86%**	**40.86%**	**5.57%**	**13.36%**	**23.57%**

This means that, where ever possible, communication and capacity building efforts undertaken for compulsory licensing will have to address the issues around the provision of, or the use of, the potable water supply. This could impact on efforts to involve the rural poor, particularly in the Nkandla and Mthonjaneni Municipal areas, in the compulsory licensing process.

Current Water Use

The Internal Strategic Perspective for the Usutu to Mhlathuze Water Management Area estimates that some 258 million cubic meters of water is available in the Mhlathuze catchment. This includes some 80 million cubic meters which is transferred into the Goedertrouw Dam from the Thukela system. However, as at the year 2000, the total requirement for water in the catchment is estimated at 345 million cubic meters (see the Table below). The catchment is therefore some 133% allocated.

WATER REQUIREMENTS IN THE MHLATHUZE CATCHMENT			
Water Use Sector	**Requirement (million m3)[1]**	**Percentage**	**National Average[1]**
Irrigation	187	54.2%	59%
Urban	44	12.75%	25.1%
Rural	3	<1%	4.3%
Bulk Industrial/Mining	90	26.1%	5.7%
Forestry	18	5.2%	3.67%
Transfer out	3	<1%	
Totals	**345**		

Of the total requirement for the catchment, irrigation is the single largest user (54.2%), followed by mining and industrial use (26.1%), and the urban sector (12.75%). This differs slightly from the national picture, where urban water use is more significant at the expense of water use in the mining and bulk industrial sectors.

Some 10% of the water available in the catchment is required to meet the needs of the Reserve (this includes both the ecological and BHN components, and is not accounted for in the above figures).

At present, small amounts (3.76%) of the total available water have been allocated to meet the needs of the rural poor for productive water use.

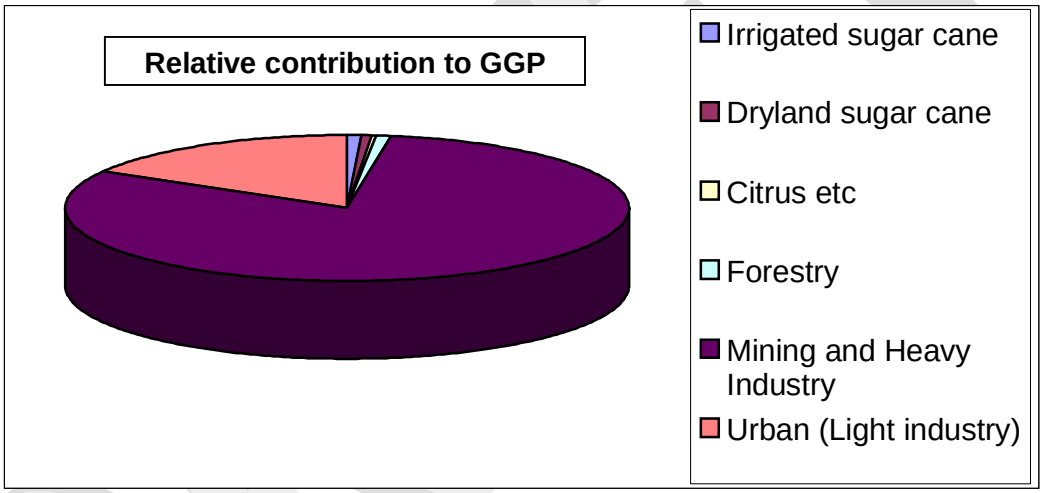
Some 13 700ha or 79% of the irrigated area in the Mhlathuze has been scheduled as part of the Goedertrouw Dam scheme, and is defined as existing lawful use. However, many irrigation farmers report using only a portion of the scheduled volume in most years. The extent of the

existing lawful use of the remaining 21% of the irrigation areas is determined by the extent of the irrigation in the qualifying period[3], and the lawfulness of the water use at that time.

Water Use Contribution to the Economy

The Gross Geographic Product (GGP) in the Mhlathuze catchment is dominated by mining and heavy industry, with light urban industries making up most of the remainder (see the pie chart below). Agriculture, including irrigated and dryland sugarcane, citrus as well as forestry appear to contribute very little to the GGP (2.4%). However, this represents the income at the farm gate, and does not include the value added in the food processing industry both within and outside of the catchment.

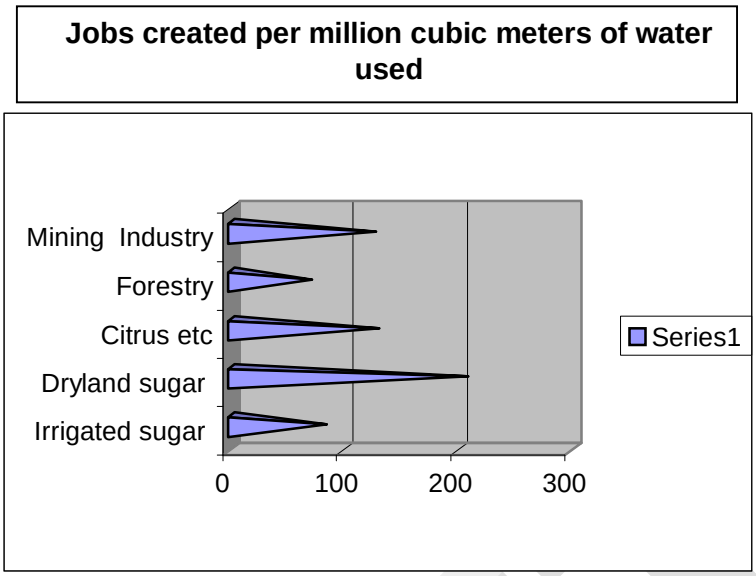
The GGP figures indicated for industry include income generated by the Felixton Sugar Mill, as well as the income generated by the Mondi Paper Mill in Richards Bay. In addition, some of agricultural products are exported from the catchment, realising additional income outside the catchment. As such, the relative contribution of the agricultural sector is under estimated by the GGP figures. Nevertheless, mining and industry is still likely to be the dominant contributor to incomes in the catchment.



Employment figures show that 20 000 people are employed in the industrial and mining sectors, and some 13 000 people in the agricultural sector (including forestry).

However, not all the urban light industry is water dependent. Excluding employment in this sector, it is possible to estimate the employment per drop of water. This shows that dryland sugarcane farming appears to create the most employment per water use, followed by mining and industrial use, and citrus farming.

[3] The Qualifying period is that period two years prior to the promulgation of the National Water Act.



Water Use Efficiency Opportunities

The Department of Water Affairs and Forestry commissioned a detailed investigation of the possibilities for water savings in a number of sectors. This study included an assessment of the feasibility and a first order cost/benefits analysis of water conservation measures in each of the sectors. The Table below summarises the results of this study.

OPPORTUNITIES AND COSTS OF POTENTIAL WATER SAVING MEASURES IN THE MHLATHUZE CATCHMENT

	Million Rands		Water Saving	% save
Water Use Sector	**Cap. Invest**	**Oper. Cost/a**	**Mill. m^3/a**	
Domestic & Commercial	4.5	3.75	3.96	1.2
Industrial and Mining	2.06	0.51	5.03	1.5
Irrigation	97.50	15.93	99.6	29.1
Alien Vegetation	1.35	1.77	1.4	0.4
System Operation	30.90	5.24	25.00	7.3
Waste water reuse	3.25	61.92	30.80	8.8
Total	**461.31**	**89.08**	**164.99**	**48.2**

A total water saving of some 165 million cubic meters per annum, or 48% of the annual demand may be possible by instituting water savings measures. The most significant savings can be realised via the irrigation sector. However, given that input production costs have increased significantly, and commodity prices have fallen in this sector, it is unlikely that irrigation farmers would be able to afford the investments required.

Nevertheless, only a portion of the scheduled irrigation area is currently under irrigation. Similarly, many irrigators do not use their full registered use or lawful entitlement due to the high costs of irrigation. Irrigators have also expressed the willingness to reduce their entitlement, but at a higher assurance of supply. These measures could be put in place to realise significant water savings with limited capital investment.

There is little opportunity to increase stream flow by removing alien vegetation, realising only a possible 1.4 million cubic meters of water. Improved system operation of the Goedertrouw Dam, mostly by tightening up operation in the wetter periods and improved monitoring of stream flows and abstraction rates, can also realise water savings.

There are some opportunities for water savings in the domestic and commercial, as well as the industrial and mining sectors, but these appear to be less significant those in the agricultural sector. Water conservation measures may however be more affordable in these sectors.

Implications for Water Allocation Reform

Current water requirements for the Mhlathuze catchment exceed the amount of water available, hence its prioritisation for compulsory licensing.

Use of water for productive purposes in the catchment is still highly skewed, with only 3.76% of the water allocated to HDIs. This group makes up 92% of the population of the catchment. The compulsory licensing is therefore necessary, not only to correct the potential over-allocation, but more importantly to spread the benefits of water use in the catchment to the rural poor.

However, initial studies of the current water use in the catchment show that actual use may be lower than that estimated from the scheduled and registered use. Similarly, there appears to be significant opportunities for water savings in many sectors, although the capital investment and operating costs to implementing these opportunities may be a major hurdle for many users.

Nevertheless, some of the demands from HDIs may be met by curtailing unlawful use, reducing the over registered use, or by better estimating the actual use in the scheduled areas, and implementing the more viable options for water savings. However, some curtailments of existing lawful water use may be necessary to meet emerging demands in the catchment. But, options for phasing in the uptake of water by emerging users in parallel with the implementation of water savings measures could be explored.

Opportunities for Water Allocation Reform

The Land Reform process usually provides opportunities to establish water using enterprises, as land which has existing water entitlements can be made available. Similarly, financial and extension support is available through cooperative governance efforts. However, there do not appear to be any immediate plans to acquire farms in the existing commercial irrigation schemes, and areas upstream of the Goedertrouw Dam are already largely under the Tribal Authority, and the occupiers have some security of tenure.

The Integrated Development Plans (IDPs) developed by local authorities provide good opportunities for establishing viable water using enterprises. Plans outlined in the IDPs are more likely to attract financial and extentsion support to help establish productive water use.

In this respect, the uThungulu Distict Municipality has identified the expansion of agricultural opportunities for HDIs as a priority. The plan also makes provision for the establishment of a Local Economic Development (LED) desk dedicated to agricultural development in the area. The “uThungulu District Municipality Agricultural Development Plan: 2003” identifies a number of crops that might be viable for the region. These include; Cut Flowers, Paprika, Organic Sugar, Bio-Diesel, Tea Estates, Essential Oils and Assorted Vegetables.

Both Sappi and Mondi support outgrower schemes to help establish small scale afforestation. These schemes provide both financial and extension support and can potentially provide opportunities to establish productive water use in the tribal areas. Studies on the potential for afforestation in tribal areas have developed maps of areas where trees could viably be grown, and which would not have significant environmental impacts (with respect to the conservation value outlined in the Ezemvelo KZN Wildlife Conservation Plan). Applications for water use licences for forestry in these areas could be fast tracked.

These maps show that, if water restrictions were lifted by compulsory licensing, a total of 6562ha (which is some 10% of the existing afforestation) could be planted in tribal areas in the Mhlathuze Catchment with little potential impact on the environment. However, these areas are not necessarily immediately available, as site visits would have to be conducted to establish the viability of afforestation in these areas, and to ensure that the low flow requirements of the ecological Reserve will still be met.

A study on the opportunities for HDIs to take up water in in irrigation schemes was conducted in 2003. This study identified areas where maize, bananas, or sugar cane could be viably be irrigated. This was done to provide an indication of the suitability for irrigation, and was not intended to restrict potential irrigation farmers to these crops.

While the use of water in mining and industry represents the best opportunities for income and job creation, it will be difficult for small scale users to successfully establish such large water using businesses. Moreover, while small scale industrial users, supplied via the municipal potable water supply, offer the best returns per unit water use, this use will be accommodated in the increased demands from local government. (Many of these businesses are also not water based.)

However, some opportunities appear to exist for small scale irrigation use, albeit not necessarily in the sugar industry. The successful establishment of these enterprises will however require extension support, and in this light the opprtunities highlighted by the uThungulu District Municipality Agricultural Development Plan, and by small scale afforestation could be explored. In addition the studies conduvted to date have not looked at the suitability of soils for irrigation, and have not tried to identify potential markets for the products produced.

WAR Roll-Out

Mhlathuze

	2006				2007				2008			
Task	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Announcement of CL												
Verification and Validation												
Catchment Assessment Report												
Framework for Allocation												
Empowerment Programmes												
Installed water resources model												
Call for Licences												
Reconciliation and Schedules												
Issue Licences												

The diagram above outlines the plans for the rollout of the compulsory licensing process.

This plan includes studies to improve our understanding of water use in the catchment, and the opportunities for HDIs to engage in productive water use during 2006. Empowerment programmes to assist HDIs to participate in the compulsory licensing process will be initiated in the last quarter of 2006. The call for licence applications is only likely to be made in mid 2007, and licences may only be issued in the second half of 2008 (NB: The timeframes for these plans are being substantially revised).

The Department of Water Affairs and Forestry has identified the resourcing requirements for the process based on this planning.