

## Letter from the Director General

Dear Stakeholder

The Directorate of Water Conservation, within the Department of Water Affairs and Forestry (DWAF) is in the process of developing a **National Water Conservation and Demand Management Strategy**. As a first step the **Draft Water Conservation and Demand management National Strategy Framework** has been produced and is being circulated for critique and comment. This document lays out the key principles, legislative, economic and social frameworks that would guide a national water conservation and demand management strategy. The completion of this phase requires comprehensive consultation and liaison with relevant role players.

You have been identified as a key role player in improving water-use efficiency in South Africa. The success and effectiveness of developing and the implementing Water Conservation and Demand Management throughout South Africa is dependent on the degree of participation of all role players. Please make sure this document reaches all interested parties in your organization. You are therefore invited to review this document and contribute your vision and insights, by forwarding your comments, no later than 19 July 1999, to:

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**DRAFT**

**May 1999**

**WATER CONSERVATION AND  
DEMAND MANAGEMENT  
NATIONAL STRATEGY FRAMEWORK**

**DEPARTMENT OF WATER AFFAIRS AND FORESTRY  
Republic of South Africa**

## **Letter from the Minister**

When I accepted the responsibility for Water Affairs and Forestry in President Mandela's cabinet in 1994, I knew that it would be an extraordinarily exciting challenge. The magnitude of excitement as well as the level of challenge came home thick and fast in the last five years. I can say with some measure of pride that the water industry of South Africa has proved itself capable and receptive to these considerable challenges

One of the key thrusts of the new approach in which we are managing water in South Africa is the entrenchment of and insistence on efficient water management and use. We have been able to give strong emphasis to this concept both in our legislation as well as through key demonstration water conservation and demand management projects. The Department of Water Affairs and Forestry is now in the process of developing a National Water Conservation and Demand Management Strategy and this draft framework is the first step in that process.

We are committed to developing this together with all the key role-players through a consultative process. The success of this process and the richness of the strategy will depend very largely on the degree of participation.

You are therefore invited to contribute your insights and wisdom toward a value-added product that will ensure that we are able to solve all water-related challenges in a co-operative manner.

Professor Kader Asmal, MP  
Minister of Water Affairs and Forestry.

## **Acknowledgements**

The drafting team would like to express their sincere gratitude to all the contributors to the process of developing the framework.

## PREAMBLE

The information contained in this report is based on the collective knowledge of experts with various perspectives and input from an ongoing consultative process.

The report is aimed at the water supply industry and South African society at large. It aims to cover all water use sectors including agriculture, forestry, industry, recreational, ecological, and water services. The scope of the report is inclusive of most water conservation and demand management issues.

This water conservation and demand management National Strategy Framework is designed for many uses. Its first use is to contribute to the water conservation / demand management (WC/DM) components of the National Water Resources Strategy. The second is to serve as the nesting framework for the development of water WC/DM sectoral and regional strategies. The third is to describe and promote a common understanding and interpretation of WC/DM principles for South Africa.

This report is phase 1 of the following process adopted for developing WC/DM strategies for South Africa:

Phase 1: Develop a draft report on the WC/DM National Strategy Framework

Phase 2: Distribute the WC/DM National Strategy Framework to a wide variety of key stake holders for comment and review the report according to comments received.

Phase 3: Develop sectoral strategies for the following water use sectors and water institutions:

Phase 3.1: Domestic use sector and Water Services institutions

Phase 3.2: Agriculture and Forestry sector

Phase 3.3: Industry and power generation sector

Phase 3.4: Environment and water management institutions

The draft sectoral strategies will be developed through workshops involving representatives of each water sector. These will then form the basis for a wider consultation process to develop the final strategy.

Phase 4: Develop a model regional strategy to be incorporated into the catchment management strategies

Phase 5: Consolidate the WC/DM National Strategy Framework and the sectoral strategies for inclusion into the National Water Resources Strategy.

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# 1 INTRODUCTION

## 1.1 *Conceptual perspective*

Water conservation and demand management (WC/DM) are topics that are commonly referred to in water resources literature in South Africa, but until recently it can be argued that the need and value of WC/DM principles has not been fully recognised or appreciated. Evidence of inefficient water usage can be found in all water usage sectors throughout the country and the value of water seems largely unrecognised by most water users - particularly the privileged who until recently had access to water at inexpensive subsidised prices. The realities of the new democratic South Africa demand improved management of our limited water resources. South Africa is a developing country that is water scarce and water stressed. In this context the necessity and importance of WC/DM cannot be emphasised sufficiently.

The implementation of WC/DM principles is essential in meeting the national goals of basic water supply for all South Africans and the sustainable use of water resources. The new water legislation also makes specific requirements relating to WC/DM and it is therefore imperative that policies and strategies are developed to meet these needs.

Both terms of WC/DM are continuously referred to in this report because of their different meanings and emphasis. It is important to note that the goals and objectives of demand management do not refer only to the objective of efficient water resource management and ecological sustainability, but also to economic efficiency, social development and social equity.

## 1.2 *Constraints*

There are various obstacles and constraints to overcome before the full potential of WC/DM principles can be achieved. It is necessary to identify and acknowledge these constraints in order to develop activities within the WC/DM strategies to address them. A number of these constraints can easily be overcome with adequate awareness, education programmes and through appropriate regulations. Some of the constraints however are related to institutional arrangements which are lot more difficult to overcome. The following are some of the obstacles and constraints identified within the water supply industry in South Africa:

- Financial constraints. Money is made available for supply side management measures but very little is made available for WC/DM initiatives
- Resistance to change by water institutions
- The principle often adopted in water resources management is to allocate all available water to consumers irrespective if water is not used efficiently.
- Officials and industry sectors protect their personal interests
- Most consultants used by the water supply industry promote the development of infrastructure without adequately reviewing WC/DM measures as alternatives
- Water institutions own supply side measures
- Water conservation measures are perceived only as drought relief mechanisms
- Fears that water conservation will result in reduced service levels

- Supply side management options appear easier to implement
- Existing planning practises choose the cheapest solution in implementation without regard to operating and running costs. (i.e. new housing developments)
- Lack of understanding of principles, scope and potential of demand management
- Demand management strategies are often incorrectly perceived and implemented as punitive measures to the consumers
- Lack of integration and co-operation between the various institutions in the water supply chain, particularly in the water services sector
- Lack of ring fencing of the water services functions or the lack of integration and co-operation within the different departments of local authorities.
- Lack of knowledge and understanding of the consumer and water usage patterns
- Lack of adequate knowledge of the drivers causing the growth in demand
- The relative low price of water, particularly in the agriculture sector
- The low level of payment for services by a significant number of consumers and users

These obstacles and constraints are not exclusive to South Africa. However, over the last ten years, there has been significant shift in focus on and developments in WC/DM internationally. Although the water sector in South Africa needs to develop its own WC/DM solutions, we can learn a lot from international experiences and practices.

### 1.3 Purpose

***The Vision of all Water Conservation and Demand Management endeavours is the efficient use of water by water institutions and consumers in South Africa.***

The cornerstone principles underlining the strategy framework are those governing the National Water Act (36 of 1998) and the Water Services Act (108 of 1997). These are **Equity, Optimal Use and Sustainable Use**. An additional principle relevant to this framework is **Responsibility and Accountability**.

A paradigm shift to the principles of WC/DM is required in the water supply industry and this can only be achieved through understanding and comprehensive strategies. This strategy framework will form part of the national water resources strategy as prescribed in the Water Act.

This document contains the WC/DM National Strategy Framework - identifying national objectives and goals that will lead to the development of action plans to be implemented by the various water institutions. The needs and opportunities for the implementation of water conservation are described, as are some of the important principles on WC/DM.

The purpose of this document is to create the platform on which the national WC/DM strategy will be based. This National Strategy Framework will also be used to develop the functions of the Directorate of Water Conservation within the Department of Water Affairs and Forestry (DWAFF) and the functions of other departments and other water institutions. It is also intended that the principles described in this report will assist the water industry to comprehensively implement WC/DM.

## **2 BACKGROUND**

For more than a decade WC/DM has been identified as a key focus area in developed countries, but has only recently been identified as an essential and effective in developing countries. It is clear that the implementation of WC/DM is as important in the developing countries as it is in the developed countries. The following are some of the issues motivating the need for the implementation of WC/DM principles in South Africa.

### **2.1 *Water resources***

South Africa's water resources are limited and, in global terms, scarce. The demand for water is growing due to the following factors: a high population growth rate, a developing economy, and the urgent need to supply water services to millions of people without water services.

The sustainability of our water resources is threatened both in terms of quantity and quality. Unless the current water usage pattern is changed, future water demand will greatly exceed existing available fresh water resources. Already there are a number of areas in the country that have to rely on expensive transfer schemes because water demands have far exceeded water availability. Such transfer schemes are being developed despite the enormous scope for WC/DM that often exists in these areas.

### **2.2 *Environment***

Environmental degradation and the prevention thereof is a key focus in our current policy and legislation. Misuse of water resources has resulted in damage to aquatic ecosystems. Measures such as guaranteed ecological reserves and in-stream flow requirements are necessary to protect the integrity and productivity of rich and diverse ecosystems. These measures make reference to both the quality and quantity of water required to maintain healthy aquatic ecosystems. It is clear that damage to or destruction of aquatic ecosystems will have negative social and economic impacts.

### **2.3 *Joint use of water by neighbouring states***

South Africa shares common water resources with the neighbouring countries of Botswana, Lesotho, Mozambique, Namibia, Swaziland and Zimbabwe. Effective international collaboration is required to achieve the optimal allocation of water resources serving the southern Africa region. With the exception of Lesotho all of these countries are classified as water scarce and it is therefore imperative that none of them should allow the wastage of water resources to the detriment of the other countries. The implementation of effective water conservation strategies by South Africa and our neighbours will also assist significantly in the allocation of water in order to meet each country's needs.

### **2.4 *Basic water supply needs***

More than a quarter of the people who live in South Africa do not have reasonable access to water services. The provision of water services to all South Africans is an important and challenging objective for the new South Africa. Through demand management measures to existing water services, water resources and bulk infrastructure can be reallocated for the provision of new services. Demand management is also essential in ensuring the

sustainability of the new water service delivery projects. Demand management measures can help ensure that water remains affordable, that consumers budget for their water consumption, and that the distribution system is operated and managed in an effective and efficient way. Demand management will play an essential role in ensuring the provision of sustainable and affordable services and ensuring the fulfilment of the national objective of “water for all”.

## **2.5 Existing water services**

The legacy of apartheid has left enormous social, economical and technical problems within the former black townships and rural areas. Water losses in many former urban black townships are estimated at 50% of the total supply in these townships. These losses consist of a combination of reticulation system leaks, faulty meters and domestic plumbing leaks. The involuntary water usage due to domestic plumbing leaks makes water unaffordable to a majority of these communities. These factors, combined with the low levels of payment and institutional problems of local authorities, make the sustainability of water services questionable. The implementation of demand management principles will be an essential tool in ensuring sustainable water services and addressing the problems in the water services industry.

## **2.6 Irrigation**

Irrigation accounts for an estimated 50% of total water use in South Africa. While irrigated lands represent only 10% of the cultivated area, some 35% of all domestic foodstuffs and 85% of all agricultural exports are derived from irrigated lands. Irrigation losses are often quite significant and it is estimated that no more than 60% of water abstracted from water resources is correctly placed in the root systems of plants. Approximately 35 % of irrigation system losses return to the river systems by overland flow and return seepage but this return water is normally nutrient enriched and polluted with herbicides, pesticides, and other pollutants that affect water quality of rivers and streams. Irrigation methods, irrigation scheduling, soil preparation, crop selection and evaporation all have a significant impact on the efficient usage of water. The application of WC/DM principles in the irrigation and farming sectors will have a significant effect on the availability of water to other sectors and the protection of water resources.

## **2.7 Industry, mining and power generation**

Economic growth in South Africa is essential to its development, and industry is expected to be the biggest contributor to its economic growth. Future industrial water use is very significant for water resource planning purposes. The industrial sector is projected to have the greatest growth in water demand and much of the industrial development will occur in major urban centres that have limited water resources, such as Cape Town and Gauteng. The availability and assurance of water supply at a reasonable cost to support industrial development is imperative, but it is also important to identify and recognise the need to include water availability and costs as part of the considerations in the geographical location and the nature of future industrial development.

### 3 THE MEANING OF WATER CONSERVATION AND DEMAND MANAGEMENT

Water conservation and water demand management are often used as synonymous terms. Although the meaning and implications of these terms is very similar, it is important to recognise the difference. Brief explanations of both terms and their definitions are described below.

#### 3.1 *What is meant by “water conservation”*

Over time, both in South Africa and internationally, the meaning of water conservation has varied. From the beginning of the industrial revolution, water conservation meant dams to capture and store water so it could be distributed as needed. These systems were designed to conserve water by preventing the waste of water to the ocean. Over the last two decades the meaning of water conservation became restricted to “use less water” and “protect the environment”.

The definition of water conservation proposed is:

**“The minimisation of loss or waste, the preservation, care and protection of water resources and the efficient and effective use of water.”**

It is important to recognise that water conservation should be both an objective in water resource management and water services management as well as a strategy.

#### 3.2 *What is meant by “demand management”*

The definition of demand management proposed is:

**“The adaptation and implementation of a strategy (policies and initiatives) by a water institution to influence the water demand and usage of water in order to meet any of the following objectives: economic efficiency, social development, social equity, environmental protection, sustainability of water supply and services, and political acceptability.”**

Demand management should not be regarded as the objective but rather a strategy to meet a number of objectives. One reason why the full potential of demand management is often not recognised is because it is often perceived or understood in a limited context. It is common for people to equate demand management only to programs such as communications campaigns or tariff increases. Demand management should equate to the development and implementation of strategies and initiatives associated to managing water usage.

A useful comparison on the philosophy of demand management is a comparison with the role of marketing in the commercial corporate environment. In the past marketing in the commercial environment meant simply advertising. Currently marketing has a much wider meaning which involves understanding the clients and their needs, understanding the market forces and then deriving a strategy in order to set and achieve target sales, market share and profits. The principles of demand management are very similar to that of marketing, where the water supply institutions should set water demand goals and

targets by managing the distribution systems and consumer demands in order to achieve the objectives of economic efficiency, social development, social equity, affordability and sustainability. The water supply industry can gain a lot by adopting marketing principles to the demand management strategies.

### **3.3 The scope of WC/DM measures**

In South Africa due to often complex institutional arrangements particularly in the provision of water services, it is often difficult to distinguish what measures are included in demand management and may vary according to which water institution's perspective it is viewed from. For example, the perspective of the Department of Water Affairs and Forestry (DWAF) in its role to manage water resources may only include as demand management those measures that affect the overall "consumptive" usage of water or the net water abstraction through the water supply chain. From a Water Board's perspective demand management will include any measures that will reduce its total amount of water abstracted from the water source. This will include measures to reduce losses in the purification process, the bulk distribution system, the distribution system of the service provider and the consumption by the end user. From a service provider's perspective demand management will only include measures to reduce distribution losses and the consumption by the end consumer.

For common understanding it is proposed that the **scope of demand management is defined to include the entire water supply chain - from the point of abstraction to the point of usage**. This includes all levels of distribution management and customer demand management. The conservation measures related to the water resources and return flow are considered under water resource management and return flow management respectively.

## **4 THE ROLE OF WATER CONSERVATION AND DEMAND MANAGEMENT**

The role of WC/DM in South Africa is significant and is reviewed briefly under the various categories of water sectors and objectives.

### **4.1 Security of supply – reconcile future demand and resources**

South Africa is a dry country and current water demands exceed water availability in some areas. With the current growth of demand it is estimated that unless water conservation and sustainable development policies are implemented, South Africa will utilise all its natural water resources within 30 years. Some of the reasons contributing to the challenges of ensuring sustainable water resources for the future are as follows:

- While the climate of South Africa varies from rain forest to desert, the typical climate is semi-desert and the average rainfall for the country is just over half of the world average of 900 mm / annum.
- Rainfall is variable and droughts followed by floods are common occurrences.
- The distribution of rainfall varies significantly and the availability of water resources is very uneven with approximately 60% of river flow arising from only 20% of the land area.

- South Africa has limited groundwater.
- Some of the metropolitan and industrial growth centres have developed around mineral deposits and are situated far from major water resources.
- South Africa's average evaporation rate exceeds its precipitation rate.
- South Africa has a population growth rate of between 2 and 3 percent.
- South Africa is a developing country with a growing economy.
- The life style of South Africans is changing corresponding to an increase in per capita consumption.
- There is a large backlog of housing and service delivery.

Although alternative water resources such as desalination and icebergs are possible, such techniques are expensive and considering its socio-economic needs South Africa can ill afford them.

The role of WC/DM in ensuring security of supply can be divided into short functions during droughts and sustainable long-term functions. During droughts emergency water conservation measures may need to be adopted such as water restrictions and punitive penalties.

The extent of the water resource problem in South Africa is illustrated in Figure 1, which indicates the availability and scarcity of water resources within the various regions of the country.

#### **4.2 Protection of the environment**

Reducing water demand reduces water withdrawals impacting on the environment and results in increased stream flows or decreased demand on groundwater sources.

Ecosystems are under threat and need to be protected from over utilisation of water resources and the continued development of new dams. Current land and water utilisation is having a damaging effect on the ecology of rivers, lakes, wetlands and estuaries.

#### **4.3 Protect existing water resources**

The protection of water resources through water conservation measures is of great importance. Examples include:

- The removal of alien invading plants, which have reduced surface runoff and the yield of existing resources. It is estimated that in some catchments the removal of invading alien plants increase yield by 10%.
- Rehabilitation of wetlands.
- Protection of groundwater resources by not allowing extraction to exceed the rate that it can be replenished.
- Minimising pollution of water resources

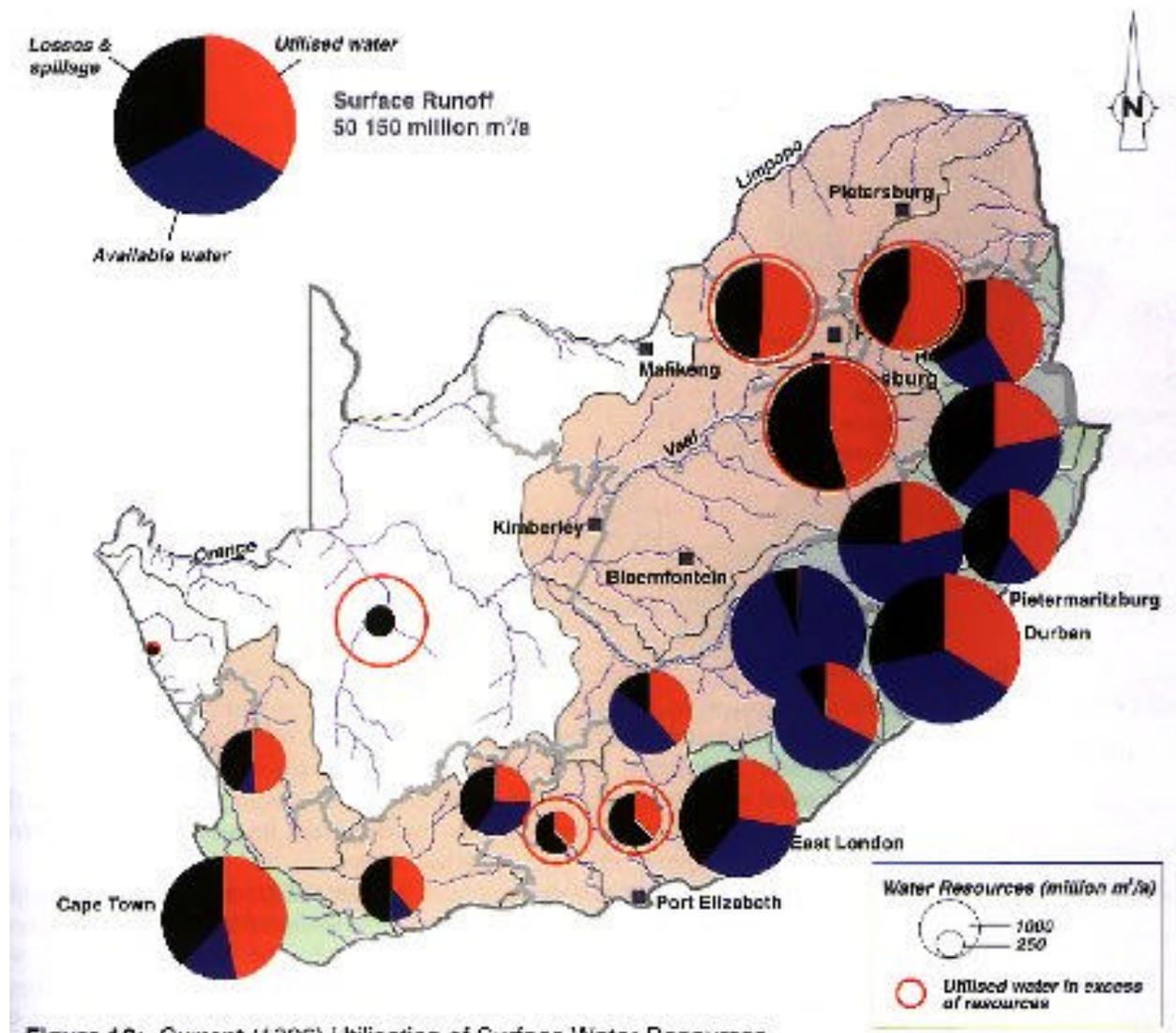


Figure 13: Current (1996) Utilisation of Surface Water Resources

#### **4.4 Economic efficiency**

Government and public institutions have a societal responsibility to ensure not only the efficient usage of water resources but also the efficient usage of public funds. One of the main objectives of demand management is economic efficiency. In the potable water services sector, economic efficiency may often be a more important objective than water resource considerations.

Economic efficiency considerations need to be looked at from the perspective of the various water institutions and from the perspective of society at large. A major constrain to demand management measures is that often a certain measure may not be economically efficient from a specific water institution's perspective but may be economically efficient from the society' perspective. An example to illustrate this is reducing demand to the affluent domestic consumers in Sandton. Such a measure could be economically efficient to society due to the economic benefit of postponing the next augmentation scheme in the Vaal River system. However this will not be economically efficient to the Sandton local authority which will have a reduction in revenue as a result of a reduction in water sales.

In evaluating the economic efficiency of WC/DM measures, it can be easily motivated that the perspective of society needs to have priority over the economic efficiency perspective of the various water institutions. This is particularly true for water institutions that are government or public organisations. It is important however to carry out economic efficiency evaluations from both the various water services institutions perspectives and for society in general for the following reasons:

- To asses if a specific demand management measure threatens the financial and economic sustainability of a water institution
- To assist in prioritising measures that will be economically efficient for both water institutions and the society at large
- To identify the potential financial contribution by each institution in the water supply chain for a certain demand management measure calculated according to the net economic efficiency from its own perspective

The economic efficiency that can be achieved through WC/DM is determined by evaluating the net present value of the difference between the economic cost of demand management measures and the economic benefits.

The economic benefits of demand management measures are related to their potential in reducing expenditure related to the supply of water or the transport and treatment of water. These are the avoided costs of the water supply industry and can be divided into avoided operating costs and avoided capital costs.

The economic costs of demand management measures are related to the cost of implementing the demand management initiatives, the cost of foregone net revenue from reduced water sales and the operating costs of the demand management measures. In calculating the economic costs of any WC/DM measures, it is important not to only look at the costs of implementing those initiatives, but to also look at the sustainability of the measures to reduce consumption.

### **a) Avoided operating costs from the water institutions perspective**

Avoided operating costs will vary according to which institution's perspective it is looked at. The operating costs can be generally sub-divided into, the cost of purchasing the water from the supplier and the net operating costs related to the functions of that institution. These include energy costs and chemical costs.

An important distinction needs to be made between measures that reduce non-revenue demand and measures that reduce revenue demand. The economic efficiency to water institutions of reducing non-revenue demand could be enhanced because income for such demand does not offset the operating cost benefits. Such measures are achieved when a water institution manages the distribution system efficiently and reduces losses from the system. In the water services sector it may involve reducing unaccounted for water which includes reducing distribution leaks, illegal connections and faulty metering and billing. In the irrigation sector it may include reducing losses such as seepage from canals, distribution leaks and unauthorised abstraction of water. Water institutions have a responsibility to the public to minimise non-revenue demand which reflects the efficiency of their own activities. It is very important that water institutions also reflect the ethos of WC/DM if they are to establish credibility with the consumers.

A less conventional measure of reducing non-revenue demand by water services institutions is reducing domestic water leaks and consumption in areas with low payment levels for services. Although repairing and retro-fitting domestic house installations are classified as customer demand initiatives rather than distribution management initiatives, water services institutions should not ignore the potential costs savings by implementing such measures at their own cost. Finding and repairing domestic leaks has the added advantage of making water more affordable to consumers and thus supporting an increase in the level of payment.

### **b) Avoided operating costs from society's perspective**

In evaluating the avoided operating costs from the society's perspective the total benefits must be calculated through the entire water cycle: including distribution management, customer demand management, and return flow management. For example the operating costs of water used to flush a toilet is the sum of: electricity costs for pumping water through a water transfer scheme, the payment of royalties if they exist, the chemical cost for purifying the water, the electricity cost for bulk water supply pumping, the operating costs for distribution, and the chemical and electricity costs for the collection and treatment of effluent.

In addition to the total avoided costs it is also important when evaluating the economic efficiency of a demand management measure to take into account the reduction in the customer's water, sewage bills and the customer's energy bills.

### **c) Avoided capital costs benefits**

Reducing the growth in demand can result in postponing large infrastructure requirements and will thus result in significant financial savings. The real long-term interest rate in South Africa is estimated to be between 6% to 8% which implies that the potential financial benefits of postponing infrastructure is between 6% to 8% per annum of the cost of developing the infrastructure. It is estimated that, if the growth in demand in

Gauteng is not reduced, over the next 20 years, R 10 billion will have to be spent on new wastewater treatment plants and R 17 billion will have to be spent for new water augmentation schemes. The net present potential value of postponing all new bulk water supply infrastructure projects in Gauteng by one year alone exceeds R 2 billion.

#### **4.5 Social development, equity and accountability**

Demand management can enhance the objectives of social development and equity in a number of ways. Some of these are described below.

##### **a) Ensuring the sustainability of water services**

There are approximately 12 million people in South Africa without reasonable access to potable water. If the basic water needs of 25 litres per capita per day (lcd) is provided, the total water requirement is 300 megalitres per day (Ml/day). The challenge is not only to develop the infrastructure or to provide the amount of raw water required, but how to maintain, manage and prevent the abuse of such systems. Through the implementation of demand management and customer focus, solutions can be found to ensure that customers do not use more water than they can afford and that reticulation systems are maintained efficiently. Demand management can therefore be instrumental in ensuring the sustainability of water services.

##### **b) Making water services affordable**

The reduction of domestic water consumption by repairing domestic water leaks, installing water efficient plumbing fittings and changing the behaviour patterns of consumers can reduce the cost of potable water services significantly. This is particularly important to poor communities who often have their services disconnected because they cannot afford the high costs.

##### **c) Enhancing the objective of service provision for all**

By reducing distribution water losses and inefficient consumption, existing resources and bulk infrastructure can be used to provide new services to people. Demand Management can therefore assist and speed up the process of service delivery for all.

##### **c) Creating job opportunities**

WC/DM initiatives generally offer more jobs to the community than supply side management initiatives. Examples are the Working for Water Project that provides thousands of job opportunities, and the repair of domestic water leak projects.

##### **d) Accountability to consumers**

Demand management requires that water institutions are accountable to the public and they understand the consumers and their needs. In general demand management requires that water institutions establish a strong relationship with the consumers and users.

## 5 PLANNING CONSIDERATIONS

The key challenge for the WC/DM approach is its integration into the water resource planning process. In the past WC/DM initiatives have been considered only as strategies associated with environmental or communications initiatives which often led to inefficient water supply planning.

“Integrated least cost planning” or “Integrated Resource Planning”, (IRP) which emerged in the context of regulations from electricity utilities in the USA, emphasises WC/DM as potential alternatives to increasingly expensive supply side management options.

The main functions of the integrated least cost planning approach and demand management paradigm are as follows:

- Integration of initial capital costs and long term operating costs in the planning process
- Introduction of social, environmental and economic issues as important considerations in the planning process
- Focusing on the end consumers and users
- Integration of the planning of the various institutions in the water supply chain

### 5.1 *What is meant by “Integrated Resource Planning”*

Integrated resource planning (IRP) is a process for determining the appropriate mix of demand-side and supply-side resources that are expected to provide long-term, reliable service to users at the lowest reasonable total cost and that which maximises benefits to society and minimises the impact to the environment. IRP for water institutions is an evolving concept with certain parameters such as avoided costs and cost-benefit tests that need to be appreciated.

The definition adopted for “Integrated Resource Planning” is:

**“ A way of analysing the change in demand and operation of water institutions that evaluates a variety of supply and demand factors to determine the optimal way of providing water services. A path is chosen that will ensure reliable services for the customers. This path must include: economic efficiency and stability, a reasonable return on investment for the institution, environmental protection and equity among ratepayers.”**

### 5.2 *Key opportunities and constraints of Integrated Resource Planning*

All demand-management activities that decrease the demand tend to affect supply management because existing system capacity is released for other customers and other users. The redirected capacity can be compared to that provided by the development of new capacity. Taking this concept further leads to the introduction of “**negalitres**”, water “produced” through conservation and efficient use of existing resources.

The opportunities for demand management exist due to the high levels of loss and

inefficient use. It is also important to note that most of the time water is used for the service that is derived from it and not for the water itself. Some examples to illustrate this are:

- Flushing a toilet. The objective is to clean the pan and contribute to the transport of sewerage to the wastewater treatment plants. If through new technologies the water required to flush a toilet is reduced to 4,5 litres rather than 11 litres, the consumer's lifestyle is not altered but water consumption is reduced significantly.
- Irrigation of crops. The objective is to maximise yield per litre of water. Through better land, farming and irrigation management practises, consumption can be reduced significantly without reducing crop yield.

It is estimated that in both the urban and irrigation sectors water loss and inefficient usage could be as high as 45%. The IRP process can determine at what rate and cost these inefficiencies can become an increased supply.

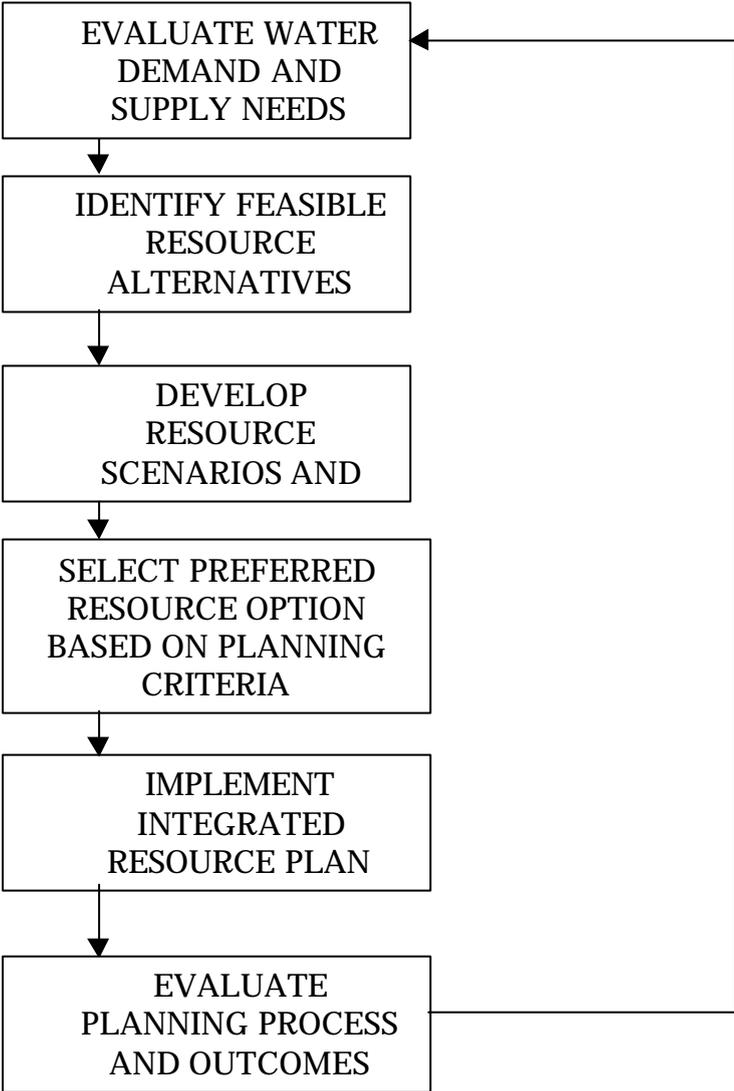
One of the obstacles to the IRP process is whose costs are supposed to be the "least": the institutions, existing customers, future customers, secondary consumers (consumers that use water downstream of the return flow of the initial consumers) or society at large. This becomes even more complicated when one considers that by implementing a demand management initiative there are participating consumers and non-participating consumers. It is possible that the implementation of a demand management initiative may be of financial benefit to community "A" who was involved directly by that initiative, but of a financial burden to community "B" who was not involved. One can argue however that the IRP process should aim to achieve the least-cost to society at large. It is important, considering South Africa's socio-political background, that the impact of any demand management initiative is looked at from various perspectives. Water utilities need to be transparent to their consumers and involve public participation in any planning process. There are various economic tests that should be considered before deciding on any demand management initiative and these should also include environmental and even political costs if possible.

A very important aspect of the principles of IRP is the need to look at the water supply chain holistically. This requires co-ordination and co-operation by all utilities and organisations in the supply chain. **IRP can only be achieved through the ethos of partnerships and customer focus.**

### **5.3 The IRP process**

The Integrated Resource planning process is iterative. Figure 2 gives a simple illustration of typical IRP process.

Figure 2: A TYPICAL IRP PROCESS



## **6 WATER CONSERVATION AND DEMAND MANAGEMENT MEASURES**

There are a number of demand management and water conservation measures and initiatives that can be implemented and these can be defined according to different categories. The categories adopted are general for all water sectors and are according to the different components of the water supply chain. Associated and common to all the categories and measures below is the need for research, consultation, communication and education.

The WC/DM measures listed below should be included and evaluated as options in an integrated least cost planning approach. The list is not exhaustive but contains many of the key measures.

### **6.1 *Water conservation measures in resource management functions***

- Water catchment management (i.e. removal of invading alien plants, wet-land rehabilitation)
- Dam storage optimisation (i.e. Suppression of evaporation)
- Protection of water resources from over utilisation
- Social awareness and education, social marketing campaigns
- Managing land use
- Water quality management
- Drought contingencies

### **6.2 *Demand Management measures in the distribution and water supply functions***

- Regulations / Guidelines
- Infrastructure optimisation
- Town planning policies
- Different levels of service
- Loss minimisation, (i.e. reducing unaccounted for water, canal lining)
- Reuse and reclamation options
- Metering
- Pressure management
- Dual distribution systems
- Education, awareness, and training

### **6.3 *Demand Management measures on customers / end use***

- Regulations / Guidelines
- Metering
- Different level of service
- Irrigation scheduling
- Auditing
- Incentives
- Minimising and metering institutional water use (own use)

- Loss minimisation (domestic plumbing or irrigation systems leak reduction)
- Retro-fitting existing systems (replace plumbing or irrigation systems with efficient systems)
- Effective pricing
- Effective billing
- Customer education and awareness, social marketing campaign

#### **6.4 Water Conservation measures for return flow management**

- Infrastructure optimisation
- Minimising losses
- Minimising infiltration
- Minimisation pollution
- Reclamation

## **7 THE LEGAL AND REGULATORY FRAMEWORK**

The recent enactment of the National Water Act and Water Services Act make various requirements and provisions for the implementation of WC/DM principles. One of the functions of a national water conservation strategy is to fulfil these requirements made through the legislation but to also utilise the opportunities created through the legislation to develop comprehensive policies.

The following section will highlight some of the important references and implications of the two acts on WC/DM.

### **7.1 Water Services Act - General**

- a) The Water Services Act sets out a framework to ensure the provision of basic water supply and sanitation and a regulatory framework for water services institutions. Amongst the **Act's stated objectives** are included the following:
  - The accountability of water services providers;
  - The promotion of effective water resource management and conservation
- b) All water services institutions are required to develop **conditions for the provision of water services** that must include for measures to promote WC/DM.
- c) The Act makes provision for the Minister to prescribe compulsory national standards, relating to amongst other issues:
  - The effective and sustainable use of water resources for water services
  - The nature, operation, sustainability, operational efficiency and economic viability of water services
- d) The Act makes provision for the Minister to prescribe norms and standards in respect of tariffs and the may include for tariffs to be used to promote or achieve water conservation.

- e) The Act makes provision for the Minister to prescribe measures to be taken by water services institutions to conserve water.
- f) The Act makes provision for anyone who continue the wasteful use of water after being called upon to stop by the Minister, a Province or any water services authority to be prosecuted.

## **7.2 Water Services Act – Water Services Authorities**

- a) The Act makes the requirement that in ensuring access to water services, a water services authority must take into account :-
  - alternative ways of providing access to water services
  - the need for regional efficiency
  - the need for low costs

This allows authorities to explore different levels of service that can be better managed and are more affordable. The need for regional efficiency allows for the introduction of integrated regional demand management strategies.

- b) The Act requires that water services authorities' development plans contain details of existing and proposed water conservation, recycling and environmental protection measures.

This provision can be used to identify if local authorities have complied with any regulations relating to water conservation. It is also possible to introduce the concepts of IRP through the development plan in order to ensure regional integrated efficiency.

## **7.3 Water Services Act – Water Boards**

- a) The Act allows Water Boards to perform water conservation functions under “other activities”.
- b) The Act requires Water Boards to set conditions for the provision of services relating to water conservation and the prevention of wasteful or unlawful use of water provided.
- c) The Act requires that a Water Boards in performing its activities and duties must exercise a balance between:
  - Striving to provide efficient, reliable and sustainable water services;
  - Optimally using available resources
  - Promoting the efficiency of water services authorities
  - Taking reasonable measures to promote WC/DM, including promoting public awareness of these matters.

## **7.4 National Water Act - General**

- a) The main purpose of the Water Act is to ensure that the nation’s water resources are

protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors: Promoting the efficient, sustainable and beneficial use of water in the public interests;

- b) The Act makes provision for the Minister to make regulations limiting or restricting the purpose, manner or extent of water use.
- c) The Act makes provision for a water authority to attach conditions to every general authorisation or licence relating to the protection of water resources
- d) The Act requires that a National water resource strategy is established and the contents of the strategy must set out strategies, objectives, plans, guidelines and procedures of the Minister and institutional arrangements relating to the protection, use, development, conservation, management and control of water resources.
- e) The Act requires that a catchment management strategy is established and the contents of the strategy must set out strategies, objectives, plans, guidelines and procedures of the catchment management agency for the protection, use, development, conservation, management and control of water resources within its water management area.
- f) The Act makes provision for including for funding water resource management including water conservation in setting water use charges.

## **7.5 Regulations**

Regulations are a useful method of achieving efficient water use. The implementation of regulations needs to be part of a balanced strategy that includes measures that are directly implemented and funded by water institutions, and measures that promote the change in behaviour of consumers.

Regulations work best when they:

- Do not greatly increase the marginal cost of new equipment
- Do not require changes in the level of comfort or service to the end consumer
- Are seen to be fair and reasonable, and in the interests of the community
- Can be easily implemented

Both the Water Services Act and the Water Act allow for the development of regulations. The principles of the national water conservation strategy will be used to identify and develop regulations.

Regulations will need to be regularly revised in accordance with the WC/DM strategies, with any technology developments, and with their acceptability to consumers and users.

## **8 NATIONAL STRATEGY FRAMEWORK**

The following sections define the National Strategy Framework by describing the objectives

and goals.

## **8.1 Objectives**

**Objective A:** *Create a culture of WC/DM within all water management and water services institutions*

**Objective B:** *Support water management and water services institutions to implement water WC/DM*

**Objective C:** *Create a culture of WC/DM for all consumers and users*

**Objective D:** *Promote international co-operation and participate with other Southern African countries, particularly basin sharing countries, in developing joint WC/DM strategies.*

**Objective E:** *Enable water management and water services institutions to adopt integrated resource planning (IRP)*

**Objective F:** *To promote social development and equity*

**Objective G:** *Contribute to the protection of the environment, ecology and water resources*

**Objective H:** *Contribute the parameters of water economics to development planning processes*

## **8.2 Goals supporting the objectives**

**GOALS OF OBJECTIVE A:** Create a culture of WC/DM within all water management and water services institutions

- A.1 Educate and create awareness on WC/DM objectives and principles for all officials and employees working in water institutions.
- A.2 Ensure that water institutions demonstrate efficient water usage and are not directly responsible for the inefficient use and wastage of water.
- A.3 Promote and ensure the regional co-operation and co-ordination amongst water institutions
- A.4 Ensure the implementation of water conservation principles by all public sector and parastatal institutions.
- A.5 Ensure that tariffs implemented by water institutions promote WC/DM
- A.6 Develop and propagate regulations relating to the functions of water institutions that will promote WC/DM
- A.7 Ensure the inclusion of WC/DM functions into job descriptions employed by water institutions.
- A.8 Develop water efficiency rating for water institutions
- A.9 Develop guidelines and model WC/DM strategies for all water institutions

**GOALS OF OBJECTIVE B:** Support water management and water services institutions to implement WC/DM.

- B.1 Develop policies and guidelines for water institutions that will allow for the funding of water WC/DM initiatives
- B.2 Develop a database and library of knowledge, information and case studies and ensure easy access to all interested parties
- B.3 Develop incentives and rewards for initiatives
- B.4 Promote the development of new technologies that promote WC/DM
- B.5 Identify and remove constraints to WC/DM principles
- B.6 Develop a national political awareness and commitment on the principles and policies of WC/DM

**GOALS OF OBJECTIVE C:** Create a culture of WC/DM for all consumers and users.

- C.1 Create an ongoing awareness on the value of water and the need for water conservation for all consumers and users in South Africa.
- C.2 Facilitate education strategies on WC/DM.
- C.3 Enable and promote the payment of water and water services by all consumers and users.
- C.4 Enable consumers and users to understand how, where, quantity and impact of water they use.
- C.5 Introduce regulations that limit the wastage and inefficient use of water by consumers and users.
- C.6 Enable the development of benchmarking for efficient water usage for all water usage sectors.

**GOALS OF OBJECTIVE D:** Promote international co-operation and participate with other Southern African countries particularly with basin sharing countries in developing joint WC/DM strategies.

- D.1 Revisit and review existing protocols, treaties and agreements in terms of WC/DM principles
- D.2 Make WC/DM a priority issue within discussions and negotiations with neighbouring countries.
- D.3 Support neighbouring countries in developing and implementing jointly water conservation strategies.
- D.4 Establish credibility for South Africa amongst neighbouring countries on WC/DM initiatives
- D.5 Develop inter-basin water catchment management strategies.
- D.6 Transfer and share information, technology and knowledge amongst neighbouring countries.
- D.7 Utilise international co-initiatives and opportunities to further develop the scope of WC/DM in S.A.

**GOALS OF OBJECTIVE E:** Enable water management and water services institutions to adopt the integrated resource planning (IRP) paradigm

- E.1 Promote the principles of IRP to all key role players in the water industry.
- E.2 Develop guidelines and models on the implementation of IRP process.
- E.3 Ensure the co-funding for WDM initiatives by each institution in the supply chain according to the avoided cost concept.
- E.4 Develop guidelines to incorporate social and environmental objectives in the planning process of water supply.

- E.5 Ensure the co-ordination and co-operation of planning between all stakeholders in the water value chain.
- E.6 Develop guidelines and methodologies for understanding existing water usage and consumers, and the drivers for future growth.

**GOALS OF OBJECTIVE F:** To promote social development and equity

- F.1 Ensure social considerations in the planning process for water supply by all water institutions.
- F.2 Ensure effective public and consumer representation in the water planning processes.
- F.3 Identify and quantify direct and indirect social benefits of various demand management initiatives.
- F.4 Ensure the opportunities for the creation of jobs through demand management initiatives.
- F.5 Promote the involvement and recruitment of women in water supply decisions and job opportunities.
- F.6 Ensure all water supply tariffs by all water institutions promote equity amongst all people and users.
- F.7 Ensure transparency and accountability to users and consumers by all water institutions.
- F.8 Ensure the development of skills for previously disadvantaged communities through the implementation of WC/DM initiatives.
- F.9 Ensure customers pay for water services.

**GOALS OF OBJECTIVE G:** Contribute to the protection of the environment, ecology and water resources

- G.1 Contribute to the water conservation component of the guidelines for water catchment management strategies.
- G.2 Develop strategies to ensure that the use and management of water resources does not destroy or damage ecosystems and the biodiversity.
- G.3 Promote inter sector co-operation and co-ordination between the department of environment and other interested public utilities and institutions.
- G.4 Identify and evaluate methods and initiatives that increase the yield of water resources, and restore ecosystems that have previously been adversely affected by inappropriate water resource management practises.
- G.5 Develop water regulations that will ensure the protection and sustainability of our water resources.

**GOALS OF OBJECTIVE H:** Contribute the parameters of water economics to development planning processes

- H.1 Create an awareness amongst key role players on the need for water related considerations in the macro planning process
- H.2 Assist in the development of resource economics tools
- H.3 Develop guidelines for the inclusion of water-related considerations and processes in the macro planning process
- H.4 Develop guidelines and policies for the provision of new water services for “wet industries” in regions where water resources are considered scarce

## 9 CONCLUSION

This document has mapped out the key principles, legislative, economic and social frameworks that would guide a national water conservation and demand management strategy. It has been as comprehensive about the different components of the framework as advised the current perceptions of sector knowledge. These perceptions are being tested through this consultation process. To repeat the Minister's sentiment, a consultation process can only be as successful as the level of stakeholder participation. We therefore urge you to forward your critique, comments as well as requests for further interactions to

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