Department : Water Affairs and Forestry

Integrated Water Resources Management

Guidelines for Water Conservation and Water Demand Management
Volume 3: WSI Implementation Guide
Summary

DEPARTMENT OF WATER AFFAIRS AND FORESTRY

INTEGRATED WATER RESOURCES MANAGEMENT

GUIDELINES FOR WATER CONSERVATION AND WATER DEMAND MANAGEMENT IN WATER MANAGEMENT AREAS AND IN THE WATER SERVICES SECTOR, SOUTH AFRICA

VOLUME 3

Implementation of Water Conservation and Water Demand Management Measures within the Water Services

Summary

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LIST OF ABBREVIATIONS

CMA	Catchment Management Agency
conn	connection (of pipe from water main or sewer to building)
CRC	cost rebate charge
DWAF	Department of Water Affairs and Forestry
DANCED	Danish Cooperation for Environment and Development
esb	equivalent service burst
GIS	geographic information system
ILI	infrastructure leakage index
IPM	integrated pest (weed) management
IWRM	integrated water resource management
KAP	knowledge, attitudes and practises (survey)
KPI	key performance indicator
kl	kilolitre (= one cubic metre)
km	kilometre
l	litre
m	metre
NWCDMS	national water conservation and demand management strategy
PPRI	Plant Protection Research Institute
PRV	pressure reducing valve
RBC	rising block charge
SABS	South African Bureau of Standards
SCADA	supervisory control and data acquisition
UARL	unavoidable real losses
UAW	unaccounted for water
WC	water closet
WC	water conservation
WDM	water demand management
WMA	water management area
WSI	water services institution

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INTRODUCTION

The passing of the National Water Act (no 36 of 1998) marked a radical change in water management policy for South Africa. The concept of integrated water resource management (IWRM) is enshrined in the Act and a key component is the adoption of an active policy on water conservation and water demand management.

To assist the DWAF in the establishment of IWRM principles, the Danish government aid agency, Danish Cooperation for Environment and Development (DANCED, later integrated with DANIDA), funded a technical assistance project during 2000-2004. The scope of this project included the preparation of water conservation and water demand management (WC/WDM) guidelines, to support the implementation of DWAF's National Strategy for WC/WDM.

Volume 1 provides guidance on the planning framework for WC/WDM at a water management area level and covers all water use sectors. **Volume 2** provides guidelines on undertaking a situation assessment and developing a business plan for a water services institution (WSI). This **Volume 3** comprises guidelines on the implementation of WC/WDM measures.

1 WATER RESOURCE MANAGEMENT

1.1 Water Quality Management – Surface Waters

WSIs are key stakeholders in the water resources and need to take an active role in their management. Water quality management objectives within WC/WDM are inter-related and are concerned with:

- Maintenance of fitness for use
- Minimisation of water requirement
- Minimisation of in-stream water requirement.

Specific measures to be taken may include:

- Minimising overflow of sewers through correct settings of combined sewer overflows and regular maintenance programmes
- Improving levels of wastewater effluent treatment
- Reducing the nutrient levels in returned water from agricultural run-off
- Controlling the use of motorised water craft with respect to discharge of hydro-carbons

The use of economic instruments to achieve pollution control objectives is complementary to a regulatory regime of enforcement. This is generally known internationally as the "Polluter Pays Principle" and has been considered by the Water Research Commission in the South African context. This was followed by a national scale Department of Water Affairs and Forestry study to evaluate the implementation of a Waste Discharge Charge System (WDCS).

1.2 Water Quality Management – Groundwaters

Specific responsibilities of WSIs in implementing groundwater quality management strategies are advocated in DWAF's Policy and Strategy for Groundwater Quality Management and include:

- Resource monitoring and dissemination of groundwater data
- Preparation of groundwater resource status reports
- Evaluation of applications and issuing of licenses
- Co-operation with the authorities responsible for source-based control to impede the introduction of contaminants into aquifers (with respect to planning)
- Control of groundwater abstraction to provide for sustainable utilisation and to prevent or minimise the migration or intrusion of poor quality groundwater
- Defining source areas and implementing the national well-head protection programme (e.g. when operating a well field
- Public education and assistance and dissemination of public information.

The strategies required for groundwater quality management in South Africa are guided by the National Water Act and the requirements of DWAF. Measures that may be taken fall into one of four types:

1. Resource Directed Measures (Classification, the Reserve, Resource Quality Objectives)
2. Source Directed Measures
3. Well-head Protection Measures
4. Remediation Strategies

Further information is given in the Groundwater Management Guidelines.

1.3 Removal of Invading Alien Plants

Alien plant control involves a sequence of activities aimed at the effective elimination of the invading plant species, or combination of species in a particular area. The timing and nature of these operations are determined largely by the (combination of) species present.

A control programme commences with a survey and situation assessment and needs to be planned over a 5 year (say) timescale.

The programme should be prioritised according to the basic rules of:

- Light before dense
- Clear source areas first
- Go for greatest impacts

The specific measures to be implemented are very location dependent due to the wide variance of flora across South Africa. The Working for Water programme and Plant Protection Research Institute (PPRI) may be referred to for specific guidance. An integrated pest (weed) management approach should be adopted for greatest efficiency and cost-effectiveness; bio control alternatives should be considered as well as mechanical control methods. The control programme must also be alert to the opportunities for use of cleared material as a resource that can provide local employment.

The key features of a successful clearance methodology are:

- Work within your means.
- Work systematically
- Be thorough
- Complete the job

It is essential to complete the job by re-establishing indigenous vegetation. A maintenance regime must be established following the initial clearance. Commitment to a medium-long term plan is essential. Once maintenance budgets are set, they must be maintained and not altered on a year-to-year basis.

1.4 Optimisation of Reservoir Storage

Optimisation of reservoir storage in the context of WC/WDM is concerned with the management of long term storage, i.e. impounding reservoirs. The aim is to:

- Reduce silting to ensure the maximum storage capacity is available through dredging, installation of silt traps and flushing.
- Reduce evaporation or the potential for evaporation to reduce losses through the introduction of transfer of water to storage with potentially lower evaporation rates.
- Implement management, institutional and administrative measures for the transfer of water among alternative users to facilitate the reduction in evaporation and silting.

2 DISTRIBUTION MANAGEMENT

2.1 Flow Measurement

Complete and competent flow measurement from "source to tap" is a pre-requisite of effective demand management as well as for efficient operational management of the water supply infrastructure.

A complete hierarchy of bulk, district, zone and consumer metering, as illustrated in Figure 1, is necessary to make accurate estimates of the various types of water loss.

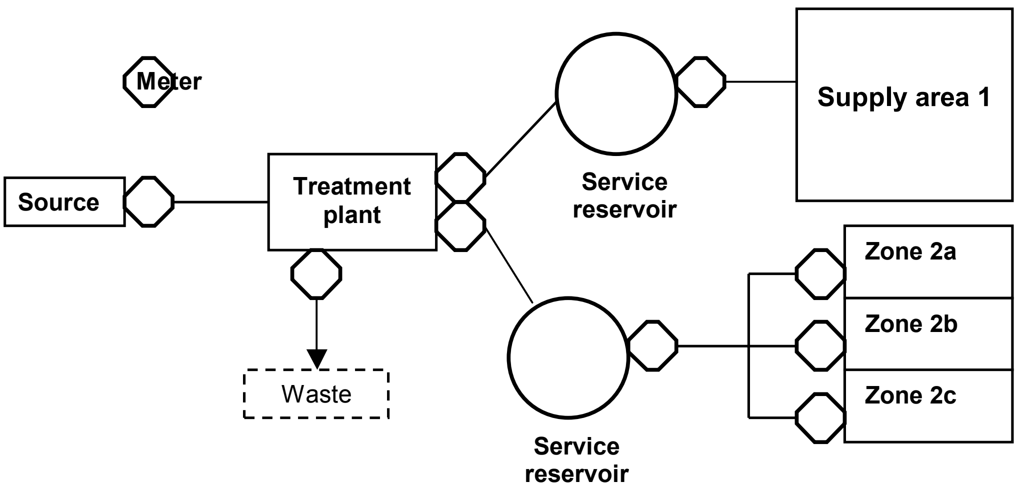

FIGURE 1: HIERARCHY OF FLOW MEASUREMENT (CONSUMER METERS NOT SHOWN)

The metering itself must be sufficiently competent to be relied upon in making loss assessments and in developing and undertaking water loss control programmes. Unless there is already a meter management programme in place, the initiation of WC/WDM measures provides the opportunity to establish a regime of accurate flow monitoring. This commences with a survey and accuracy check, the re-calibration or renewal of defective or obsolete meters, plus the installation of new meters where necessary to complete the hierarchy.

Once the flow metering has been brought up to a satisfactory level of completion and accuracy, a programme of regular calibration of system management meters and replacement of ageing and defective consumer meters should be established.

If active leakage control is to be practised, zone meters as shown in supply area 2 are required.

2.2 Zone Metering and Sectorisation

An accurate meter on any feed into supply, regardless of the size of the supply area or district, can be used to estimate the amount of water loss, both by mass balance and night flow methods. Sectorisation enables leakage control efforts to be targeted efficiently to areas of highest loss. The smaller the area supplied from the meter, the easier it is (a) to localise leaks and (b) to identify that a new leak has occurred. The latter is generally achieved if the zone size is less than 2,000 properties and preferably less than 1,000.

2.3 Water Meter Types, Applications and Selection

There are no universally suitable flow meters for all applications and it is important to choose the one that meets as many of the requirements for a particular installation.

Mechanical meters, turbine or velocity, are the most common type of meters in use, both for system management and consumer flow measurement. Electromagnetic and ultrasonic meters are potentially more accurate and cost effective for larger sizes above 300 mm dia, but require specialist skills to ensure correct installation and maintenance if there is to be confidence in the output data.

Differential pressure meters, e.g. venturi, orifice plate, have very poor accuracy at low flows and are generally now regarded as being obsolete.

It is essential that flow meters are correctly sized for the range of flows that will be experienced, otherwise accuracy will suffer and possibly no flow will be registered at all when there is a low flow through the meter. Over-sizing of meters by fitting a meter of the same size as the pipeline in which it is installed is the most common fault in this regard.

Data loggers and telemetry links should be considered to ensure full and efficient data capture and for ease of interrogation and archiving.

2.4 Leakage Reduction

There are various factors that cause water leakage from potable water supply and delivery systems and these can be summarised as follows (SABS 0306: 1999):

- Appropriateness of original design, specification of materials and construction workmanship
- Pressure - the higher the pressure, the higher the flow rate from a given defect
- Soil type - soils such as clays are subject to movement, potentially causing fractures in pipes and fittings; corrosive soils can cause failure of metallic pipe materials and fittings.

- Corrosion potential of the pipe and soil systems together
- Climate - variations in temperature, rainfall, humidity
- Traffic - vibrations induced by vehicles can cause defects

Time is fundamental to the practice of leakage control, whether “passive” or “active”. When a leak occurs, its discovery and repair may be a matter of hours only in the case of a major burst that causes loss of supply and/or flood damage. But other leaks may run for many months or years before discovery. Even quite small leaks can lose very considerable quantities of water if they run for many years. Consequently **the objective of leakage control is to minimise the time between a new leak occurring and its repair**.

In a reticulation system new leaks are occurring all the time, at a rate dependent on the factors previously mentioned. This phenomenon is known as the “natural rate of leak propagation” and when considered in conjunction with the time factor means a water loss control programme must comprise two stages:

1. Reducing losses to a practicable/economic level
2. Keeping them there, permanently

There are many examples of good results from one-off campaigns as (1). Unfortunately a not insignificant number of initiatives fail to be sustained as in (2).

Leakage control can be applied to the following main group of assets:

- Service reservoirs and water retaining structures.
- Large dedicated supply pipelines with few or no off-takes.
- Water distribution networks.

In all cases, the activity comprises the three stages of:

1. Estimating the amount of loss
2. Locating the source(s) of loss
3. Stopping the loss by repair or operational control.

The time between (2) and (3) is a measure of the effectiveness of the control methodology and procedures adopted.

In existing water distribution networks, the basic methods of leakage control employed comprise:

- Passive leakage control – a formalised procedure for receiving reports of leaks that ensures that all reported leaks are repaired quickly
- Active leakage control – a pro-active monitoring and control regime in which new leaks that occur and which have not been reported are quickly identified, located and repaired
- Pressure management – the reduction of excessive pressures in the network to levels that are nevertheless adequate for consumers, typically 20 to 30 m pressure
- Rehabilitation of the network – renewal of water mains and services that are beyond economic repair, i.e. that in a given area are prone to repeated bursts and incur high costs in maintenance and repair

“Active leakage control” is an ongoing operational activity and must not be seen as a one-off or occasional campaign initiative.

Pressure management does not involve the location and repair of leaks; it simply reduces the amount of water lost through a given leak. It may have spin off benefit in reducing the frequency of bursts in parts of the network that are in poor structural condition.

Rehabilitation of a water distribution network is not normally justified financially on leakage reduction grounds alone, except in very severe localised instances. An integrated approach to rehabilitation that addresses general structural / pipe life, failure rates (burst frequency), hydraulic performance and also water quality issues, if applicable, is recommended.

Finally consideration must be given to the installation of new infrastructure, particularly underground water mains and services, to quality standards that do not lead to a recurrence of the leakage problems that the WSI may be facing with its existing infrastructure. Technically there is no reason why a “leak free” system cannot be devised and implemented, if that aspiration is given priority and importance in design and installation.

2.5 Asset Management

The provision of a water service to consumers requires the necessary physical infrastructure assets to abstract, treat, store, convey and deliver water to consumers, and the appropriate deployment of operational resources. Assets that are in good physical condition will require less operational attendance and will perform better than those in poor physical condition.

In the context of WC/WDM: distribution management, asset management is primarily concerned with the structural condition of the infrastructure and the amount of leakage therefrom, and the competence of the flow metering, especially the large stock of consumer meters.

Rehabilitation of a network can take several forms:

- **Replacement** of mains, in which the old main or service connection is either abandoned or destroyed and is replaced by a new pipe.
- **Renovation** in which the existing main is retained and continues to perform a structural function
- **Reinforcement** in which the hydraulic capacity of the network is increased, either by providing a new main or mains, or by renewing an existing main in a larger size

Consumer meters may require replacement for several reasons:

(a) They are worn and provide inaccurate / misleading readings, especially at low flows – not necessarily immediately apparent

(b) They do not work at all – immediately apparent unless property is not occupied

(c) They are not correctly sized, typically over –sized, and are therefore inaccurate, more likely to under-record rather than over-record

The rate of deterioration of the consumer meter stock depends on the quality of the original meter - design and materials of manufacture - and the characteristics of the water, in terms of corrosion potential and the erosion / seizing up of mechanisms due to particulate matter.

The establishment of a consumer meter management programme consists of three stages:

1. Evaluation of the existing meter stock and the establishment of criteria for meter replacement based on accuracy requirements
2. Accelerated initiation of the programme to catch up with the backlog of past neglect
3. Ongoing meter replacement to maintain the meter stock within the required accuracy levels.

2.6 Dual Distribution Systems

A dual distribution system supplies two grades of water through two separate pipe networks in the same service area, one being potable and the other non-potable. It can reduce demand for potable quality water by some 25 to 50%.

Non-potable water may derive from natural raw water sources that have not been treated to drinking water standards. Of interest in water conservation are dual systems that utilise treated effluent from wastewater treatment plants, either directly or indirectly from surface waters that have received wastewater effluent.

The non-potable water is generally used for irrigation / garden water, but also may have applications in industry. Whilst not suitable for direct human consumption, non-potable water in such systems should be microbiologically and chemically safe for skin contact, garden irrigation of vegetables eaten raw and salad crops.

2.7 Intermittent Supply Rationing

This distribution management tool may need to be considered in cases where the water demand is in excess of the water available at source or from a particular water distribution reservoir. It can also be considered in areas where the water demand needs to be reduced to cut operational costs. The method simply involves closing the inlet isolating valve(s) to the selected area of the network for a predetermined period. For large areas, this valve is usually a distribution reservoir outlet valve.

Intermittent supply rationing is most suitable in areas where total water wastage from the distribution system is high. It is easiest to apply in areas where no water point flow control devices have been installed to deliver a fixed maximum amount of water to individual customers. If such flow control devices are not adjusted, customers with these devices fitted will be further rationed unjustly.

3 CONSUMER DEMAND MANAGEMENT

3.1 General

“Technical” measures must be accompanied by and be integrated with a complementary programme of social awareness and education.

It is a necessary baseline for the development and relevant targeting of any type of consumer demand management measure to understand the patterns of consumer use amongst different categories of consumer, i.e. how much water is used for what purposes and the nature of the proportion of consumption that is waste. Benchmark consumption breakdowns are given in Volume 2. Further targeting at an individual consumer level may be appropriate by reference to consumer billing records, assuming reasonable reliability of the consumer meter stock.

The basic objective of any consumer use reduction initiative is to change the habits and practices of consumers such that they use less water, without them having to experience any significant reduction in quality of life.

Measures that may be employed to reduce consumer use include:

- Education & Awareness (refer section 5)
- Water Efficient Appliances
- Waste Control Fittings Reclamation and Re Use Consumer Leak Repairs
- Delivery Point Water Management
- Financial Management

3.2 Water Efficient Appliances and Installations

Any new hot and cold water services installations should be designed according to "waterwise" good practice. This is obviously a more cost effective approach than retrofitting a few years later. Waterwise domestic plumbing "designs out" such defects as dead legs, imbalances in hot and cold pressures that may cause overflow, and incorrect pipe sizing.

Internally the water used for flush toilets generally offers the greatest scope for savings, by reducing cistern volume in combination with dual flush mechanisms. Low cost cistern volume reducing bags are available, but as with other similar measures, there is a limit to the extent to which cistern volume can be reduced without affecting the flushing performance of an existing pan that was designed for a larger cistern.

In commercial buildings, urinals should be fitted with controllers that eliminate flushing when the toilet is not in use.

User acceptance of low use taps and showers is aided by well designed spray heads that give good wetting properties.

Opportunities for water saving are also found in hot water systems, such as point of use heaters. These offer a secondary benefit both to the consumer in lower electricity bills and in saving power station cooling water.

Drip irrigation systems offer the greatest water use efficiency in garden watering, but relies upon the consumer getting the installation right and using it correctly.

3.3 Water Conserving Habits and Practices

These are generally well known and feature in most social awareness and education campaigns:

- Fix leaking taps and running cistern or header tank overflows (ball or lift valves)
- Shower rather than bath
- If dual flush cistern fitted, use it
- Use basin plugs taps to limit water used for washing rather than under running tap
- Close tap while brushing teeth
- Use bucket and brush rather than hose for washing vehicles
- Irrigate garden early morning or evening to minimise evaporation losses
- Cover swimming pool when not in use to minimise evaporation loss
- Lower water level in swimming pool slightly to reduce amount of water lost in splashing

3.4 Reclamation and Reuse

There are a number of systems and devices, which permit the re-use of "grey water" for secondary purposes, such as garden irrigation and toilet flushing, and serious consideration should be given to their use when designing any new water installation.

A toilet cistern is available which delivers the water entering to refill the cistern, after the toilet has been flushed, via a small hand basin let into the lid, for hand washing. Only after this initial use does the water enter the cistern to be re-used for the next flush.

The secondary use of water for above ground irrigation is not recommended as this is considered by some authorities to be undesirable for health reasons.

Many buildings, particularly in the industrial and commercial sectors, have large roof areas that are suitable for the collection of rainwater ("rainwater harvesting"). This water can be used for various purposes including the augmentation of grey water collected for use in the irrigation of landscaped areas and in water-wise gardening projects. It should not be used for drinking or sanitary purposes.

3.5 Consumer Leak Repairs

Seen from the WC/WDM perspective, consumer leakage is just another form of excess consumption that offers scope for reduction, but requiring different solutions to those employed in the minimisation of inefficient or wasteful use.

A consumer leakage reduction programme can most readily be implemented when there is an active leakage control regime in place on the distribution network. Consumer leakage will show up on the night flow readings in just the same way as leakage on the network and will be identified as such when leak location is undertaken. Assuming there is a functioning consumer meter, it is a very simple matter to confirm that there is a leak on the consumer's premises.

Consumer leakage reduction may also be seen as a complementary activity to the monitoring of consumer meters for malfunction / degradation. A sudden increase in meter reading is a strong indicator that a leak has occurred and should lead to further investigation.

3.6 Delivery Point Water Management

Delivery point water management methods limit the amount of water that is supplied to an individual consumer by introducing a hydraulic restriction device (unlike in a traditional system where the consumer effectively has unrestricted access from an "open" network that is limited only by the size of the connection and the pressure in the network at that point). For shared connections, it includes any means of regulating the amount of water customers can collect. These methods are used where customers need help to manage their water usage to a quantity they can afford and/or where there is persistent non-payment coupled with high wastage.

There are two basic methods and a number of types:

1. Flow control devices
   (a) Pressure compensated
   (b) Non-pressure- compensated
2. Volume control devices
   (a) Batch control with storage tank, single customer
   (b) Pre-payment water meters, single customer or shared connection
   (c) Non pre-payment volume limiter

Flow control devices are generally cheaper to install, administer, and maintain. Volume control devices cannot be installed without a conventional water meter and are inherently more expensive to install and maintain (but not necessarily to administer) than a conventional metered connection. However, unlike flow control devices, for most designs, the water is delivered at the full reticulation pipework pressure.

3.7 Financial Management

The Water Services Act, 1997, section 10(1), requires WSIs to implement a rising block charge structure, or equivalent, for water supply services to households who have access to an uncontrolled or high volume of water. For each customer, regardless of water usage, sudden increases in charges above the inflation rate quickly convert to a reduction in demand, so that income rarely increases significantly, and may even decrease if the increase is accompanied by a steep step for a high consumption block.

The cost rebate / surcharge (CRC) tariff as well as the rising block (RBC) tariffs are both effective in reducing demand. CRC is less common, but has the benefit of better transparency and is preferred by National Treasury.

As a general rule any tariff restructuring needs to be undertaken within the context of the WSI's overall finances for water service provision and it may well be appropriate at that time to review the tariff structure for optimal compliance with the Water Services Act.

Together with effective cost control and tariff structures, effective charging and credit control is central to the financial management of WSIs, as well as water demand management. Credit control includes the ability of a WSI to control water usage to what each customer can afford. However, these WSI financial management tools do not necessarily help customers to control water usage. Thus for many customers with household connections, but especially in the poorer areas, an appropriate water delivery point management tool needs to be used in combination with the financial tools.

4 RETURN FLOW MANAGEMENT

4.1 Minimising Infiltration, Inflow and Exfiltration

Infiltration of groundwater into sewers and sewer connections to buildings occurs when the sewer is below the groundwater table and water enters through defective joints, broken or cracked pipes, poorly constructed manholes, etc. Exfiltration is basically the consequence of similar defects but in the situation where the sewer is above the water table.

Inflow of surface water into a sewer that is intended to convey sanitary sewage / wastewater, may occur either through piped connections from surface water inlets, rainwater downpipes and the like, or through defects in the sewerage network, such as broken or missing manhole covers. Some of these points of inflow may have been intentionally devised to solve problems of surface water drainage, but thereby causing problems of overloading of the sanitary sewer network and merely serving to cause other problems further downstream. Instances of sanitary sewers being used as a temporary flood relief measure by residents lifting manhole covers in areas that are prone to ponding during heavy rainfall may also be found.

Having assessed the general extent and severity of infiltration, inflow and exfiltration through the process of water audit (see Volume 2), the significant defects are then localised through a process of progressively narrowing the area of search, by analysis flow data and other evidence.

Minimising exfiltration and infiltration may involve the repair of localised defects of a significant nature, or it could form part of an integrated sewer rehabilitation programme, using “no-dig” techniques as appropriate. Minimising inflow requires the identification of the stormwater access points and sealing them off. Regulations intended to prevent unauthorised discharge of stormwater into the sanitary sewer system may need to tightened and enforced.

When eliminating any point of surface water inflow into the sanitary sewerage system, it is necessary to ensure that the alternative route for these inflows does not create a greater problem.

Technical measures may need to be accompanied public awareness and education programmes to reduce instances of abuse of the sanitary sewerage system by the public.

4.2 Water Re-use

Residential water usage can be separated into two categories, indoor and outdoor usage. In South Africa, the split between indoor and outdoor usage is dependent on the category of consumer.

A partial re-use system can reduce residential water consumption by up to 25% and reduce the load on the sewer system by up to 50% (Milne, 1979). A total re-use system can achieve a 50% reduction in water demand.

5 SOCIAL AWARENESS AND EDUCATION

5.1 General

“Water demand management is 50% technical, 50% social awareness.”[1]

One of major impediments to the implementation of integrated water resources management, and water conservation and demand management, is the level of awareness and understanding about these topics amongst both consumers and water services institutions/authorities.

Demand management is generally concerned with both technical interventions and raising awareness. Awareness raising needs to be approached from a “marketing perspective” as in the promotion of a product or a concept and has to be approached in a strategic manner. Changing the mindsets and behaviour of both water users and managers is a fundamental component of WC/WDM. Water users should not be the only targets of education and awareness campaigns; they should be targeted to all stakeholders, including WSIs and local government.

An awareness / education campaign has to be *integrated, ongoing, relevant* and *targeted.* Campaigns need time, energy and resources, and those promoting them need to adopt a single, consistent message. Preliminary research is therefore necessary to develop an understanding of the characteristics, conditions and dynamics of the context/community in which awareness raising needs to be conducted.

[1] Hannes Buckle, Rand Water.

Understanding mindsets and misperceptions is critical. The low level of payment for water services and the low level of awareness of the need for and the benefits of WC/WDM are two of the main challenges to WC/WDM in South Africa.

The links between WC/WDM and other water priorities need to be explicit, clarifying the role of WC/WDM in the broader water management context. Foremost amongst these is the fact that decreasing the amount of water that is used and wasted will make more water available within existing resources to supply water to those who presently do not enjoy an adequate water service. The financial benefit to the community in delaying expenditure for expensive supply-side measures is another important message that needs to be conveyed.

Achieving a change in behaviour is directly related to information. Providing information creates awareness around an issue. With sufficient information and a strong campaign, knowledge is deepened, gradually creating a change in attitudes and education, and finally, behaviour change. The degree of behaviour change achieved will depend completely on the nature and effectiveness of the campaign.

5.2 Approach to Awareness-Raising

A simplified six-step process is proposed:

1. Identify Stakeholders
2. Build Awareness of WC/WDM
3. Establish a Process of Change
4. Identify Conflicting Needs
5. Develop a Common Objective
6. Step 6. Establish Interim Objectives

A successful awareness/education campaign is one that is *targeted* towards a particular group. It is therefore necessary to develop an understanding of the characteristics, conditions and dynamics of the context/community in which awareness raising will be conducted, e.g. using a KAP Survey. A communication strategy is then developed, based on the findings of this research, to raise awareness and ultimately change the behaviour of the target group, in line with common objectives.

The KAP tool focuses on identifying people's behaviour regarding a particular subject and provides a model for facilitating change on an individual basis, to incorporate new practices that are being introduced, such as WDM. KAP is also useful in identifying the factors that influence behaviour.

5.3 A Communication Campaign

Communication is a crucial element of a successful water demand management programme. Consumers and water managers need information on which to base decisions regarding their water usage patterns in a way that is credible to which they can relate to the information. To promote water demand management successfully, information and concepts have to be *marketed* to target audiences, based on a sound understanding of local conditions.

Although there is a range of options for a communication campaign, the key elements of the campaign and communication tools will be determined by the requirements of the local community and the message that needs to be conveyed. Basic elements in any communication campaign include (Mvula Trust, 2001):

- The *audience* – a particular group of people who have been identified as the target for receiving messages in order to bring behaviour change
- The *messages* – specific pieces of information which have been identified as necessary and appropriate for the audience to act on a topic
- The *communication vehicle* – the kind of media, material or tool used to carry the messages
- The *communication strategy* – when each of these elements (audience, message, vehicle) is well researched, planned, implemented and evaluated.

6 MANAGEMENT AND INSTITUTIONAL ASPECTS

The full guidelines provide advice on management and institutional aspects that have an important on the successful implementation of WC/WDM measures:

- Institutional strengthening and capacity building
- Outsourcing
- Institutional culture / ethic and communication
- Human resources development
- Benchmarking and performance indicators
- Information Systems, including GIS and hydraulic modelling
- Consumer meter reading
- Drought management