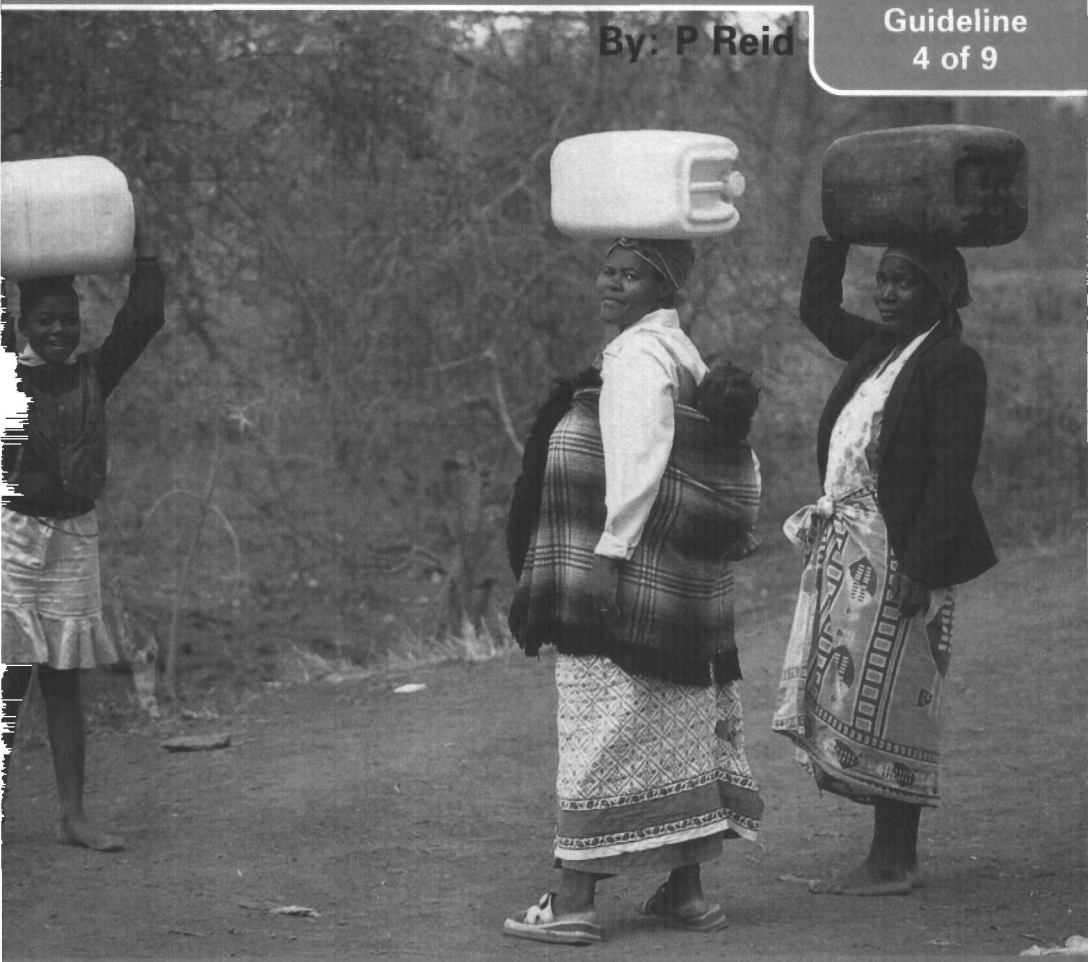
SUBSISTENCE FARMING AND DENSE SETTLEMENT RURAL COMMUNITIES

By: P Reid

Guideline
4 of 9



Building Awareness and Overcoming Obstacles to Water Demand Management

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WATER DEMAND MANAGEMENT

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Preface

The IUCN-RoSA (World Conservation Union-Region of Southern Africa office) managed a Water Demand Management (WDM) programme between 1997 and 2002 to study WDM practices and applications within the SADC member states. These studies indicated the urgent need for improved water resource and supply management in much of the region and the broad potential of WDM to be an important tool in achieving this aim.

Currently, IUCN-RoSA is committed to sharing the knowledge gathered in the studies to promote the adoption of sound WDM practices as a method of accelerating effective water resource and supply management throughout the region. These guidelines on building awareness of and overcoming obstacles to WDM are a part of IUCN-RoSA's WDM sharing initiative. They have been written by a multi-disciplinary team assembled from several countries in the SADC region.

The guidelines comprise 9 separate booklets, aimed at all the people who can influence WDM outcomes or who should be responsible for actively promoting or implementing WDM, within different water management, supply, and user sectors. Since every water user and water resource or supply stakeholder can improve the quality of life for him/herself or others, by ensuring WDM plays an important role in his/her planning and actions, related to water management and usage, one or more of these booklets has been written with you in mind. The titles are listed on the inside of the back cover. Check the titles, see which apply to your situation, and obtain copies. They will help you to do your job better.

In these guidelines, Water Demand Management (WDM) includes all actions that improve the efficiency and equity of water use. Efficient water usage includes using water in a manner that minimises pollution. Thus, WDM is not about getting poor people with insufficient water to use less, but about, all users, using water wisely so that everyone has sufficient access. In this context, WDM is seen as an integral part of Water Resource Management (WRM) and Water Supply Management (WSM).

When implemented effectively, WDM will:

- Reduce water supply costs per unit volume, whilst assisting to create more financially sound water supply institutions, through: postponing the development of new sources;
- Reducing water wastage, and equitably reducing unpaid water bills; ensure the delivery of sufficient water to meet the reasonable demands of all users, for domestic and productive water, at a reasonable cost in both water abundant and scarce areas, whilst assuring ecological sustainability, or, in the few situations where this is not practical, WDM will maximise equity and minimise deprivation;
- Neither improve the assurance of supply through ensuring that the demand does nor exceed the yield of the source;
- Prepare users and supply institutions to manage with less water as scarcity arises, through population increase, general development or climate change; and
- The prevention of all ongoing serious water pollution.

By definition, WDM, on balance, always produces positive outcomes. However, effective implementation requires:

- A good knowledge of current demands and usages;
- Planning and resources to introduce behavioural change within well-managed time frames; and
- Communication with other stakeholders upstream and downstream of your place in the water supply/usage chain.

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Abbreviations and Acronyms

AWARD	Association for Water and Rural Development, South Africa
CBOs	Community Based Organisations
DWAF	Department of Water Affairs & Forestry, South Africa
IRD	Integrated Rural Development
IUCN	The World Conservation Union
MDG	Millennium Development Goals
NGOs	Non-Governmental Organisations
RWH	Rainwater Harvesting
SADC	Southern African Development Community
SSA	Support Services Agent
WDM	Water Demand Management

Introduction

1.1 Target readership

This Guideline is for use by all organisations and role players, at all institutional levels, formal and informal, throughout the SADC, involved in the supply of domestic and productive water to rural communities. This includes policy makers; regulators; water resource managers; infrastructure development role players; support services agents; and bulk and retail water supply managers.

The Guideline covers all water supplies, domestic and productive, used in environments that are not catered for by the commercial agriculture, municipal or industrial water guidelines.

1.2 Why should WDM be considered in rural communities?

WDM could help rural communities ensure that all households have affordable access to sufficient water to meet their basic domestic and productive needs. Communities lacking sufficiently developed water resources often suffer during periods of drought, with households often needing emergency relief to help them. This makes the use of WDM to make water available to such communities all the more important.

There are also other advantages, such as:

- Improving the income of the water supplier,

which makes it possible to improve the quality and sustainability of the service;
- Reducing water wastage decreases potential environmental pollution, while helping to reduce water supply costs;
- Improving assurance of supply; and
- Helping communities to cope better with a limited volume of water.

While some communities get their water from a regional scheme, upstream communities may take an unfair share by wasting water, leaving the downstream community wanting. In this case, WDM could help improve the management of water in the offending up-stream communities.

After a lack of development, climate variability and climate change in southern Africa are possibly the biggest challenges that have threatened the region for decades. It is generally accepted that water resources in SADC are likely to be further adversely affected by climate change over the next few decades. Table 1 lists the likely impacts of this phenomenon.

Table 1: Likely Impacts of Climate Change (after IPCC, 2001)

- Increase in droughts, floods and other extreme events will add stress to water resources, food security, human health and infrastructure
- Changes in rainfall and intensified land use will increase desertification
- Rise in sea level will affect coastal settlements, causing flooding, and coastal erosion
- Decreases in surface runoff and water from major rivers, which are highly sensitive to climate variations, could affect agriculture and hydro-electric power schemes

1.3 Guideline purpose and content

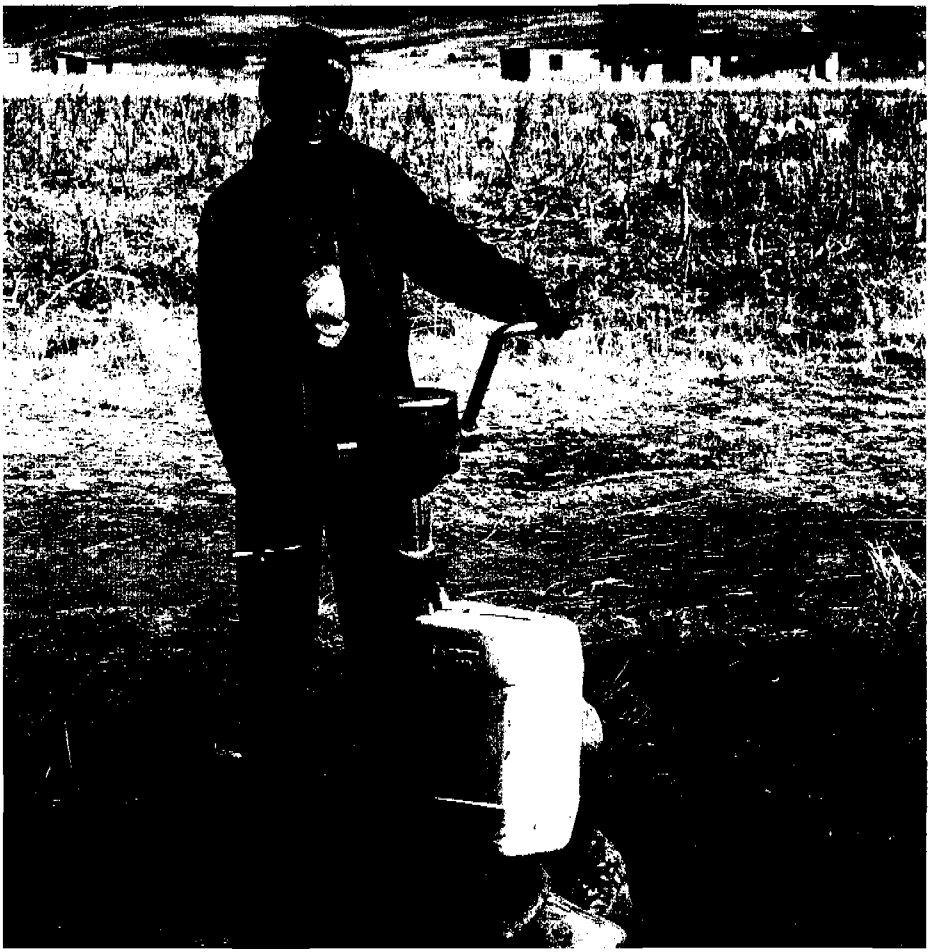
The aim of this Guideline is to:
- Provide an overview of WDM in rural communities and to explore the incentives of implementing WDM;
- Generate awareness of WDM among all levels of water management in the region; and
- Help rural communities implement their own specific WDM strategy.

The Guideline focuses on the role of WDM in rural water management. It looks at what is needed for the development of a WDM programme, and the qualities associated with effective WDM. There are also examples of previously implemented WDM activities.

1.4 Guideline limitation

The information provided in this Guideline should only be used as a basis for those who wish to implement WDM in rural communities. It does not provide an inclusive or prescribed method of developing and implementing a WDM strategy.

Sectoral background



2.1 Use of water by rural communities

Generally, there are four types of water use in rural communities (Hazelton, 2002):

- Domestic: drinking, human hygiene, house cleaning, cooking, laundry, sanitation, and building (cement and mud bricks for own use);
- Small businesses: such as brick making, beer brewing, and hair salons;
- Animal watering: cattle, sheep, goats and poultry; and
- Agricultural: including subsistence crop irrigation, vegetable gardening, fruit tree cultivation and other woodlots.

2.2. Future demand and trends

In SADC, most rural communities' demands for water are not currently being met. Table 2 reflects the overall situation for rural communities in South Africa.

Table 2: Important attributes of rural communities in South Africa (Hazelton 2004)

Rural community attribute	% of SA's total
Population	41
Water use	4
Land use	13
Income	13

For these communities to experience equity and economic advancement, their water use needs to rise from 4% to 13% of the nation's total. This will require a 325% increase in their present consumption.

This increase will not take place without policy interventions and financial support from national taxes or DOA, dependent on the average GDP per capita in the country being considered. Thus, there is a huge challenge to water policy makers and implementers to ensure that the required growth in demand takes place sustainably, despite the general scarce water resources in the region, climate change, and low institutional capacity, skills levels, and financial resources. All these factors affect how WDM should be promoted in rural areas.

2.3 Benefits for rural communities of adopting WDM

Despite the above challenges, WDM can lead to the enhanced social and economic well-being of rural communities and their water services delivery institutions through:

- Increased coverage;
- Better water quality and quantity;
- Sustainable water resources and infrastructure bringing improved security;
- Financially stronger water services delivery institutions;
- Increased business opportunities;
- Improved animal husbandry and increased agriculture production;
- Efficient water usage, which facilitates the equitable distribution of water within the community and with other communities downstream;
- Lower water costs per unit delivered through the reduction of customer non-payment rates and unaccounted-for water;
- Savings in human time and energy;
- Reuse and safe disposal of water;
- Reduction of pollution to the environment, with attendant improved health benefits; and
- Improved levels of service, especially to customers who can afford higher payments.

Broad approaches

3.1 National and local policy, legislative and regulatory support

For WDM to work suppliers and users need to change their behaviour to ensure good water supply and usage practices. In rural areas, there are three main aspects to be considered. Firstly, the promotion of equity in water resource and water supply management at national and community levels. Secondly, the promotion of sound management of water supplies and use by community-based organisations; and lastly,

the protection of resources from contamination and over-use.

The development and dissemination of sound policy, supported by sound national legislation, standards and regulations can support these aims. This is already beginning to happen throughout SADC. South Africa is probably furthest ahead with regard to the development of legislation, policies etc while Namibia is probably the most advanced with regard to implementation.

While countries can shorten their own promulgation and implementation times by learner from their colleagues it shouldn't be shortened too much to allow local government, tribal leaders, professional stakeholders, civil society and users to be involved in the process.

On the other hand, communities should not wait for their national governments to have the best polices, legislation, standards and regulations in place before implementing WDM in their areas. Within the community itself, strategies can be worked out to overcome problems. Communities can also learn from neighbouring communities and from specialist rural WDM practitioners from national government departments, local government, non-governmental organisations (NGOs) and rural development consultants.

These strategies should focus on long-term behavioural changes, rather than on once-off capital projects. These practices should be written up as by-laws or as part of the operating, monitoring and maintenance instructions for the use and care of the local water resources and infrastructure. Thereafter, it is essential that the local traditional leader, government officials and/or water management committee ensure that these by-laws and/or instructions are implemented within an agreed time frame and, thereafter, sustained as ongoing practices.

3.2 Financial assistance

The implementation of WDM, especially in relation to rural communities, is nearly always at the local level. However, rural communities rarely have the financial ability to apply WDM. Financial assistance, preferably in the form of grants, is usually required in four areas, namely:

- Initial information gathering, and planning;
- Capital costs; and
- Ongoing costs.

Funding for initial information gathering and planning costs normally originates from either national government or international development agencies. Many countries require communities or households to contribute towards the capital costs of improving water services and implementing WDM. Such contributions should be encouraged, provided no community or household is deprived of basic domestic or productive water services because of household affordability problems.

Within a nationally agreed definition for basic water services, capital assistance should be equally available at the community and household levels to remove any bias towards constructing more capital-intensive centrally controlled infrastructure. Trickle feed yard connections; for example, provide a fixed maximum quantity of water per day into a household storage tank, automatically managing the water demand. Such systems work on a pressure compensated equity valve or broken pressure fixed head system. The fixed volume delivered can easily be adjusted by changing the size of the control system. No water meters are used and customers pay a fixed amount each month for their water, based on the maximum amount of water that can be delivered through the regulating system (DWAF 2000).

Once a community has demonstrated its institutional capacity to operate, manage and

maintain such a level of service, governments should help make loan finance available at preferential interest rates to individual households to encourage them to opt for higher levels of service. However, this must not interfere with the responsibility of service providers to ensure that all reasonable demands for productive water are met.

Putting an economic value on water by asking households to pay for its use promotes better household management of this resource over the long term. However, WDM, equity and health considerations all demand that local service providers, national governments and official development assistance agencies ensure that all households have access to sufficient water to satisfy their basic needs for domestic and non-business productive water. Thus, the provision of capital funding needs to be matched by sufficient ongoing funding to ensure the infrastructure can be maintained and can serve the poor for whom it was built.

As a WDM tool, whatever the details, a country's subsidy policy with respect to ongoing costs should:

- Be transparent with respect to who is subsidising what and by how much;
- Be cost-effective and easy to implement;
- Cover the basic domestic and non-business productive water needs of the poor without the majority of the poor having to apply for the subsidy;
- Be based on the gap between individual service providers costs and their ability to recover them through equitable pricing; and
- Ensure that the rich and influential with the highest levels of service receive little or no subsidies.

National level financial assistance providers often require decentralised implementing agents to handle day-to-day management of their funds. As far as practical they should do this by employing local institutions, such as local government or water boards, to build up local capacity and to prepare these institutions to support and regulate community-based water service providers.

Not all WDM options need a large financial outlay, including:

- Protection of water sources from livestock;
- Re-use of household grey water for irrigation, and flushing of waterborne sanitation systems, among others; and
- Minimising water wastage by employing better water drawing techniques.

3.3 Comparison of rural and urban service levels

Urban areas throughout southern Africa generally have moderate to good levels of water supply and sanitation, while these services tend to be poor or non-existent in rural areas.

There should be a different focus when seeking to improve access to safe water in rural than in urban areas. More effort needs to be placed on using WDM to optimise the abstraction of water from traditional sources such as spring, ground water, rainwater harvesting and rivers.

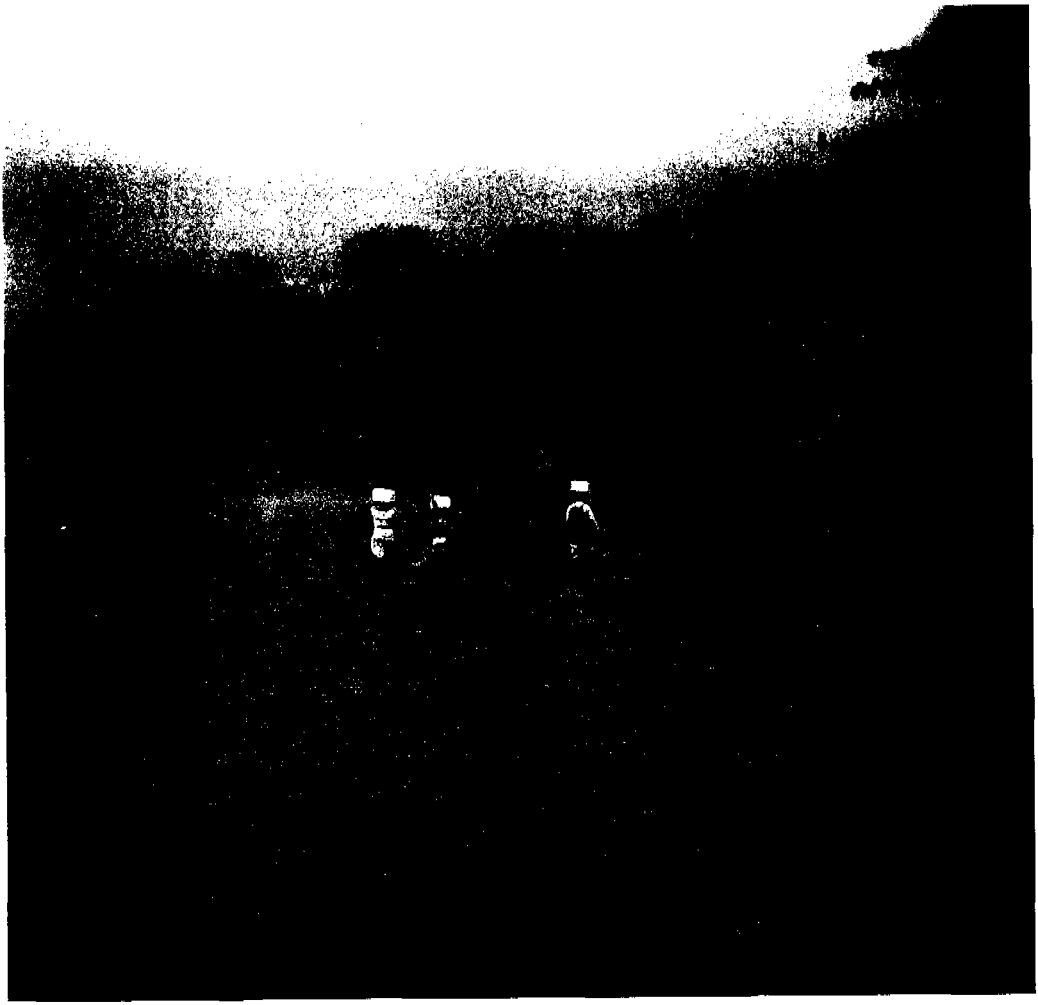
3.4 Social issues

Women are crucial to the WDM process as they are involved in nearly every aspect of water use. Not only have they traditionally been the main water collectors, in many instances they are also responsible for all the household's agricultural production and associated activities.

Thus, it is important for women to ensure that their water supply, whatever the source, is well managed, and that water is used effectively and efficiently. However, their desire to save water is often hindered by a lack of technology and

expertise. Yet, once equipped with the necessary knowledge, women can positively affect the behaviour of other members of the household.

involvement of women in WDM and water supply management, one has to be careful not to move too far in the opposite direction, however. The challenge is to involve all groups:



Historically, while women have been excluded from water management, their role is becoming increasingly widely accepted.

In righting past distortions related to the low

community leaders, existing civic or water interest groups, the rich and the poor, men, women, and youth. Such inclusive programmes and projects that cater for the needs of all

community members and involve them in the educational and decision-making process have the greatest chance of continuing success.

Children should be educated on WDM at school. Such a curriculum should include modules on:

- Water usage in the country and in the community;
- Why it is important to use water wisely and to prevent pollution;
- Evaluating water use trends at school;
- Regularly checking and, if necessary, reducing water wastage at school;
- Quantifying how much water is being used beneficially for different activities in the school and checking if it varies with the seasons and/or weather patterns;
- Waterborne diseases, such as bilharzia, malaria, cholera, typhoid and diarrhoea; and
- Hygiene promotion.

3.5 Incorporating WDM into integrated rural development

To derive optimal benefits from the implementation of a rural WDM strategy, it is best to link the WDM plan to an integrated rural development (IRD) strategy that aims to uplift the community by improving household livelihoods. This makes WDM easier as key stakeholders may already have been identified and relationships already formed. Also, the goals and objectives of a WDM project can be incorporated into the broader IRD framework easily.

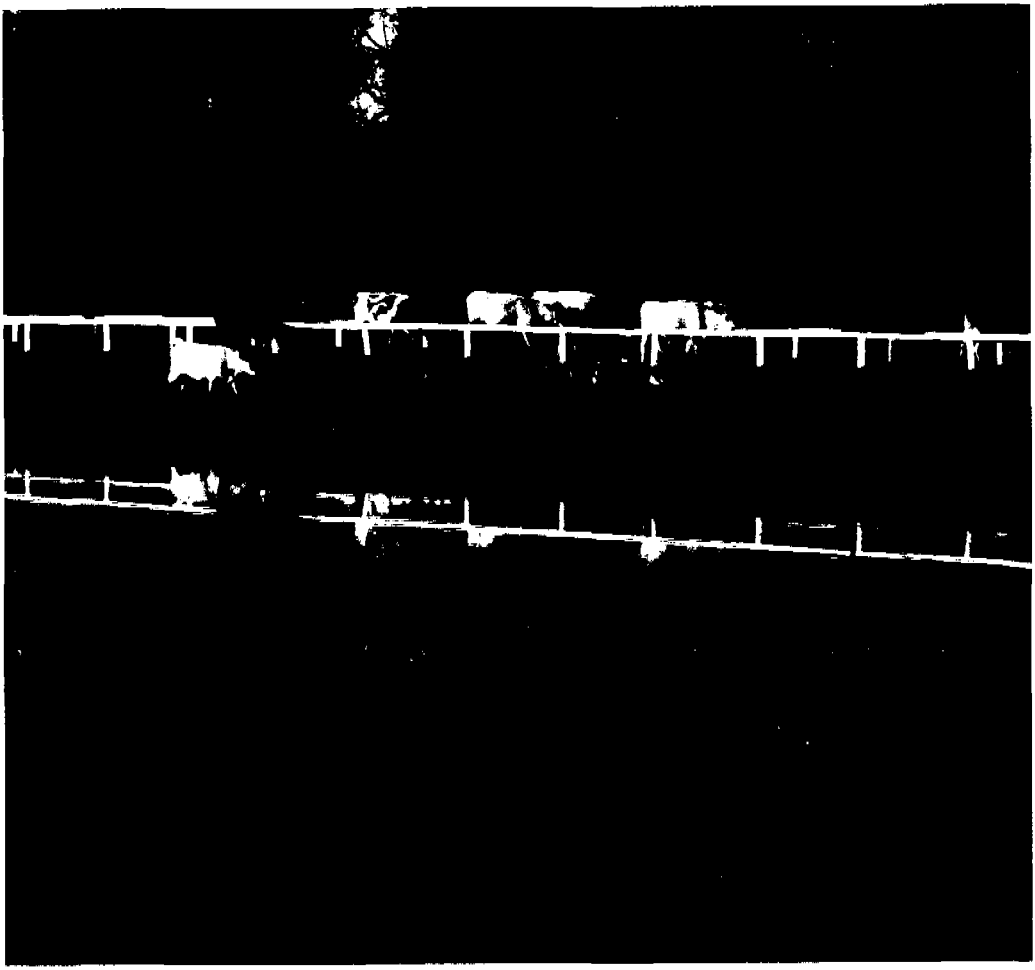
4.1 Managing water resources

4.1.1 Monitoring the water source

While everyone needs to have an equitable share in the water resource, it is also crucial to ensure that the demand does not exceed the safe yield of the source. For ground water this means the static level, the draw down level during pumping and the level recovery rate need to be monitored.

In the Herschel area of the Eastern Cape, for example, high school children are tasked with taking these measurements and keeping the community informed about the state of their water source (WASE 2004).

As a guide and for future reference, an appropriate yield test and a recovery test need to be carried out when new or upgraded water schemes are being developed. Only a very simple test is required if a human or animal



Rural WDM options

powered pump is to be installed (Hazelton 2000). More thorough yield tests are required when higher pumping rate, engine or electric motor powered pumps are to be installed on the borehole (BWA 1992).

When a community is taking a high percentage of the flow from a small stream, a plain sheet metal V-notch weir should be installed to monitor the flow. For small lakes and dams, which are in danger of drying up, some simple means should be devised to monitor the drop in depth or the receding shore line each dry season.

As well as indicating water availability during years with an average rainfall, water source monitoring is also useful as an early warning system in times of drought.

While communities should ensure that their supply is well monitored, they cannot do this without some support or auditing from government agencies.

4.1.2 Water management practices

Typically, once a WDM strategy has been implemented, the community becomes responsible for the management of its water resources. Different management practices have been highlighted by Kampala et al (2002). This should be implemented to ensure equity, sustainability and minimum wastage:

1. **Limiting the amount of water drawn from a source at any one time**
   Limiting the amount of water drawn for each household to between five and eight 25ℓ containers helps to ensure water for all community members.
2. **Using funnels and appropriate containers when collecting water**
   Funnels limits the amount of water wasted, while sealable containers reduces wastage during transportation.
3. **Removal of rotary taps**
   After collection times, the tap at the source is removed to prevent wastage of water, and to prevent unauthorised use of water. This also reduces the need for maintenance of the system as well as theft of tap components.
4. **Presence of a tap attendant**
   This entails having someone at the tap who can prevent wastage of water and perform a hands-on management role by monitoring water use.
5. **Set times during the day to draw water**
   Setting times for drawing water, usually in the morning and evening, helps to maintain orderly abstraction of water, and prevents waste during the day.
6. **Payment for water drawn**
   Paying for water used from a standpipe or hand pump provides funding that allows the community to maintain the infrastructure. Paying for the service also promotes awareness about wasting water. It should be remembered, however, that there will be households that are unable to pay for the resources.
7. **Rules and regulations**
   A set of rules and regulations can protect the water sources from degradation, and help manage water demand in times of shortage.
8. **Managing waste**
   Wastage at tap stands and hand pumps can be collected and used by constructing concrete aprons around the source. The apron drains the wasted water into nearby channels that can be diverted to either livestock watering troughs or to the irrigation of crops, such as vegetable gardens or orchards (Kampala et al, 2002).

4.1.3 Cost recovery for services

Without sufficient income no water services provider can implement WDM and ensure equitable delivery in the long term. Along with food security, community members, government and foreign donor agencies need to make the availability of adequate water a top priority.

For some this means supporting WDM, while for others this means paying for water. However, in most cases where 100% payment for services have been enforced for services provided, community members have stopped using the service and gone back to old unsafe water sources. This not only leaves service providers short of income in many cases, but also endangers the health of poor customers, as illustrated by the cholera epidemic in KwaZulu-Natal in 2000 – 2001.

It is, therefore, crucial that governments and foreign donor agencies change their priorities and make more resources available to cover the justifiable gaps that community water services providers experience with respect to capital and recurrent costs. Cost effective and socially beneficial methods of delivery need to be used in providing these essential services (Hemson et al, 2004).

4.2 Protection of water sources

4.2.1 Livestock access to rivers, streams and dams

Uncontrolled livestock access can seriously affect water quality. The ammonia from the cattle urine causes nitrification of water sources, leading to algal bloom, particularly in dams and pools where the cattle have direct access to the water's edge. When cattle are allowed into surface water source they stir up silt and increase the turbidity.

In the case of wells and borehole hand pumps, livestock urine contaminates the ponded water around the water point, which then seep into the ground water below and affect the water that is being abstracted.

4.2.2 Protecting ground water quality from in-situ sanitation

Potable water supplies in rural areas often consist of untreated and un-chlorinated ground water, while sanitation is usually pit latrines. The most basic of these comprises a large unlined hole dug in the ground. It is therefore important to position pit latrines to avoid possible contamination of the ground water sources.

Many different sanitation construction methods are available to rural communities, each with its own advantages and disadvantages. These need to be weighed up against the need of the particular community or household as well as the environmental constraints of each method. The South African Department of Water Affairs & Forestry (DWAF) has a very useful document that details each sanitation option available.

4.3 Rainwater harvesting

4.3.1 Rooftop harvesting

In this case, the household roofing system is used to catch and channel the collected water into gutters, and then into large metal or plastic tanks at ground level. Though very effective for the collection of large quantities of water, this technique is dependent on the cleanliness of the roof structure and guttering system, as well as the holding tank.

The holding tanks need to be adequately sealed to prevent contamination and mosquito infestation. Contaminated water cannot be drunk, but can be used for irrigation and stock watering.

One disadvantage of this method is the initial high capital outlay for the guttering and holding tank. The system is, however, very simple and requires no specialised skills or material inputs, and is easy to maintain.

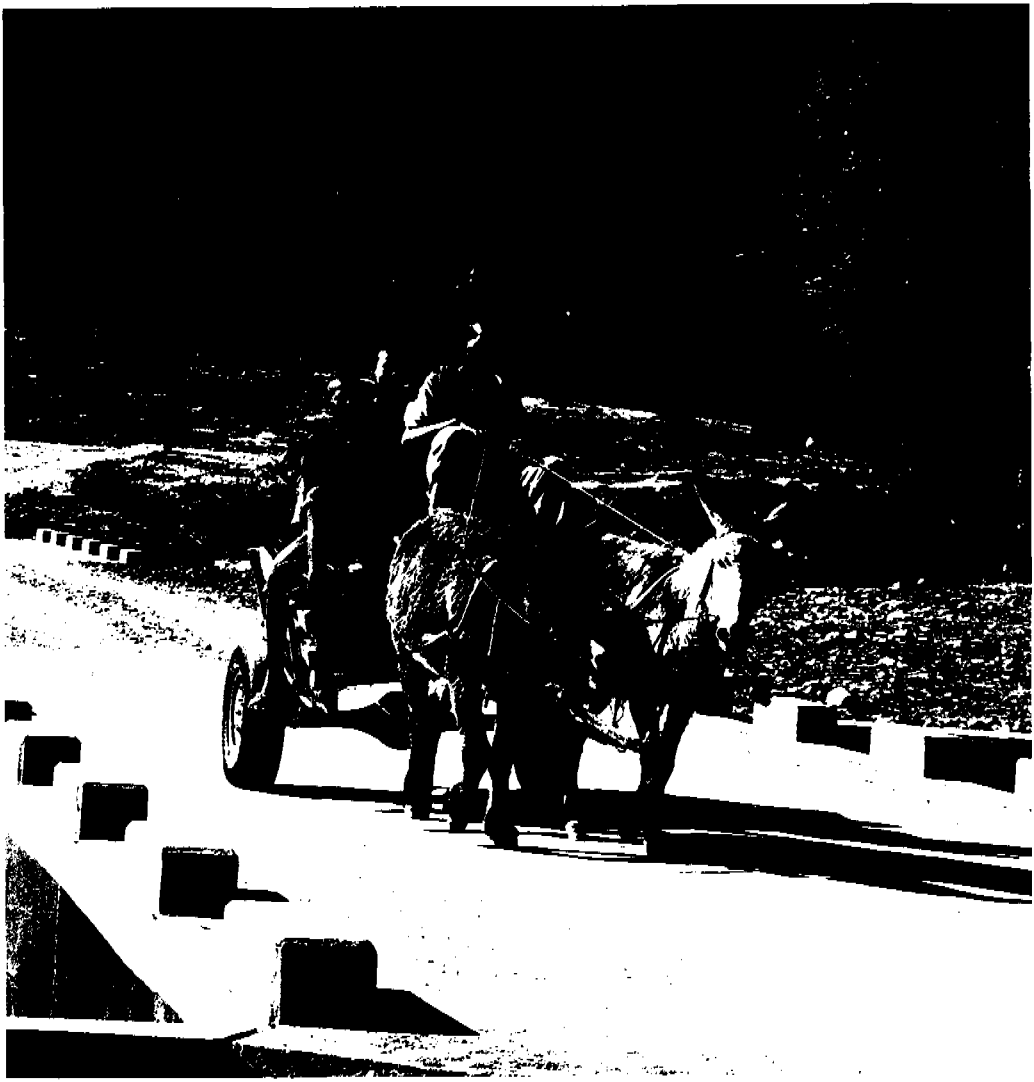
Box 1: How much water can be collected?

South African group, the Association for Water and Rural Development (AWARD), teaches people how to collect water from the roofs of houses, schools, or other buildings. AWARD calculates that for every 30mm of rain falling, a house with a 50m² roof designed to funnel this rain into a water tank would collect at least 1 200ℓ. This would save a person with a wheelbarrow about 16 trips to the local water-collection source.

Source: IUCN South African Country Office: Factors affecting the implementation of WDM strategies in Southern Africa

4.3.2 Surface drainage and erosion control

These technologies use the same principle as rooftop rainwater harvesting, but collect surface runoff in constructed storage structures, such as tanks, earth dams, sand dams, basic weirs, ponds and pans. Water can be diverted to a specific area by using hand-dug channels and ponds. This technique requires no financial cost to the household and is simple to construct manually.



4.4 Waste water reuse

4.4.1 Capturing waste water

The reuse of domestic waste water, or grey water (water from baths, clothes washing and household water use), at household level can easily be implemented without excessive costs. Setting up a grey water collection system involves collecting the water from the outlet pipes from each of the household sources, and does not require special skills or equipment. Any household member can do it, regardless of age or gender.

The collection of grey water is not constrained by the hygienic requirements of RWH, as it is not used for drinking. All collected water should be kept in sealed containers to prevent wrong use of the water, such as children playing in it or animals drinking it. Grey water can be reused for flushing

toilets, or for small-scale irrigation on household plots. Excess water from specifically designed sanitation systems can also be used to recharge ground water systems through soak-away systems, such as soak pits or field drains. Importantly, these systems need to be placed far from clean water sources to prevent contamination and at an adequate depth to prevent surface ponding during high rainfall.

Babies' faeces are just as dangerous as grown-ups' faeces. Soiled nappies should be washed in water, without using strong chemicals, and the waste water disposed of immediately in the household's latrine.

4.4.2 Safe use of waste water

Care should be taken to collect grey water safely. Domestic grey water should not be contaminated with corrosive and/or abrasive cleaning chemicals such as drain cleaners, bleach, disinfectants, dyes, and acids, among others.

These chemicals will destroy all the bacterial activity that is used in the decomposition of human waste if put into latrines. If contaminated water is used for irrigation it will not only pollute the soil, but will kill growing crops. When disposing of this contaminated water, care has to be taken to do this away from clean water sources.

4.5 Water-wise small-scale irrigation techniques

4.5.1 Introduction

In most rural areas water for irrigation is typically limited to water that has been collected. This water is usually collected in 25ℓ drums from springs, standpipes, wells or rivers or using rainfall harvesting. These processes are labour intensive and generally involve large time investment from household members. Thus, in these areas there is an even greater need than usual to choose and/or develop irrigation techniques that maximise the efficiency of this limited, collected water. To do this, these techniques should take into account factors such as:

- Costs of implementation;
- Water use efficiency;
- Labour requirements;
- Local soil conditions; and
- The quantity and availability of water.

The following sub-sections are to help rural farmers make decisions that take such factors into account.

4.5.2 Keeping water in the root zone

Keeping the irrigation water in the root zone longer allows crops to benefit more from the available water. During normal irrigation practices the water evaporates from the soil. There are three techniques to do this:

1. **Pitcher irrigation**
   This method provides an efficient and economic method of delivering water directly to the root zone of the crop by using (traditional) porous unglazed clay pots. The pots are buried neck deep in the soil between rows or next to crops, and the water is poured into the pitcher and distributed to the surrounding soil at a rate controlled by the porosity of the clay. This method allows for the slow application of water over a long period of time.
2. **Subsurface pipe irrigation**
   This method uses clay, metal or PVC (plastic) piping that is placed beneath the soil near the root zone. The pipes have holes in them that allow the water to be released slowly into the subsurface root zone. One end of the pipe is closed off while the other end has a funnel system to fill the pipe up. This method requires very little capital input by the farmers and there is no need for skilled labour to construct the system.

3. **Low-head drip systems**
This system operates under pressures of 0,5m and 2m water head compared to 10m and 15m water head needed for standard drip irrigation (Miller 1990). Containers, such as oil drums, are mounted on block supports so that the force needed to push the water through the system is maintained. Perforated flexible plastic piping conveys water to the plants. Low-head drip irrigation has been found to be suitable especially for stands with a 100% ground cover, since humidity is retained well under the canopy after a water application.

4.5.3 Selecting the right crops

Selecting the right crop may entail deciding between a crop with a high yield but low drought tolerance, and crops with lower yield but high drought tolerance.

In rural areas where irrigation water is paid for, but water is plentiful and crops are sold, farmers still need to select profitable crops that have very high yields per unit of water used. However, communities with limited water supplies need to grow high yield crops that require very little water or correspond to the climatic conditions of the area.

4.5.4 Knowing how much water to apply at any one time

Irrigation scheduling means deciding how much and how often to apply water. The aim is to provide the plant with sufficient water at the right time of day while avoiding wastage. Scheduling the application of water according to the season is important. During winter or early planting stages plants need less water than they do during warmer periods. Once the scheduling has been worked out for a year, the same schedule can be used again and again for the same crop.

4.5.5 Reducing losses

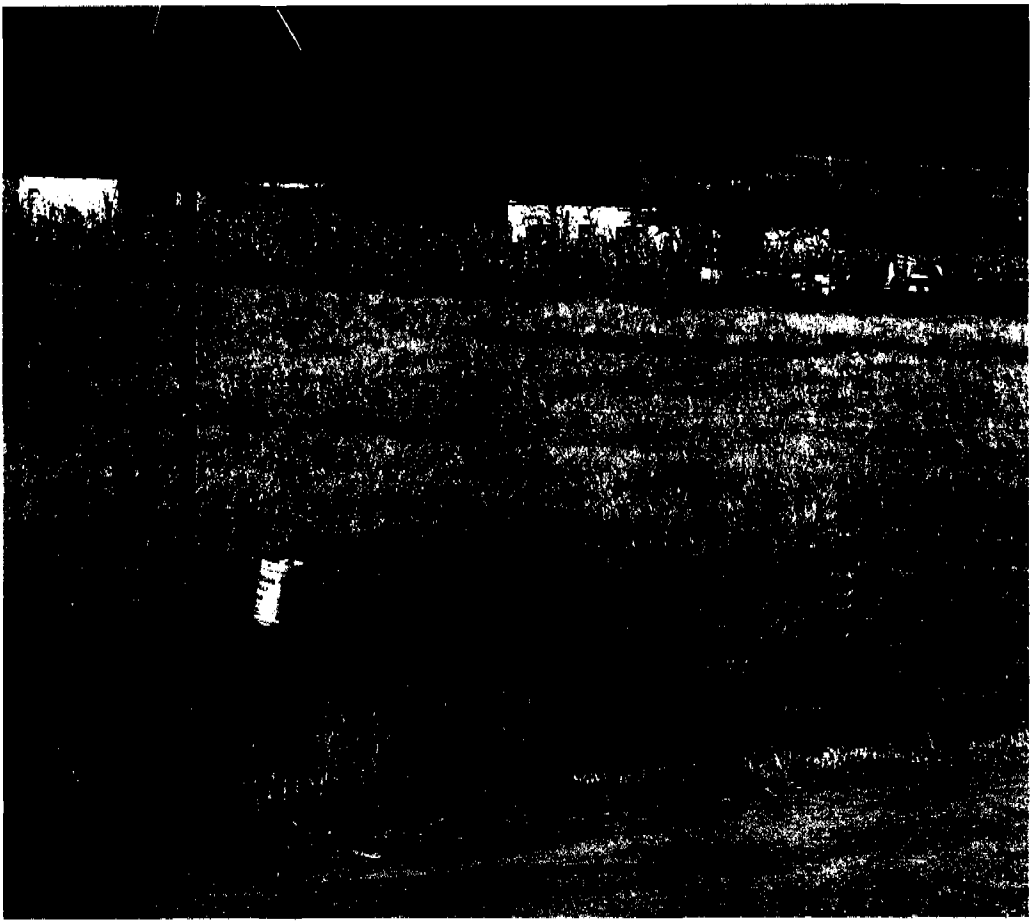
Losses in rural water schemes can occur in a number of ways such as leakage, and evaporation. Water leaks from canals, channels, impoundments and delivery systems are fairly easy to identify and in most cases are straightforward and inexpensive to repair.

Flood irrigation is sometimes practiced in the rural areas of the region. Its use should be discouraged and current users should convert to a safer or effective practice, such as one of those described in section 4.5.2. Some of the problems that may be associated with flood irrigation are:

- Deep percolation of water away from the crop root zones;
- Large evaporation rates associated with the large pools of water;
- Increased occurrence of soil erosion;
- Leaching of soils; and
- Over use of water.

Irrigating crops during cooler hours in the day prevents water loss due to evaporation, and limits the amount of water loss from the plant as well as out of the surrounding soil.

Towards a WDM programme



5.1 Introduction

Many water services projects have been implemented in the rural areas in the past, but have proven unsustainable in the long term. WDM cannot be successfully implemented in such an environment. This section looks at the transformation required to build up the effective institutions through which sustainable services and WDM can be attained.

In addition, there are sustainability, economy of scale and cross fertilisation advantages in developing an ongoing area WDM programme rather than implementing fixed duration area or community level projects.

5.2 Strategy for community level development

The implementation of WDM programme comprises three phases, each with its own steps (See table 3). It is important to implement all the steps, because if one fails it can have a 'domino' effect on the rest of the programme (Abrams 1996).

Table 3: The steps required to develop a community WDM programme

Phase 1: Assessment and planning (section 5.3)

- **Appoint a feasibility study facilitation team (sub-section 5.3.1)**
  - a) Learn about the current water supply and WDM situation from and with the community (sub-section 5.3.2)
  - b) Learn about the community's aspirations for the future and create additional community awareness about upgrading possibilities, WDM, and the country's water supply and management policies (sub-section 5.3.3)
  - c) Analyse the data collected (sub-section 5.3.4)
  - d) Prepare a multi-option feasibility report encompassing the upgrading of the community's water management institutions and delivery infrastructure (sub-section 5.3.5)
  - e) Help the community select the best programme options and thereafter to apply for funding to implement their selection options (sub-section 5.3.6)

Phase 2: The transformation of institutions, infrastructure and behaviour (section 5.4)

- **Appoint a programme transformation implementation facilitator to facilitate (sub-sections 5.4.1 and 5.4.2)**
  - a) Do overall planning and coordination (sub-section (sub-section 5.4.3)
  - b) Elect an inclusive representative water committee (sub-section 5.4.4)
  - c) Provide training to build the community's institutional capacity and skills base (sub-section 5.4.5)
  - d) Undertake the detailed design of the institutional capacity building, infrastructural upgrading and behavioural change portions of the programme (sub-section 5.4.6)
  - e) Produce a comprehensive set of management and reporting instructions for the water source, supply and usage aspects service provision (sub-section 5.4.7)
  - f) Implementation of water supply and demand management by the community water services provider and WDM by the users (sub-section 5.4.8)
  - g) The construction and testing of the infrastructure upgrading portion of the programme (sub-section 4.4.9)
  - h) The production of a before and after close-out report (sub-section 5.4.10)

Phase 3: Ensuring the sustainability of the programme (section 5.5)

- **Appointment of an ongoing services auditing and support agent to:**
  - a) Formalise the community water committee's relationship with government structures
  - b) Audit and support the community committee in its ongoing management and monitoring of water services provision

This process, which is described in more detail below, applies to small stand-alone schemes, and the distribution component of larger bulk water schemes. It promotes community empowerment and the development of human resources. Such an approach supports the

decentralisation policies being implemented by SADC countries, and is an essential part of the wisdom that acknowledges that, in the long term, community water systems are best managed by village level institutions (Serageldin 1995). It also leads to greatly improved self-reliance, but not self-sufficiency. Thus, area structures are still required to audit and support the performance of community service providers.

5.3 The assessment and planning phase

5.3.1 Composition of the feasibility study team

Only two people are needed for a rural community feasibility study team: a sensitive technical advisor (male or female) and a dynamic culturally acceptable female community mobiliser. Both members need to have experience of and an aptitude for serving non-expert rural community clients. Their main aim is to evaluate and start closing the gap between the community's current motivation and capacity as well as capacity required by the community to select, implement, with the help of sub-contractors, and sustain a feasible water supply upgrading programme with limited financial resources.

Before starting their work, they should hold a meeting with the community to explain the steps by which its improved water supply and demand management programme will be planned and implemented. The team's communication skills will encompass looking, listening, learning and awareness creation.

5.3.2 Assessing the current situation

Table 4 gives a list of typical questions that need asking to draw up a clear description of the current water services and WDM situation in the community. The feasibility study team should also encourage the community to tell them about how they see the current situation. Another good idea is sending out a feasibility study questionnaire to the community.

The team members should also use their observations and professional and local knowledge to augment the questions they ask and to help them evaluate the current water supply and management situation. Health details can be checked with local health department officials. A camera can be most useful for recording observations and for enlivening the feasibility report.

Table 4: Assessment of the current situation at the community level

Item	Typical questions
Community demographics	• Population information: Total number of people; number of pensioners, unemployed, employed, self employed, informally employed subsistence workers, migrant workers, children and students. Number of households • Health of children younger than 5: Total number; number under weight, number that die each year, common causes of death • Which of the following diseases related to the need for good water and sanitation management have been experienced by the community in the last 12 months: serious diarrhoea, cholera, typhoid, hepatitis A, polio, bilharzia, malaria, skin diseases, stomach worms, "blue baby" syndrome (excess nitrates), mottled teeth (excess fluorides), bad eye infections and HIV/AIDS • Details and numbers of businesses that use water • Numbers of animals owned in the community: cattle, goats and sheep; horses and donkeys; poultry • Agriculture products produced in significant quantities
Community institutions	• Is there a community water services committee? • Does it have a constitution? • Is it registered in terms of any national company legislation and, if yes, as what? • Does it employ people to manage water services delivery? • Does it have a set of instructions describing how it is to manage and report on its delivery responsibilities?

Item	Typical questions
Community institutions *(continued)*	• Do employees have a job description? • What are the responsibilities of each employee? • Is it registered as a water services provider?
Public and private exploited water sources	• What sources of water does the community use at present? • Is the quality of the available water at each source suitable for its uses? • Are any of the sources polluted from a cause that can be remedied? • Do any of the sources ever fail partially or completely? • To what extend are the sources exploited? • Are the sources being monitored regularly for water quality and availability both with respect to abstraction rates and long-term yield? • What are the assured short-term abstraction rates and long-term yields of the sources? • Are actions outside the community's control the cause of any unacceptable pollution, water shortages or potential future water shortages?
Additional public and private unexploited water sources	• Are there any additional unexploited water sources within easy reach of the community? • What is the state of these additional water sources as per the questions above on exploited water sources?
Existing public and private bulk supply improvements	• What bulk supply improvements exist in the community: pumps including details of power source, water treatment plants, bulk pipelines and reservoirs? • What is the delivery rate or storage capacity of the infrastructure?

Item	Typical questions
Existing public and private distribution improvements	• What distribution improvements exist in the community: reticulation pipe work; shared and individual domestic access points, institutional and business access points, livestock drinking troughs and dipping tanks; agricultural access points (include brief details) • In terms of the countries' definition of adequate, how many households are adequately served with domestic water by water sources and infrastructure in terms of water quantity, maximum cartage distance, assurance of supply, the minimum flow-rate from taps and quality? • How many households are not adequately served with domestic water (include brief details of the inadequacies)? • How many households have access to additional productive water?
Are the water resources and delivery services well managed	• Are the water sources quality and abstraction quantities well or poorly monitored and managed? • Are there any records or indications showing how the infrastructure has performed, and has been maintained? • Are there any records indicating how customer complaints and water outages have been handled? • Are water losses and unaccounted-for-water (UAW) well managed? • If not, what is causing the water losses or unaccounted for water levels to be too high? • Is there any unauthorised water usage, especially from unauthorised connections? • Are the existing water resources shared equitably and wisely by community members?

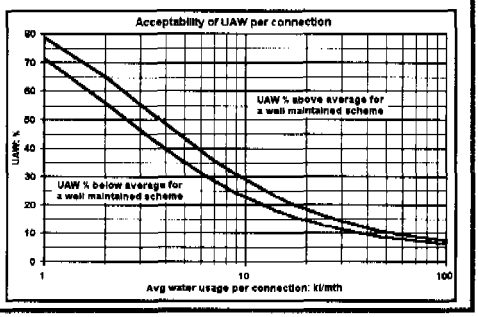
Item	Typical questions
Are the water resources and delivery services well managed *(continued)*	• Have there been any resource shortages in the past and have they been imaginatively handled? • Are costs and cost recovery equitably and well managed? • If not, in what ways are costs and cost recovery poorly managed? • Is there a system in place to ensure that poor customers who have difficulties in paying for their water are adequately provided for, without having unlimited access? • How much money does the water service provider currently have in the bank? • What was the water service provider's income over the previous 12 months? • Does the water services provider have a good knowledge of WDM options and are they adequately promoted to ensure users manage their water usage wisely? • Are any their signs of the scourge of invasive alien trees? • Are there any signs of soil erosion or the potential onset of soil erosion through the destruction of indigenous bush and forests?

5.3.3 Community aspirations and awareness creation

The feasibility study team also needs to find out about the community's aspirations for the future. This will indicate the community's current knowledge of WDM and the motivation existing for giving WDM its rightful place in any proposed water services upgrading programme. The positive experiences of the neighbouring communities can be used in discussions to evaluate and to start closing the gap between the community's current motivation and the motivation required to develop a vision that is worthwhile and challenging.

Lastly, the team may need to create additional awareness of relevant water supply policies applying in the community's country to ensure that their vision is also attainable. The vision should include a number of descriptive goals. As soon as practical, a specific measurable target must be added to each important descriptive goal.

Figure 1: Acceptability of UAW% as a function of average water usage per connection (Hazelton and Kondlo 1998)



For example, figure 1 indicates what UAW% is acceptable from a well-maintained water scheme, depending on the average water usage per connection. Therefore, if a community's UAW is unacceptably high, it could use figure 1 to set a target figure to be achieved during phase 2, if not before. Figure 1 was generated from the UAW figures obtained from a group of eight well designed, constructed, maintained and managed schemes, less than 12 years old, that had essentially zero leakage from the pipelines as distinct from fittings and connections. Thus for older schemes, international norms suggest that an additional loss of between 172 to 276 kl/month per kilometer of pipeline could be justly added to cover known losses of this nature.

In many countries in the SADC region, both government and other funders will only release funds for programmes after the community has demonstrated its interest in the programme by collecting an agreed amount of money, as a contribution to the costs. Often it is a fixed percentage of the costs of phases 1 and 2 combined that is required.

However, in rural communities, the biggest hurdle to implementing integrated water supply and management programmes successfully is the ongoing funding of the monitoring, operation, maintenance, and management costs. It is important that the feasibility team keeps this in mind, especially when helping the community to select options for funding.

Community circumstances vary enormously. In remote areas of Mozambique, for example, Water Aid has reported that evidence strongly suggests that hand pumps are not sustainable in all community contexts and, therefore, should not be the minimal level of service approved by Government (Breslin 2003). The issue is about communities being allowed to choose, not about the feasibility team promoting and offering only one level of service in their feasibility study report.

5.3.4 Data analysis

The gap between the community's current capacity and the capacity required to implement and sustain the WDM programme will be overcome by analysing the data collected during the assessment of the current water supply and WDM situation. This exercise should be carried out at a meeting with the community's water committee, or at a general public meeting, depending on the community's size. Every effort should be made to ensure that all community interest groups, as set out in section 3.4, are represented.

The feasibility study team should present the current findings, and the future vision and goals, with special emphasis placed on the ongoing management of the five main components of a water supply system, namely:

- The water sources;
- The water bulk supplies;
- The water distribution system;

- The water users, and
- The services provider.

After these preliminaries, a recognised technique such as the strengths, weaknesses, opportunities and threats (SWOT) method should be used to get the delegates to analyse the information presented at the beginning of the meeting. To do this the delegates can be handed blank white paper cards on which to write very short descriptions of:

- Existing circumstances that they feel are currently strengths or opportunities with respect to the community achieving its vision; and
- Existing circumstances that they feel are currently weaknesses or threats with respect to the community achieving its vision.

Once the strengths, weaknesses, opportunities, and threats have been recorded, it can be discussed with the delegates how the strengths and opportunities will be used to help create the future vision. Then the weaknesses and threats must be discussed to strategise how they will be overcome, so that by the time phase 2 of the programme is complete, the weaknesses will have become strengths and the threats will have been overcome. Once this exercise is complete, the team will be ready to write the feasibility report.

5.3.5 The feasibility report

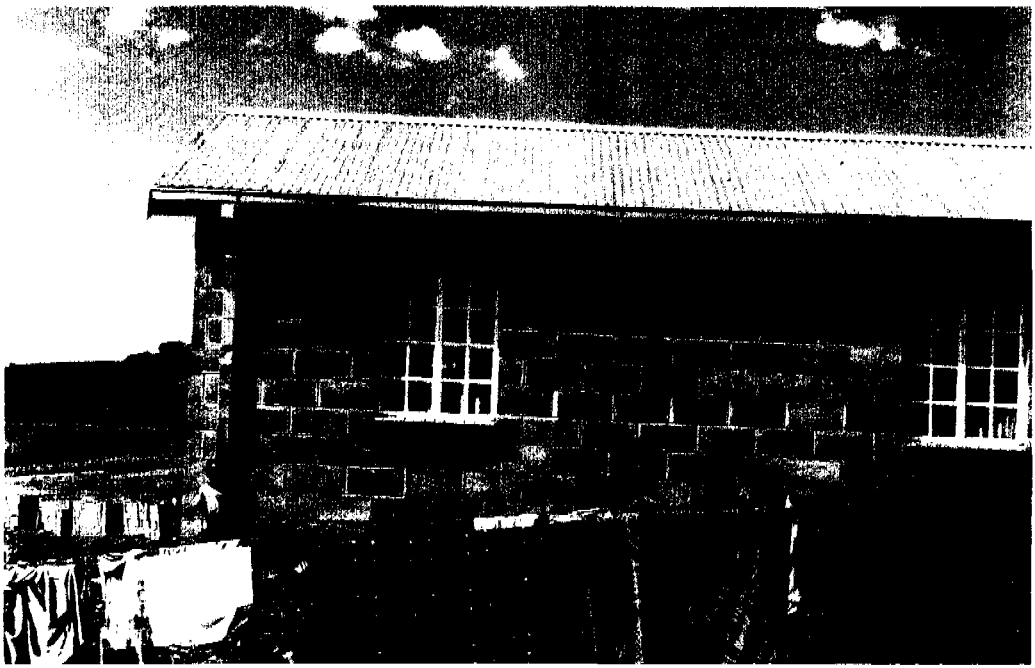
The feasibility report should describe up to 6 options, in order of increasing capital cost, to improve the community's water supply through better management only or through better management combined with new infrastructure to improve access and/or to increase the quantity of water available. This will give potential funders an opportunity to fund an intermediate vision initially before investing further in capital works; while allowing the community to compare the different options before making a final decision.

Box 4: Contents of a typical community level feasibility study report

1 Location and description of the area
2 Community demographics
3 Description of the present water services, water usage and WDM situation
4 How the present water services perform and are managed
5 How to improve the performance and management of the existing water services
6 The community's vision of improved water services; including goals and targets
7 Additional institutional upgrading necessary to manage the community's vision
8 Available water resources
9 Options towards achieving the community's vision
10 Estimated capital costs of the various options
11 Estimated ongoing costs of the various options
12 Summary of the estimated costs
13 Advantages and disadvantages of the various options
14 Conclusions and recommendations

5.3.6 Helping the community to select options and to seek funding

Within 2 weeks of receiving the report, the community should hold a public meeting to discuss its findings. Then, within a further 2 weeks, the feasibility study team should return and attend a further public meeting, chaired by a community member. The aim of this meeting will be to learn from the community how it has received the report and help it to select their first and second choice of programme from the report's options.



Thereafter, the choosing of options should proceed transparently and democratically. If this does not happen, the team should go through the options again briefly and answer any questions before asking the chairperson to ask delegates to vote on the options. Some brief reasons for the community's choices and the relation between the choices should be given and recorded.

To save an additional field trip, immediately after the meeting the team should sit down with the community's water committee, to help it draft a letter reporting on the decision of the community's public meeting, and seeking funds to implement, preferably, the community's first choice of programme. This letter, accompanied by a copy of the feasibility study report should then be sent by the water committee to possible funders.

5.4 The upgrading phase

5.4.1 Appoint a programme implementation facilitator

The appointment of a programme implementation facilitator should be made jointly by the community water committee, the funder and, an area representative of the relevant government structure if government is not the funder. The facilitator needs to have most of the attributes of the two feasibility study team members combined, be happy to implement a programme which has been outlined by others and who has definite strengths in empowering rural community members. The facilitator needs to be present in the community throughout the duration of phase 2 or be there much of the time and be based close-by, so that she/he can be back on site at short notice.

5.4.2 Responsibilities of the implementation facilitator

The responsibilities of the facilitator are set out in table 3. It is most important that the facilitator remembers that he/she is the facilitator and not the manager, and therefore spends most of his/her time guiding and instructing the community on how to manage this phase of the programme.

5.4.3 Overall planning and coordination

The overall planning will include drawing up a project schedule right at the beginning of the phase. Everything needs to be scheduled with the maximum practical input and the agreement of the community.

The facilitator should also review the phase 2 budget, which will most likely have been based on the feasibility study report. Any discrepancies should be discussed early with the community and funder.

If not already available from government or the funder, the facilitator will also help the community to draw up Terms of Reference and general conditions of contract for any specialist training, design, or other work that needs to be contracted out.

5.4.4 The election of a water committee

No special water committee should be set up at the community level to manage the implementation of phase 2 of the programme. However, the beginning of phase 2 should be used to ensure that a truly inclusive democratically chosen committee exists to take forward future water services initiatives.

5.4.4.1 The composition of voting members

The holding of the elections may also require the work shopping and adoption of a new or revised draft constitution to get agreement on how the committee is to be formed. Table 5 sets out three alternative sets of rules assuming the total number of voting members is nine in each case. Rule one gives maximum flexibility with respect to allowing voters to consider other criteria such as ability. Rule 2 gives medium flexibility whilst ensuring greater representation from women. Rule 3 gives women voting control of the committee.

Table 5: Committee elections: Sample rules for taking gender and youth into account

Specification with respect to gender and youth	Sample sets of rules for committees with 9 voting members		
	1	2	3
Women	at least 3	at least 4	at least 5
of which the following are to be:			
Mature women	at least 2	at least 1	at least 2
young women	at least 1	at least 3	at least 2
Men	at least 3	at least 3	at least 3
of which the following are to be:			
Mature men		at least 2	
young men		at least 1	
No restrictions	3	2	1

5.4.4.2 The need for additional ex-officio members

Apart from elected members the following groups should be asked to appoint one ex-officio representative: the local tribal authority, locally-elected members of government, one official from each government department with a responsibility for water and health services in the community, and community civic organisations with an interest in water or health services.

5.4.4.3 Electing committee members

A common method used to establish a community committee is to elect the members of the committee first and then to allow the voting members to choose the office bearers. Sufficient persons should be nominated in each category – mature women and men, and young women and men – to fill all the places but if not the committee can co-opt additional members later. Prospective committee members need to know from the outset that they will not get paid for the work they do.

5.4.4.4 Choosing committee office bearers

The core values of committee members are honesty, transparency and accountability. In choosing their chairperson, committees should choose a person of vision, commitment and trustworthiness, who is enthusiastic and good at supporting and encouraging other committee members, as well as encouraging the participation of the whole community.

The other two important office bearers in a committee are the secretary and the treasurer. Both these positions require specific skills including record keeping, and the ability to read and write in the community's home language, and the most common language used by the national government. The secretary's duties include taking minutes at meetings, reading letters received and drafting the replies after the committee as a whole has decided on the reply. The treasurer's duties include budgeting and ensuring accurate bookkeeping records are kept.

If there is a shortage of skills in the committee serious consideration should be given to asking a teacher, shop-keeper, nurse or other educated community member to act as a non-voting ex-officio committee member and to fill the post at least until a deputy is trained.

Choosing a deputy chairperson, secretary and treasurer is also a sound practice. Such deputies should 'shadow' their corresponding office bearer and learn to become competent through their own knowledge as soon as possible.

Mature women aged about 30 or older, generally make the most committed office bearers in water committees.

Once a satisfactory committee exists, the facilitator should plan the details of what institutional capacity building, and skills training, is to take place in the community.

5.4.5 Institutional capacity building and skills training

Once a committee is chosen all members, including ex-officio members, should receive training in:

- Conducting community and committee meetings in a manner that ensures a wide participation;
- Using the SWOT analysis technique as a means of finding solutions;
- Conflict resolution;
- Democratic decision making;
- Drawing up and formally adopting a constitution;
- Designing a community level water services delivery and management structure;
- Facilitating WDM and customer driven service delivery;

- Principles of budgeting, bookkeeping, cost control, connection fees, setting consumption charges;
- Ensuring all indigent customers receive an adequate basic supply, credit control and the design and imposition of fines and other penalties for non-paying water wasting customers;

Constitutions adopted by community water services providers nearly always include a clause stating that they are 'not-for-profit' organisations. This does not mean that they should not make a surplus, but only that the whole of any surplus made, after perhaps paying staff a performance bonus, will be reinvested in water services and not paid out as a dividend.

- Setting up a fault recording and close-out reporting system for use by customers, committee members and staff;
- Choosing and using key indicators;
- Reporting to ensure transparency and accountability;
- Contracting organisations or people to supply goods or services and ensuring quality performance; and
- Employing staff to perform tasks and ensuring long-term motivation and quality performance.

Apart from the training in the principles of financial management included above, it is likely that the treasurer and deputy treasurer will need additional more in-depth training to improve her/his skills in financial management. It is a good idea to take the opportunity and train some community members at the same time since it is likely that the committee will want to employ a financial manager/bookkeeper, even if only on a part-time basis, during both phases 2 and 3 of

the programme. Likewise, other community members will require additional training in:

- The construction infrastructure;
- The operation, day-to-day care and maintenance of the completed works; and
- The monitoring of the scheme, and of customers' water usage, from a WDM viewpoint, and how to motivate corrective action when required.

It is vitally important that the required training is specified in contract enquiry documents. The appointment of any training agents should be done with the full support of the water committee. Moreover, no payments should be made without the approval of the committee.

5.4.6 The detailed phase 2 design for sustainability

After the initial training the committee should start considering the actions and institutional design that will be required to sustain the water supply and water demand options during phase 3 of the programme. With respect to the actions required for ongoing monitoring, maintenance, and corrective action, a comprehensive list should be built up from the start.

The selection of materials and the scheme design should include clear fit-for-purpose criteria and facilitate easy monitoring, maintenance, and management, and spares availability has to be considered. Designs should also maximise the use of local materials, and facilitate labour-intensive construction.

Lastly, it is good to include the essential requirements with respect to behavioural change. Changing water users' behaviour requires special planned effort and will not change overnight. During phase 2, the water committee should hold publica meeting once a month. The purpose of these meetings is:

- To report on progress;
- To remind water users what is expected of them in terms of the programme and to discuss any problems; and
- To listen to water users queries and complaints and to respond to them.

In this way WDM and cost recovery issues with respect to water users discussed during phase 1, can be reinforced.

During this detailed design, the community's vision, goals, and targets set out in 5.3.4 should be confirmed or revised as allowed for in the funders conditions of funding.

5.4.7 Management and reporting instructions

It is crucial for community water services providers to have a comprehensive set of management and reporting instructions for each section of the water supply and usage system. As phase 2 proceeds, the water committee and the transformation facilitator should build up a full set of management and reporting instructions for all components of the scheme. These instructions will include, but will not be limited to, the management and reporting instructions provided by suppliers.

Apart from the instructions themselves, the water committee needs to decide who will be responsible for what. This should be done by drawing up job descriptions for each person to be employed, and for any committee members that are to carry out auditing/ support functions.

5.4.8 Implementing upgraded management and behaviour change

Communities are going to find more and more, that funders and government authorities are going to provide funds in the first instance to assist them in improving the service delivery and WDM from existing infrastructure. Only when the water services provider has implemented high-quality management and reporting systems, and the community users are using water wisely, will funders provide additional capital to increase the capacity of water schemes.

Even without this realisation, water committees should start upgrading their management of the community water services, and ensure that both they and the community water users are implementing behaviour change, as soon as possible. An agreed outline will have been included in the feasibility study report. The funders may have extended the requirements, in their conditions of funding. Finally, further details will have been set out in the training and design components described in 5.4.5 and 5.4.6, and the implementation strategy will have been clarified in the job descriptions, and management and reporting instructions, described in 5.4.7.

Then, as each component of the new infrastructure is completed and commissioned, the suppliers should train community members to how operate, monitor, and maintain them.

5.4.9 The construction and testing of infrastructure

Another area that is often neglected is quality control during the construction, refurbishment, and/or testing stages of the programme. Supervision and quality control should be of the highest standard, and should be brought in from outside if there is any doubt about local capabilities. Likewise, after construction,

refurbishment, or installation, all components should be fully pressure tested for 48 hours, and all components with other functions, in addition to containing water, should be fully performance tested.

5.4.10 The before and after close-out report

At the end of all the above stages of phase two, it is common practice for the community's water committee to formally take-over the infrastructure and management systems and to accept responsibility for the ongoing sustainability of the programme at a joyful but modest party, attended by the funders, government authorities, the transformation facilitator, and community members.

Soon afterwards, but preferably between six and nine months thereafter, the transformation facilitator should produce a comprehensive but concise report comparing:

- The water supply and WDM situation before the programme started;
- The targets quantifying the goals to be reached by the community to achieve its vision;
- The achievements reached with respects to these targets at the time the close out report is being written; and
- The gaps still existing between the targets and the current achievements, including recommendations as to how these gaps can be overcome.

The report should contain descriptive sections and tables based on the headings indicated in table 6.

5.5 Ensuring the sustainability of the programme

Communities need to know that they are a part of a greater whole, and that they will be supported and regulated as a part of that whole. To ensure that the community becomes part of a greater whole, a government agency needs to sign a formal agreement with the community services provider setting out the services provider's management and reporting responsibilities, and the government agency's supporting, regulating and intervention responsibilities. For a sample agreement, which also includes minimum reporting requirements, refer to DWAF, 2001.

Thereafter, the government agency also needs to fulfil its responsibilities. This can be done by the government agency directly or by the government agency appointing a private sector Support Services Agent (SSA) to act on its behalf.

5.6 Strategy for area level facilitation and regulation

Sections 5.2 to 5.5 recommend that in rural areas decentralisation should take place down to the community level, and explains a strategy for doing this. Decentralisation cannot take place in a vacuum, and each area needs a government agency to facilitate and regulate the decentralisation process. This can be done through local government or area offices of a national government department.

Regardless of which route is chosen, this government agency needs to have the authority to approve, reject or ask for modifications to community programme funding applications, regardless of who is providing the funding.

To make use of this authority government agencies need to have a method of evaluating community programmes. It is recommended that this be done in 2 steps (Hazelton and Harris 1999). Step 1 is used to prioritise the programme or to reject it on an overall evaluation basis. Step 2 is used to look at aspects that are of a more specific nature.

Table 6: Close out report: Recommended column headings and sample entries

Item no	Description of item	Units	Before	After		
				Target	Achieved	Gap %
1	Water supplied	kl/mth	2 700	2 250	1 875	-17
2	Water used	kl/mth	1 350	2 025	1 575	-22
3	UAW	%	50	10	16	+60
15	Income from users	US$/mth	168	506	354	-30

If any of these aspects are found to be inadequate, they must be corrected before full implementation is approved.

In countries where strong government agencies exist to facilitate and regulate the decentralisation process, donors should consider supporting the water through budgetary support, rather than through detailed bilateral programmes. This will make the implementation of combined water supply and WDM programmes simpler. Should this happen, or should a government agency disperse capital funding itself, it will need to develop capacity to monitor and regulate phase 1 and phase 2 programme facilitators.

Lastly, in all circumstances, government agencies will need to have the capacity to promote the sustainability of individual community WDM programmes or manage private sector SSAs as set out in section 5.5.

Resource material

- *Abrams L, 1996: Capacity Building for Water Supply and Sanitation Development at Local Level: The threshold concept, available from: <www.thewaterpage.com/threshld.htm>*
- *Breslin E 2003 Demand Response Approach in Practice: why sustainability remains elusive, available from WaterAid at: <www.givewater.org/in_depth/in_depth_publications_new/chronological_list/1558.asp>*
- *BWA 1992circa Groundwater: Guidelines for Boreholes Borehole Water Association of Southern Africa, undated, pp 35.*
- *DWAF, 2000: Water Supply Service Levels: a Guide for Local Authorities Department of Water Affairs and Forestry, Directorate Water Services, Sector Development, Pretoria South Africa.*
- *DWAF, 2001: Community Based Water Services Provider Model Contract: Version 1 Department of Water Affairs and Forestry,*

Directorate Water Services, Sector Development, Pretoria South Africa, April

- *DWAF, 2002: Sanitation for a Healthy Nation: Summary of the White Paper on Basic Household Sanitation 2001, Department of Water Affairs and Forestry, Pretoria, South Africa.*
- *Hazelton DG, 2004: The Funding of Full Cost Recovery for Potable Water Supply Schemes in South Africa, IRC, The Hague, The Netherlands, to be published 2004.*
- *Hazelton DG, 2002: Overcoming Constraints to the Implementation of WDM in southern Africa: South Africa country report, IUCN South Africa Country Office, July.*
- *Hazelton DG, 2000 The Development of Effective Community Water Supply Systems Using Deep and Shallow Well Hand Pumps Report no TT 132/00 for Water Research Commission, Pretoria, South Africa, pp 198.*
- *Hazelton DG and Harris J, 1999: Pilot Study for the Collection and Use of Data on Rural Village Water and Sanitation in South Africa Report no 710/1/99, Water Research Commission, South Africa.*
- *Hazelton DG and Kondlo S, 1998: Cost Recovery for Water Schemes to Developing Urban Communities Report no 521/1/98, Water Research Commission, South Africa.*
- *Hemson D, Meyer M, and Maphunye K, 2004. Rural development: The Provision of Basic Infrastructure Services Human Sciences Research Council, South Africa. Jan, pp 63.*
- *IPCC, 2001: Climate variability 2001: Impacts, Adaptation, and Vulnerability, J.J. McCarthy, O.F. Canziani, N.A. Leary, D.J. Dokken and K.S. White (eds), Cambridge Press, Cambridge.*
- *IUCN, 2000: Water Demand and Management: Towards Developing Effective Strategies for southern Africa, 2002.*
- *IUCN, 2002: Factors Affecting the Implementation of WDM Strategies in Southern Africa, IUCN South African Country Office, March 2002.*
- *Kampata, J.M., Mondoka, A. and Shisala, S.F., 2002: Research Study for the Application of Water Demand Management to Rural Areas (Zambia), Submitted to IUCN South Africa Country Office, May 2002.*
- *Miller, E., 1990: A Low-Head Irrigation System for Smallholdings, Agricultural Water Management, 17, 37 – 47.*
- *Van der Linde, J., 1998:. Greater Hermanus Water Conservation Campaign, A Model for Water Demand Management. Promotional publication by the Hermanus Municipality, September 1998.*
- *WASE, 2004: Schools Help Maintain Boreholes. In Water Sewage & Effluent, Vol 24, No 2, Brooke Patrick Publications (Pty) Ltd, South Africa. Mar, p 43.*

7.1 Organisations

- AWARD (Association for Water and Rural Development): http://www.award.org
- Eldis Programme: http://www.eldis.org
- World Bank: http://www.worldbank.org
- WRC (Water Research Commission), PO Box 824, Pretoria,0001, South Africa: URL: http://www.wrc.org.za
- DWAF (Department of Water Affairs and Forestry), Private Bag X313, Pretoria, South Africa: http://www.dwaf.gov.za
- Centre for Scientific and Industrial Research (CSIR), Pretoria South Africa: URL: http://www.csir.co.za/
- Scientific and Industrial Research Centre (SIRDC), Harare, Zimbabwe: URL: http://www.sirdc.ac.zw/

7.2 Websites

General

- http://www.wateraid.org
- http://www.deat.gov.za
- http://www.dwaf.gov.za
- http://www.worldbank.org
- http://www.dfid.gov.uk
- http://www.globalwater.org
- http://www.unesco.org/science/water-day2000/water_use_in_the_world.htm

Community water and sanitation

- http://www.silsoe.cranfield.ac.uk/iwe/cws
- http://www.watershowcase.org/new/project_showcase_id.asp?projectID=1

Irrigation engineering & management

- http://www.silsoe.cranfield.ac.uk/iwe/expertise/irrigati.htm
- http://www.silsoe.cranfield.ac.uk/iwe/expertise/irrigagr.htm
- http://www.dripworksusa.com/design.html

Water management in semi-arid environments

- http://www.silsoe.cranfield.ac.uk/iwe/expertise/semiarid.htm
- http://www.worldhungeryear.org/why_speaks ws_load.asp?file=19&style=ws_table
- http://www.sciam.com/2001/0201issue/0201intro.html
- http://www.safewatersystems.com/
- http://www.tribology.co.uk/poldaw.htm

8 GLOSSARY

Grey Water: Waste water that is generated from baths, showers, clothes washing and dishwashing.

Sanitation: Refers to the principles and practices relating to the collection, removal or disposal of human excreta, household waste water and refuse as they impact upon people and the environment.

Turbidity: This refers to the suspended solids in the water e.g. mud, silt and sand.

WDM: A management approach that aims to conserve water by influencing demand. It involves the application of selective incentives to promote efficient and equitable use of water. WDM has the potential to increase water availability through more efficient allocation and use. This is guided by economic efficiency; equity and access; environmental protection and sustainable ecosystems functioning; governance based on maximum participation, responsibility and accountability and political acceptability (IUCN, 2000).

Water Audit: This process involves taking account of all water sources within the area and assessing the reliability, quality, access to, and the overall management of the resource as a whole.

Water Poor: These are areas where there is not enough water to maintain a household livelihood.

Water Scarcity: A decrease in the volume of water available per capita over time.