THE IMPLEMENTATION OF WATER DEMAND MANAGEMENT STRATEGIES IN TWO SOUTH AFRICAN CASE STUDIES: STELLENBOSCH AND HERMANUS

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November 2000

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ACKNOWLEDGEMENTS

I wish to acknowledge the help of my supervisor Mr. Kevin Winter for his efforts towards my project and Mr. Sean Moorgas and Mrs. Bea Whittaker for their time and effort.

Fellow group members of the Water Demand Management Core Team are also to be thanked for their time and commitment..

ABSTRACT

Traditionally, an increase in water consumption and the corresponding decrease in the availability of water resources, has lead to the development of new water augmentation schemes to store and transport water. Both in South Africa and internationally, dams, tunnels, reservoirs, inter-basin transfers, pipelines and weirs have offered effective but temporary solutions to an ever increasing demand for water. However, as rivers, wetlands, waterways and canals start to show signs of collapse, emphasis is changing from the traditional water supply management to water demand management. Water demand management, which can be divided up into a number of related tools, looks at ways of using water more efficiently instead of exploring new sources of water. In this project, two water demand management case studies in South Africa were investigated and compared to international trends in water demand management. The case studies were at the small towns of Hermanus and Stellenbosch both in the south western Cape. The Hermanus project consisted of 12 different water savings programmes, while the Stellenbosch project consisted entirely of a retrofitting programme. The Hermanus project has recently run to the end of its three-year duration, and has won numerous awards for the success it has achieved, while the Stellenbosch study took place four years ago and was on a smaller scale. Many aspects of the 12-point Hermanus programme were found to compare favourably with international WDM programmes and the project was well structured and run. However, some parts of the 12-point plan were not successful, and failed for various reasons. The Hermanus project received large amounts of support from various levels of governance, and questions remain whether the project would have been this successful without this support. The sustainability of this project has come under the spotlight in recent months. The Stellenbosch study was less successful than the Hermanus, but served to highlight the importance of some of the WDM tools and the combination of different tools in a water demand management programme. Stellenbosch has recently introduced a comprehensive Water Master Plan. It was concluded that the expertise and potential exists in South African to implement successful water demand management programmes, however the sustainability of the South African water demand management initiatives should be investigated.

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1. INTRODUCTION

An increase in water consumption and the corresponding decrease in the availability of water resources has traditionally lead to the development of new water schemes to store and transport water. Both nationally and internationally, dams, tunnels, reservoirs, inter basin transfers and pipelines have offered effective, but sometimes temporary solutions to an ever increasing demand for water.

With the increased number of dams, canals and pollutants in our fresh water systems, river ecosystems around the world are showing signs of collapse. The cleansing and filtering functions of natural river systems that are so often taken for granted are failing to function properly. Internationally, people are waking up to the fact that more and bigger dams are not necessarily the only solution to supplying humans with greater quantities of affordable drinking water (Davies and Day 1998). Water supply authorities worldwide, including the western Cape, have started looking for new less environmentally demanding sources of water.

The nature of international water management is changing and greater emphasis is being placed on the impact of activities on water resources as well as the efficient use of water (Davies and Day, 1998). The growing concern and shortage of fresh potable water sources, is forcing water supply authorities around the world to look at the way in which they use their water. Many authorities are looking for better control over the use of water in an attempt for more efficient use. Various techniques employed internationally to use water more efficiently have been collectively termed water demand management (WDM). Internationally, WDM has been on the increase as authorities are seeing the benefits of efficient water use. WDM stresses the need to use less of currently available supplies, rather than supplying the ever-increasing demand for water (Veitch1999).

According to Brooks and Peters (1989), WDM is defined as "*any measure that reduces the average /peak withdrawals from sources (surface/groundwater) without increasing the extent to which wastewater is degraded.*"

The Water Conservation and Demand Management National Strategy Framework of the Department of Water Affairs (DWAF) released in South Africa in 1999 states that WDM is: *"The adaptation and implementation of a strategy (policies and initiatives) by a water institute to influence the water demand and usage of water in order to meet any of the following objectives: economic efficiency, social development, social equity, environmental protection, sustainability of water supply and services and political acceptability."*

A Namibian WDM study explains WDM as *"attempting to supply a given service to water consumers whilst reducing overall demands on the primary water sources"* (van der Merwe *et. al.* 1999).

From the above three definitions, we can see that WDM is broadly defined as *"a technique of curbing water demand"*

Many of the tools used to improve water consumption are similar in principle and have been used to greater or lesser success internationally. Often, these tools are not used independently and typically, numerous tools would be introduced to complement each other in a WDM programme (Fiander and White 1994). Over the last few years, there has been an increase in the number of WDM programmes in the larger cities around the globe, including South Africa.

Two of the most recent WDM programmes in South Africa have taken place in the Western Cape. These two programmes, which were implemented in Hermanus and Stellenbosch differed in both scale and goals however, they allow us to draw comparisons between local case studies and international trends and tools in WDM. The Hermanus study was implemented over a three-year period and included many smaller projects under the title of the Greater Hermanus Water Conservation Programme (GHWCP). The Stellenbosch project ran over a shorter time period and consisted entirely of a retrofit programme. In the two case studies presented below, different WDM tools are explored and compared in terms of the Hermanus and Stellenbosch WDM programmes.

2. STELLENBOSCH RETROFIT PROGRAMME

Stellenbosch experiences a Mediterranean-type climate with dry hot summers and cold wet winters. This climate poses unique problems for water supply authorities as peak water demand corresponds with the dry summer months. Stellenbosch is however situated close to a high rainfall area, with the Hottentots-Holland Mountains surrounding the town, receiving up to 2000mm of rainfall per year (Moorgas 1999).

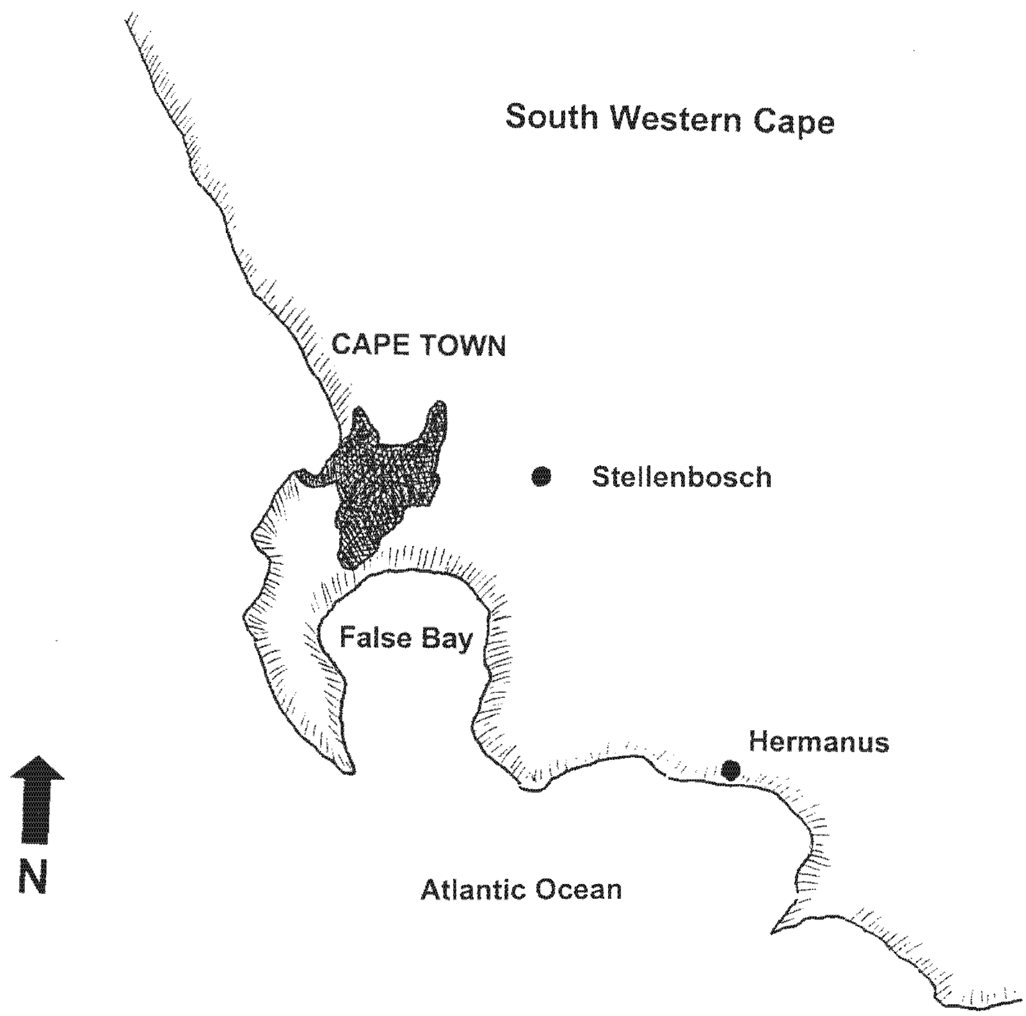

Figure 1: The south western Cape showing the towns of Stellenbosch and Hermanus

Water supply has therefore never been a large problem, with 70% of Stellenbosch's water coming from the Eerste River catchment in the Jonkershoek Valley and the remaining 30% pumped from the Theewaterskloof Dam near Villiersdorp (Moorgas pers comm.). Although Stellenbosch has never experienced any major water shortages, an increasing population together with growing economic activity has resulted in a greater demand for water. Despite the growing demand, conservative estimates predict that Stellenbosch has enough water to meet this demand until the year 2030 and possibly 2045 (Moorgas pers comm.). In 1996, the Stellenbosch Local Transitional Council together with Eskom entered into a joint partnership to install energy and water savings devices into 120 homes in Stellenbosch.

Aims

The aim of the Stellenbosch project was to implement an intensive retrofit programme in a residential area by replacing existing fittings with water-saving fittings. An electricty study was linked to the retrofit project in Stellenbosch, hot water installations were insulated in many of the houses to prevent wasted heat loss (Moorgas 1999). Electricity and water consumption figures were compared before and after to gauge the success of the project. The Stellenbosch project served as a comparison with a similar study in the town of Hermanus. Hermanus, being a popular holiday destination shows great seasonal fluctuation in water demand. Together with this comparative study, the Stellenbosch project also gave further insight into the potential for retrofitting projects in South Africa in the future.

Method

The initial stage of the Stellenbosch project consisted of a questionnaire. The aim of the questionnaire was to establish which houses would be representative of the area and which residents would co-operate in this project. A marketing company was appointed to conduct the questionnaire phase of the project. After the data from the questionnaire was analysed, 120 names of different homeowners who agreed to participate in the study were given to the municipality.

The second phase of the project involved pre-installation visits to establish types of fittings as well as to give the public a feel of how the project was running. After the pre-installation phase, appointments were set up with homeowners for installation of new plumbing fixtures. In the installation phase, one plumber and three helpers were used. Finding the best time for the different homeowners and the plumbers proved very difficult.

Water together with electricity consumption was monitored before and after installation to compare fluctuations in usage. Retrofitting included dual flush toilets, toilet dams, earth showerheads, aerators and flow restrictors.

Results

The Stellenbosch retrofitting programme achieved mixed success. The water consumption figures from one meter are shown as Figure 2 below. Although just one meter is illustrated, it gives an indication of the potential savings. One must bear in mind that rainfall and temperature figures are not included in this analysis and could play a large part in water consumption, especially over the summer months. In the four months shown in Figure 2, a 17% reduction in water savings was achieved. One of the major shortcomings of the retrofit project was the unsuitability of water savings devices. The dual flush toilet system was not suited for most toilets and the system did not fit into most porcelain cisterns. The toilet dams were often too long to fit into the cisterns, which in some cases were very thin. Aerators and restrictors rely on the correct pressure to function properly.

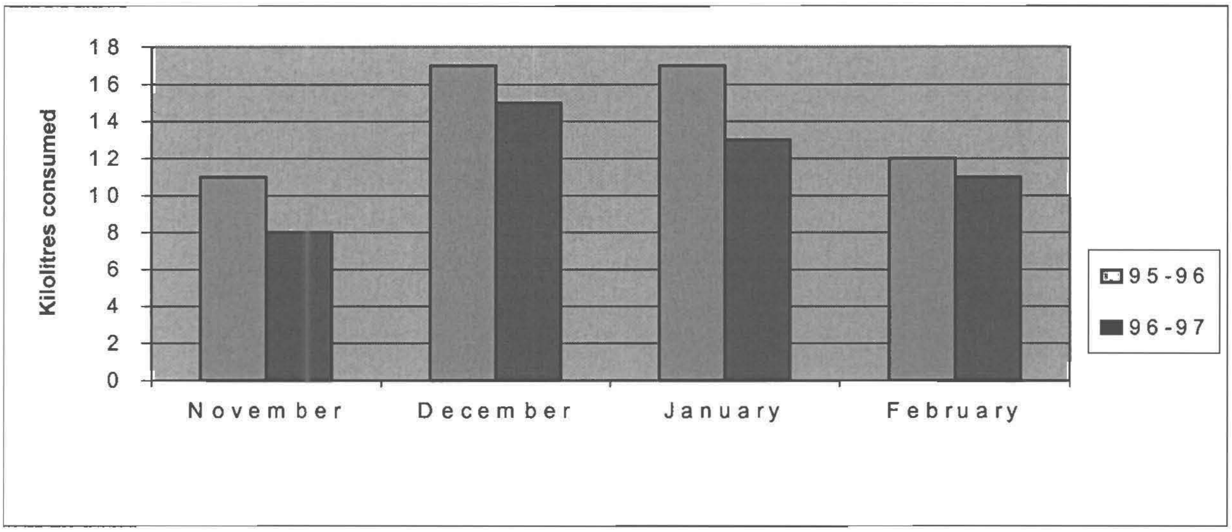

Figure 2: Comparison in water consumption before and after the Stellenbosch Retrofitting programme

In many cases, the pressure was not sufficient to allow for the correct functioning of the fittings. Installing the 87 houses took approximately 3 months to complete. Although the installation process took approximately two hours, it was the appointment process that resulted in the whole process being delayed. The execution and analysis of the survey data should be done as efficiently as possible, preferably less than one month. Advertising and communication between the participants and the council is crucial for this type of project to be successful. These conclusions were derived by the Stellenbosch Council and will hopefully serve as a guideline for other institutions wishing to implement their own strategies.

3. GREATER HERMANUS WATER CONSERVATION PROGRAMME

The Greater Hermanus Water Conservation Project (GHWCP) has been heralded as one of the most ambitious projects of its kind in South Africa. The Greater Hermanus Water Conservation Project is a package of incentives and disincentives aimed at promoting equity, efficiency and sustainability in supply and use in this coastal town in South Africa (http://www.africanwater.org/urbawater/ghwcp/index.html). Much of the success of the GHWCP lies in the 12 point plan formulated to cover many aspects related to water consumption in the Greater Hermanus area (Bea Whittaker pers. comm.).

Greater Hermanus is a seaside town and a popular holiday destination for many people in the western Cape. It occurs in the winter rainfall area of the south western Cape and experiences hot, dry summers and cool wet winters. For many years, the smaller villages that make up Greater Hermanus relied on local groundwater supplies. However, with the increased development in the area in the last few years, the De Bos Dam was constructed approximately 3km upstream of the Onrus River estuary (Van der Linde and Whittaker 1999). Projections at that time estimated that this annual consumption would last until the year 2005. However, with increased tourism and development along the coastline, it was found that the annual consumption of up to 2800Ml per annum would be exceeded before the projected date (Van der Linde 1997).

In 1991 it was proposed that the dam wall be raised by some 4 metres, which would secure abstraction of 4100 Ml per annum and thus satisfy the demand until the year 2009. The application to raise the dam level reached the Department of Water Affairs and Forestry (DWAF) and they concluded that the net assured yield was only 3 300Ml per annum and an increased allocation above 2800Ml per annum would not be approved.

In 1994, the town engineer recommended that WDM be implemented in the future to ensure a sustainable future water supply. Contact was made with DWAF's National Water Conservation Campaign, and a comprehensive WDM programme was proposed.

In a combined effort between DWAF, the Greater Hermanus Local Authority (GHLA) and the people of Greater Hermanus, the GHWCP was launched.

Aims

The GHWCP was structured to serve as a model for all municipalities to assist them with their water demand strategy (http://www.hermanus.co.za/info/water/html). The goals of the project included the introduction of the following WDM initiatives:

- A "user pays" approach, whereby all water users pay for their water consumption
- Introduction of a "lifeline" water tariff, aiming to promote equity of water supplies and services
- Introduction of a tariff whereby all water users who drive the marginal cost of water pay for the marginal price
- A polluter pays approach
- A commitment to full resource economic approach when selecting possible augmentation options
- A strategy that ensures that the municipalities finance is kept on a sustainable footing as far as water revenues are concerned
- Enhance water security through alien clearing and protection of water resources
- Ensure efficiency in water allocation, supply and service maintenance
- Be a role model for similar practices in other areas

More specifically, the project aimed to achieve a saving of 30% in water consumption over the next 3 years, and increase water revenue by R100 000 per year to fund some of the components of the conservation programme.

Methods

Much of the success of the Hermanus project has been attributed to the 12-point plan developed specifically for this area. The 12-point plan is multifaceted and covers a broad spectrum of topics consisting of incentive (carrot) and disincentive (stick) factors. The 12-point plan included the following:

- Assurance of supply tariff
- 11-point escalating block rate tariff
- Informative monthly billing system
- Intensive communication campaign
- 20/20 Vision resource audit
- Working for water programme
- Water-wise demonstration gardens
- Water efficient devices
- Water loss management project
- Water wise food production project
- Municipal By-laws
- Masakhane Combined Services Communications Project

Results

The GHWCP was met with both a positive and negative response by the community. If anything, the project made the community more aware of their water consumption and general water use. The greatest reservations were seen with regard to the perceived "high" water tariffs.

Consumption levels over the three years of the project showed very positive results and can be seen in Table 1.

Table 1. Consumption and Rainfall figures for the duration of the project

Year	95/96	96/97	97/98	98/99
Consumption (megaliters)	2 884 185	2 412 308	2 557 566	2 765 834
Rainfall (millimetres)	591.1	611.3	622.5	698.4

One of the main goals of the GHWCP was to reach a 30% reduction in water consumption after 3 years. Some of the original strategies of the 12 point plan are self sufficient, and will still continue, while others, which require continual input have run to an end.

4. INTERNATIONAL WDM PRINCIPLES IMPLEMENTED IN HERMANUS AND STELLENBOSCH

The different components of a WDM programme are discussed below in greater detail. Various WDM tools are introduced and then discussed in relation to WDM initiatives internationally and then compared to the GHWCP and Stellenbosch retrofitting programme.

4.1 Communication Strategy

A carefully planned and professionally implemented communication strategy is crucial to the success of a demand management programme (Fiander and White 1994). In many successful WDM programmes, the communication strategy is the foundation of the project (White 1994).

The primary purpose of the community education campaign is to inform the public of the WDM programme, and what the authority is doing with regard to demand management and how this leads to better water supply management (B. Whittaker pers. comm.). The structure and makeup of the local community will, to a large degree determine the scale and structure of the communication strategy. Most community education campaigns should aim to communicate: why the project is being done, what will happen if the project is not implemented, what the individual can do to contribute to the problem and what the authority is doing about the problem.

A communication campaign can take the form of a variety of media, including TV, radio, public presentations, newspapers, magazines, brochures, seminars and newsletters (White 1994). The most effective of these media, are audience specific media. In WDM, this is anyone who uses water. If for example, one were making comments on changes to the pricing structure, the water bill would be a good place to advertise.

Educating the youth in WDM can provide many learning opportunities at pre-primary, primary, secondary and tertiary education establishments. The influence school children have on their parents should never be underestimated (Fiander and White 1994). White (1994) identifies the following as being important benefits to both the water authority and the school education sector: useful curriculum material provided to children, schools themselves can save money by introducing programmes and savings techniques, and school students can be effective teachers to their parents.

Another part of a communication programme, is a community extension programme, which involves providing free training to members of the community in water savings practices. The Earthworks programme initiated in NSW in Australia was a community extension programme and conducted training courses in water savings. The programme has been extremely successful with several hundred graduates now responsible for water conservation in their respective communities. For this type of programme to work, a great deal depends on the enthusiasm and motivation of the trainers.

GHWCP - Communication Strategy

The GHWCP emphasised the importance of a good communication strategy and that it was the basis to a successful WDM programme. The communication strategy was undertaken by a private communications consultancy, and was one of the most important and successful parts of this project. The programme fulfilled the four communication principles of: why the authority is doing it, what will happen if people don't contribute, what people can do to help and what the authority is doing to help.

The communication campaign included:

- Press releases
- Weekly coverage in the media on any water activity and water related matter,
- Talks with residents and interest groups
- The reverse side of the informative billing sheet was used as a information tool and covered a variety of topics on how to save water, from water savings in the garden and landscapes to leaking toilets and general tips on water conservation

- A water hotline was established to answer a variety of public questions, dispel fears, amend misunderstandings, report leakages and provide conservation tips on request
- All correspondence relating to water issues were answered promptly
- A monthly newspaper, On Stream, was published and served to highlight positive and negative progress of the GHWCP as well as more tips on water conservation and awards won by the project. The newsletter was both unbiased and informative and served to:
    - → highlight some of the issues relating to the new tariff
    - → provide information on topics such as various new water related laws
    - → bring some of the successes of the project to the fore

Water audits were conducted at all the schools in the Hermanus area, and data-sheets were sent back to NWCC for processing. Engineers from the municipality helped with the conversion of some of the fixtures to "water friendly". While some schools showed great commitment and developed their own projects over and above those prescribed by the GHWCP some of the schools did not take up the water conservation with the same enthusiasm. The education and awareness programme in the schools was nevertheless, successful.

A combination of financial constraints and the completion of the three-year time period means that the very successful communication strategy has come to an end. Much of the hard work done in the last three years will unfortunately be undone if a similar programme is not implemented in the near future. It has been shown that much of the success of the programme is quickly forgotten amongst many of the residents, and they return to their old water wasting days once the programme ends (White 1994). This can be seen in the consumption figures. Not directly related to the communication strategy, but related to the WDM project as a whole, two water-wise gardens were established in public areas, and helped to highlight the water savings campaign. These gardens are still on display in the town and although slightly neglected, serve to educate. The water wise gardening project was successful with improved awareness levels of consumers and homeowners. However the level of success of this particular project is difficult to measure.

Stellenbosch - Communication Strategy

Although the Stellenbosch project did not implement a communication campaign, it was suggested that such a campaign together with a retrofitting initiative would have achieved significantly better results. The lack of commitment of the public was identified as a major weakness of the project. Many of the people were not fully informed about the aims of retrofitting and WDM in general, and were thus apprehensive about getting involved in the retrofitting initiative. Had an effective communication campaign been established, it was felt that public cooperation would have contributed towards greater water savings (S. Moorgas pers. comm.). A communication strategy would have provided a greater understanding of the problems at hand and thus a better grasp of the logistics surrounding the problem. Sean Moorgas, project coordinator believes that any project of this type should begin with a communication strategy, and if they were to start another project, a education and communication strategy would be of top priority (S. Moorgas pers. comm.).

A useful comparison can be made between the success of the Stellenbosch and the Hermanus projects with respect to their communication strategies. Hermanus implemented a very successful communication strategy (together with many other WDM tools), while Stellenbosch neglected the benefits of a communication strategy for various reasons, and did not achieve similar results.

4.2 Retrofitting

Many WDM initiatives implement retrofitting programmes. Retrofitting programmes involve the replacement of old, often-inefficient fittings with efficient equipment in residential or non-residential users (Fiander and White 1994). Fittings include all appliances that use water such as toilets, taps, showers and urinals. A retrofitting project works best when accompanied with a water use audit, which can help decide what fitting to replace and the amount of water to be saved. Typical water savings devices reduce the amount of water used by simply using it more efficiently (van der Linde & Whittaker 1998). Some types of water savings devices for toilets include dual flush toilets, displacement bags, valve replacements and smaller but more effective cisterns (New Mexico State Office 1999). Urinals can be fitted with demand buttons or infrared and microwave sensors. Showers can be fitted with low-flow showerheads, specially designed to reduce the flow without compromising the efficiency of the fitting. Taps can be fitted with flow restrictors or with aerators to use water more efficiently (New Mexico State Engineers Office 1999).

Apart from good management practice and a combination of tools such as water audits, a successful retrofitting programme needs good quality equipment. Fittings are needed, which provide the same service as the old equipment, but are more efficient in their water usage. There is little use for equipment which conserves water, but which sacrifices the quality of the fitting. A problem common to retrofitting programmes, is that where user comfort is sacrificed for the sake of water conservation, users quickly replace the new water savings devices with old fittings (R. Donovan pers. comm.).

A well-designed retofitting programme integrated with an audit of the customers' premises followed up with advice and education can offer the maximum possible savings (Fiander and White 1994). In Kalgoorie Boulder, Australia, where the price of water is considerably lower than that paid by most customers, retrofitting programmes are very cost effective (White 1994). Within the Los Angeles district, a toilet rebate system instituted in 1990 resulted in 40 000 toilets being retrofitted in the same year. The following year, the same programme was retrofitting over 10 000 toilets per month. This programme resulted in estimated annual savings from retrofitting of conventional toilets, showerheads and taps of 54 litres/capita/day (Vickers 1991). In a retrofitting study conducted at a camp in the Royal Natal National Park, a 20% savings in water was achieved. This reduction was achieved by simply installing water savings devices including low-flow showerheads, dual flush toilets, aerators and flow restrictors in taps (Tendele User-pays Project Team 1998). A well-planned programme requires that the authority maximise the benefits of the audit and customer contact, avoiding repeat visits (Fiander & White 1994).

GHWCP – Retrofitting

In the GHWCP, original objectives were to retrofit all of the houses built before the date of project initiation for free. It was planned to fund this operation from the funds generated by the increased tariffs. These retrofitting projects included the following:

- Dual flush toilet mechanisms
- Low flush showerheads
- Tap aerators
- Flow restrictors in pipes

After numerous meetings on retrofit strategy, plumbers were trained and thereafter conducted visits to houses. 58 houses were visited initially, and it was seen that the retrofitting programme was not as easily implemented as originally planned. Thereafter, it was decided that the first 58 houses were to be used as a small sample study to determine the suitability of various devices. The results from this study would give an idea of the effectiveness of retrofitting devices.

The retrofit programme unfortunately encountered numerous logistical problems. Constraints included, technical shortcomings preventing successful retrofitting, financial constraints preventing the involvement of the desired number of participants, inaccessibility of houses, resistance from home owners and the fact that all water-savings devices do not fit all plumbing installations. The first 58 houses were therefore used as a pilot study for later retrofitting exercises (van der Linde & Whittaker 1998). Whether the retrofitting project will continue is unknown. Although the GHWCP served to illustrate that a retrofitting project of this nature is an expensive operation and large amounts of money and time has to be invested, the potential exists for significant water savings.

Stellenbosch - Retrofitting

In the Stellenbosch study, fittings replaced included showers, taps and toilets. Showers were fitted with low flow showerheads, toilets were fitted with a dual flush mechanism and toilet dams while taps were fitted with flow restrictors and aerators. Geyser insulation was also part of the programme, but will not be discussed here. Although the Stellenbosch retrofit project did not produce the desired results, it was successful in that it highlighted certain problem areas, which can be overcome in projects of a similar nature in the future. The support and commitment of the public was lacking in the Stellenbosch project, probably as a result of a poor communication programme.

The Stellenbosch study found that the time period between the initial visit and the retrofit was delayed due to logistical problems. This time period is crucial for the success of the problem, as the issues are still fresh in the minds of the residents. Extra labour is recommended to bring down the long-term operational costs. The quality and type of retrofitting equipment is of utmost importance in a retrofit project. It has often been found that poor quality equipment is one of the biggest problems with a project such as this. Residents will simply resort to the old equipment if the new fittings are of a poor quality. The financial implications of a retrofitting programme are considerable, and should not be underestimated. The Stellenbosch project had a limited budget, and found if a retrofit project is to be successful, it is going to cost quite a bit of money.

4.3 Pricing Structures

Various pricing structures have been implemented in different parts of the world in an attempt to change consumption patterns. In many WDM programmes, the price structure has often been one of the most successful tools (Fiander and White 1994). There are various pricing structures, namely the two-part tariff, flat rate charges, declining and inclining block tariffs and seasonal pricing. A key principle of water pricing is that the long-run marginal cost of water supply should be used as a benchmark for setting tariff levels, and not the average historical cost, which is often the case (Eberhard 1995).

The two-part tariff consists of an availability charge and a usage charge. The availability charge comprises a set charge, while the usage charge is placed above this and usually matches the marginal cost of providing the next unit of water to the consumer. Flat rate charges require each consumer to be charged a fixed amount based on service size or property value. This usually means that the consumer pays a set minimum rate. In a similar system, users are charged a fixed charge for the first part, to which the consumer is entitled a set amount. Thereafter the price paid per kilo-litre may decrease with unit bought. In this system, large users will pay less per unit of water than small users.

Similarly, in a declining block tariff, consumers are charged at lower rates the higher the consumption. Very large users pay a lower marginal cost, while small consumers pay a higher marginal cost. One of the best pricing systems is the inclining block tariff, where high users pay a higher price for every extra unit of water bought. Finally, seasonal pricing results in prices varying seasonally depending on consumption and rainfall patterns. .

GHWCP - Pricing Structure

As part of the WDM programme, the local authority implemented an 11-step increasing block rate tariff for all residential users in hermanus. The tariff started at 30 cents per kiloliters for the first 5 kiloliters used per month, and then gradually increased in 11 blocks up to R10-00 per kiloliter for each kiloliter used above 100 kiloliters per month. Although the tariff may have appeared very high, it is only expensive when a household exceeds 36 kiloliters per month. In a telephonic survey conducted by the University of Cape Town, it was seen that 96% of the people were supportive of the programme, a further 70% and 54% were supportive of the stepped tariff structure and assurance of supply tariff respectively.

The assurance of supply charge was charged as a privilege of having clean water delivered on the site. The assurance of supply also provides the local authority with an assured income, which is important in a holiday town such as Hermanus where many of the residents are only present in the summer months. The house vacancy for most of the year would result in no income generated for the authority. A further aspect of the assurance of supply charge, was that different charges were applied to different income groups, with low income, middle income and high income all paying different amounts. This could potentially allow for subjective decisions, but it seemed to work for the Hermanus project.

The monthly difference in income for the first year of the GHWCP was–7% for June and +51% for January. After the first year, the additional income amounted to R1.3 million. This was R0.2 million higher than projected for the first year. The tariffs were not increased at all during the first three years.

Apart from increased revenues from water sales, water consumption dropped considerably, probably as a result of the increased price. The assurance of supply and block rate tariffs were probably two of the most successful parts of the GHWCP. It has been shown that water pricing has had a significant effect on water consumption in many parts of the world and the water-pricing project will most probably continue in Hermanus. In a holiday town such as Hermanus, where large fluctuations in visitor numbers are seen, the assurance of supply ensures a constant income for the water supply authority, while in the block rate tariff system, large users pay more for every extra unit of water used.

Stellenbosch – Pricing Structure

Although water pricing was not part of the Stellenbosch project, it would definitely contribute to a reduction in water consumption. The newly introduced Water Master Plan has included a stepped tariff rate and is proving very successful. The assurance of supply also implemented in Stellenbosch was very successful and will also continue.

4.4 Meters and Leakage Control

To effectively manage the water used by a facility, it is necessary to quantify the volumes involved (Massachusetts Water Resources Authority 1995). Water metering of private organisations allows for accurate estimates of water use, helping with the assessment of unaccounted for water as well as water bill estimation. Highly visible meters serve as a constant reminder to consumers of the water that is being consumed further adding to the savings potential of meters (R. Donovan pers. comm.). Together with the installation of meters, the frequent reading and recording of meters is essential (Massachusetts Water Resources Authority 1995). Metering programmes are highly cost effective, and in most cases are effective WDM tools (Fiander and White 1994). Meters work very successfully if implemented with a water loss management programme.

Non-revenue water is water which is delivered but for which the municipality receives no payment. Within non revenue water, unaccounted for water is all water that is delivered in bulk, but is not registered on a meter as having been used, while reticulation water is water that is lost in the system and not used at all (Fiander 1994). Any water authority implementing a water conservation programme should attempt to eliminate reticulation water. Water lost due to leaks is water that has been transported, filtered and stored at an expense. The loss of this water is an extra cost and provides no value to consumers or system administrators therefore increasing the cost of the water that does arrive at a consumer. Furthermore, leak detection and correction measures are ways of showing users that authorities are serious about water savings and conservation and are a prerequisite to any successful water savings programme.

GHWCP - Meters and Water Loss Control

Hermanus identified a leaking network as a major cause for concern and in need of serious attention. Fixing a leaking network not only saves water, but it creates a good impression of the supply authority amongst consumers. Residents are less likely to obey water restrictions if they see water within the authorities network being wasted. The water loss management programme implemented in the GHWCP consisted of bulk water supply management, network management, meter management and water balancing. In the bulk water supply management project, a greater understanding of the water movement in the different reservoirs is gained via telemetry systems. The opening and closing of reservoir valves, indications of water levels in each reservoir, overflow and intruder warning signals are communicated through the system to the treatment works, with alarm sounding when the levels are too high or low. All valves and hydrants were audited by means of a computer network management programme. The control system will ensure effective maintenance, measure productivity and calculate costs incurred. In 1997, many faulty, inaccessible, unreadable and other inaccurate meters were identified. In 1998 a properly organised meter management computer programme was implemented. Water balancing efficient water use by the authority is of utmost importance and water balancing for the individual reservoirs districts in Greater Hermanus needs more attention A leaking network makes it very difficult to run an effective water supply system.

Although the Hermanus metering project has still not come into full operation, plans are in the pipeline for the introduction of the complete meter system in the community of Mount Pleasant. Combined water and electricity bills are envisaged together with bi-directional links with the ambulance, fire brigade and police. Due to numerous technicalities, the project has not come to fruition. This type of project is ideal for the work of a non-governmental organisation (NGO), and a partnership between the water supply authority and the NGO should be established. An NGO working in Mount Pleasant would understand the difficulties and the most successful ways of dealing with projects in these areas, and would have experience in the particular field. Partnerships between water supply authorities and NGO's are needed to successfully implement such programmes.

Stellenbosch - Meters and Water Loss Control

Realising the need to conserve water, the Stellenbosch water supply authority, recently launched a water master plan for the Stellenbosch area. This master plan includes the installation of new bulk meters and the maintenance of old meters to record water flow. With the assistance of a computer system, the flow can be effectively measured. Together with the bulk meter programme, a pipe replacement programme has been introduced which analyses and calculates pipes due for replacement. This minimises water loss and repair costs due to the repeated breakage of pipes.

4.5 Water Re-use

Water is supplied from rivers in catchment areas to storage dams and reservoirs, from these reservoirs and dams; the water is pumped to residential and industrial users in towns and cities. Often after only a single use, water is discharged into a sewer, through minimal treatment and then into a waterway which runs out to sea. Apart from being an extremely inefficient system, much polluted water enters rivers and streams, leading to contamination. Around the world, tougher standards on discharged water, has seen a huge improvement in the quality of much discharged water. This improvement has made it possible to use discharged water for many applications in the industrial, domestic and irrigation sectors (White 1994). As a supply source, wastewater is one of the most reliable, hardly being affected by drought, and increasing with an increase in population (Fiander 1994).

As a tool for WDM, wastewater provides a large source of readily available water at a fraction of the price of primary water. Wastewater re-use provides benefits to both the supply and the wastewater side of water utilities operations. The government of Namibia, realising that Windhoek's demand was fast outstripping its supply, initiated a water savings campaign in 1992. Together with a very successful education and awareness campaign, the town began to re-use some of its domestic sewage. Apart from being a world first, this re-use is still in operation today and is one of the most effective systems globally. The plant recycles between 7 and 13% of the Windhoek's wastewater (van der Merwe *et al* 1999).

Scope for Water Re-use in the Hermanus and Stellenbosch

Both Hermanus and Stellenbosch can potentially benefit from water re-use programmes. Neither Stellenbosch nor Hermanus have implemented plans to re-use water and further development in this direction would be beneficial. The benefits of water re-use have been well documented in other cities such as Windhoek (van der Merwe *et al* 1999). Initially, in the GHWCP, it was planned that treated sewerage effluent would be used in the development of food gardens in Zwelihle. The food would be chosen specifically for its suitableness towards this type of irrigation.

Unfortunately, the water wise food production project was not successful due to numerous difficulties, and the project was eventually terminated however some sectors of the community still manage to maintain gardens initiated during this project. The help of local NGO's could have greatly contributed to the success of this type of project. NGO's have a good working knowledge of the local conditions and limitations.

4.6 Legislation

In many parts of the world, legislation is providing authorities with a base from where to work and implement water savings initiatives. In Boston Massachusetts, legislation now prohibits the use of toilets which use more than 7 litres per flush, (http://www.mwra.state.ma.us/water/html/wsupdate.htm), while in Bangkok, Thailand, new plumbing codes require 6litre toilets instead of the old 14litres (Maddeus *et al* 1996). New legislation in Cape Town permits the installation of automatic flush urinals in new buildings (Roy Donovan pers. comm.). Enforcing new regulations and legislation not only helps water authorities, but saves millions of litres of water.

Scope for Legislation at Hermanus and Stellenbosch

Greater Hermanus will be introducing the National Water Regulations as by-laws. These will ensure that both the rights and responsibilities of both the local authority and the residents will be given the force of the law. All residents of Hermanus are requested to adhere to the principles of the draft regulations of the Water Services Act (No 108 of 1997). There is large scope for water savings in new legislation in both Stellenbosch and Hermanus. Regulations proposed in the Water Services Act (No 108 of 1997) include equitable tariff structure; water balancing; non payment procedures; banning garden watering between certain times; an audit of the authorities own performance; a ban on washing down of paved surfaces, and strict control on water and energy efficiency design in new houses and developments.

4.8 Projects Initiated in the GHWCP

Working for Water Programme - Clearing Invasive Alien Vegetation

In the 1997/98 financial year, 360 hectares of invasive alien vegetation was cleared in the catchment area of the De Bos Dam. The project, which is part of the national Working for Water Programme employs up to 120 people of which 80% are woman (van der Linde and Whittaker 1998). Various training programmes have been implemented on days when work cannot be done. The National Working for Water project is tending towards private contractual work with the eventual goal of it being run totally by private contractors. The success and benefits of the working for water programme have been well documented. Apart from the water savings, thousands of jobs have been created, and further environmental damage is prevented by the removal of alien vegetation (Whittaker 1997). In Hermanus, the working for water project will continue after the three-year time period as sufficient funding has become available. Further clearing of alien vegetation will continue above the De Bos Dam.

Water Wise Gardening

As already mentioned in the Communication strategy, two demonstration gardens were set up in Greater Hermanus, one in the centre of town and one opposite a local high school. The garden in the centre of town was chosen due to its exposure to the public, while the garden opposite the school was divided into two parts, showing a normal garden and a water wise garden and the comparative water consumption

5. CONCLUSIONS

The demand for water is unlikely to go away. Neither are droughts, dams, irregular rainfall, invasive plants and growing cities. However, the way we use our resources will determine the rate of decline of our natural systems. WDM is a strategy that is successfully making us aware of our water usage and our efficiency and helping to prevent excessive use.

From the above assessment, it can be seen that parts of the GHWCP compare favorably with international WDM initiatives. There are many factors that should be borne in mind when assessing and comparing local and international programmes. Ideally, WDM projects need to be assessed in terms of their sustainability. Whether a project can continue past the initial stages without the continual assistance of an authority is a test of its sustainability. A project that requires the attention of a water authority will be unlikely to succeed. Water shortages are not temporary, and permanent solutions are needed to counter them. A combination of successful policy, legal, economic/financial, technological and educational aspects are necessary for a WDM project to be successful and sustainable (Allison *et al* 2000).

The GHWCP has been the cause of much local attention in the last three years, and a large amount of precious resources have gone into making sure that the GHWCP project is successful. Looking at some of the awards and international recognition achieved by the GHWCP, it is hard to believe that the project has not been a great success. However, at the end of the three-year period, water consumption is again on the increase in Hermanus and the future of the project hangs in the balance.

As is often the case, administrative problems have cast uncertainty over the GHWCP and the hard work by some has unfortunately been quickly forgotten. Disputes over the allocation of project finances have caused a few of the more successful projects within the GHWCP to be placed on hold. The long-term sustainability of the GHWCP has to be questioned. The communication drive, such an integral and successful part of the project is no longer in operation. It should also be borne in mind, that the GHWCP received huge support from a national level downwards, and whether the same success would have been achieved without this kind of support is unknown. Within the GHWCP, some parts of the 12-point plan were very successful, while others were possibly a little ambitious. However, what the GHWCP did show was that water savings were possible, and that with the proper planning and management, the whole GHWCP will contribute greatly to future WDM initiatives in South Africa and in the Greater Hermanus area. The GHWCP showed that in South Africa, we have the technology and the know how to implement an up to date WDM programme which compares favourably with international water conservation initiatives.

The Stellenbosch retrofit programme was to a large degree, less successful than the GHWCP, but was limited by a tight budget and lack of personnel. Future projects in Stellenbosch include the implementation of the Water Master Plan, which involves the upgrading of the water distribution systems, a pipe replacement programme, a bulk meter installation programme and possibly, the installation of prepayment meters in some parts of Stellenbosch. The Stellenbosch Local council also plans to undertake an automatic urinal study.

The South African Water Services Act 11 (1) states that *"Every water service authority has a duty to all consumers or potential consumers in its area of jurisdition to progressively ensure efficient, affordable, economical and sustainable access to water services."* Every water services authority in South Africa is bound by this statement to provide the required service. The Stellenbosch Local Council has developed a Water Master Plan to successfully manage and develop a culture of planning and implementation. By first focussing on the existing distribution system and creating effective management, elements such as water demand, unaccounted for water, water wastage, pipe breakages, can be minimised and eliminated. It is also vital that the consumer is made aware of water related issues, in order to minimise water demand, thus minimising the need for continual upgrading and construction of new water sources (Moorgas 1999).

The investigation into two WDM strategies in the south western Cape revealed that we have the potential to save large amounts of water. Current initiatives are starting to highlight some of the wastage that is occurring in the Cape and South Africa. With the correct management and experience, we can make a very real contribution to water conservation in South Africa. Current WDM initiatives are contributing to the growth in awareness of water issues in South Africa.

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