EVALUATING THE EFFECT OF INFORMATION ON DOMESTIC WATER CONSUMERS IN CAPE TOWN

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COMPULSORY DECLARATION

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

Signature: Signed Date: 5/09/2005

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Abstract

For the past three decades, information combined with other demand management strategies has been used by many conservation studies and programmes to reduce resource consumption. Findings from these international studies have been mixed. Minimal research on water demand management has been conducted in developing countries. To date, no studies have tested the independent effect of information on resource use in South Africa. This study evaluates the effect of five different types of information on water consumption behaviour amongst the top 20% of domestic water consumers in Cape Town. Types of information tested in this study takes the form of tips, potential water savings, information illustrating monetary savings, feedback on household water consumption, and a combination of the above information, all of which was presented in an information leaflet. Monthly water data from a randomly selected set of 2 300 households was obtained from the City of Cape Town. Percentage changes were calculated using consumption figures during the study period (July to November 2004) and compared to the same months from the previous year (2003). A control group was used to factor in the effects that extraneous variables such as rainfall and restrictions, have on water demand. The control group achieved a 15% reduction in water consumption during the study period. This percentage reduction was factored into the experimental group's percentage change in consumption. The study concluded that information in general had no effect in reducing water demand. The group receiving information on potential monetary savings actually increased water consumption by 3%. Households that received feedback reduced water consumption overall by 2%, a percentage that decreased to 4% when information was combined with imposed water restrictions in the last two months of the study. The success, albeit limited, was attributed to feedback designed to motivate, reinforce and increase awareness of

household water consumption. Larger water consumers (households consuming 50Kl or more of water each month) who received the feedback leaflet combined with the water restrictions did, however, achieve a considerable reduction of 16% in water demand. A telephone survey using open-ended questions clarified and confirmed the results. Respondents attributed a reduction in their water consumption to water restrictions and the information leaflet that provided feedback. The majority of households found the information leaflet useful, while 71% felt that the leaflet should continue to be sent to water consumers in the future.

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List of abbreviations

CCT	City of Cape Town
CMA	Cape Metropolitan Area
CMC	Cape Metropolitan Council
DWAF	Department of Water Affairs and Forestry
GHWCP	Greater Hermanus Water Conservation Programme
IWRM	Integrated Water Resources Management
IWRP	Integrated Water Resources Planning
Kl	Kilolitres
ProMIS	Professional Management Information System
SAP	Systems, Applications, and Products
SES	Socio-economic status
UK	United Kingdom
USA	United States of America
WDM	Water demand management

Chapter 1

Introduction

The growing scarcity of fresh and clean water is among the most important issues facing civilisation in the 21st century.

(Bruenig and Simonovic, 2002: 249)

1.1. Global water demand and its future supply

Approximately 2.5% (1.4 billion km^3) of all water on Earth is freshwater (UNEP, 2002). Of this percentage, less than 1% (0.01% of all freshwater resources) is used by ecosystems and human beings (Ibid.). Human beings consume about half of all available water on Earth (United Nations, 2001).

Worldwide, water demand has increased tenfold since 1900 (Baer, 1996). Huge pressures on the world's water reserve have occurred for two important reasons: the global population explosion[1]; and an exponential demand for food production that is water intensive (Turton, 2000). Consumption patterns[2] have also changed. Since 1950 material consumption has increased (Postel, 1992) and per capita consumption of resources has also grown[3]. Water pollution has also reduced the quality and quantity of available water (World Bank, 1993; European Commission, 1998). In addition, rapid urbanisation and economic development (Bate & Tren, 2002) have contributed to significant increases in water demand. In response to these realities, the long term sustainability of water has become a major global concern. Postel forecasts that "if current [water consumption] trends continue, per capita water supplies worldwide will drop by more than a third by 2025" (1992: 191). Bate and Tren (2002) agree that water shortages occur as a result of the mismanagement of water. The

[1] In 1900, the world population was 1.6 billion (Postel, 1992), by 1990 it had increased to 5.3 billion (World Bank, 1993) and is predicted to reach 8.1 billion by 2030 (United Nations, 2001).
[2] Global water demand has been growing faster than the population and is nearly "50% higher than it was in 1950" (Shiklomanov as cited in Postel, 1992: 39).
[3] Worldwide, the demand for fresh water for human consumption has quadrupled in the last 50 years, while the world population has roughly doubled during the same period (OECD, 1997: 29).

management of current reserves and future demands for water is therefore critical to secure future supply.

Water is a basic human right (Constitution of South Africa, Act 108 of 1996 as cited in DWAF, 2004) and is vital to social, economic and political well-being (European Commission, 1998). Despite this reality, more than 1.2 billion people worldwide have no access to safe drinking water (Postel, 1992; Pacific Institute For Studies in Development, Environment, and Security, 2005).

About 230 million people live in 26 countries classified as water deficient and this number is expanding (Postel, 1992; European Commission, 1998). Many countries, such as Kuwait, Singapore, Saudi Arabia, Israel, Algeria and Malawi are in a state of absolute[4] or relative scarcity[5] (Baer, 1996). By 2025, the number of people living in water stressed[6] countries will "increase sixfold from 470 million in 2000 to 3 billion" (Postel, 1999: 257). Predictions for the next 50 years appear dismal as between 13% to 20% of the global population (the majority of whom reside in Africa and the Middle East) will be affected by severe water scarcity (World Resources Institute as cited in OECD, 1997).

Increases in per capita water demand and unsustainable consumption is increasingly prominent in developing as opposed to developed countries (United Nations, 2001). Postel (1999) predicts that between 1995 and 2020, household and industrial water demand in developing countries will increase by 590 billion kilolitres[7] every year. This increase is the result of both urbanisation[8] and industrialisation in developing economies (Crompton & Erwin, 1991). Furthermore, Postel predicts that "on average, about 150 000 people join urban dwellers daily in the developing world" (1999: 112). Developing countries continue to focus attention on increasing water supply rather than choosing water efficiency and water demand management (WDM) options (European Commission, 1998).

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[4] Below 500 m^3 of water per person per year (Baer, 1996).

[5] Less than 1 000m^3 per person each year (Baer, 1996).

[6] Less than 1 700m^3 of water per capita each year (Baer, 1996). Countries are considered to be water stressed if water tables are decreasing and/or lakes and ground water reserves are diminishing and/or wetlands are disappearing and/or flooding and droughts are intensifying (Postel, 1992).

[7] 1 kilolitre = 1 000 litres = 1 m^3

[8] By 2025, 5 billion people are expected to live in cities - twice as many as in 1995 (Postel, 1999).

1.2. Future supply and current water demand in South Africa

One of the most critical challenges of sustaining a growing South African population lies in the provision of water resources. South Africa is a developing country with an increasing per capita water demand (DWAF, 2003). In 2001, the South African population of 44.8 million (Statistics South Africa, 2003) continues to expand rapidly[9] at a growth rate of 2 to 3 per cent per annum (DWAF, 1999). Due to this growth, it is predicted that unless water conservation and sustainable development policies are able to stem the demand, South Africa will use all its natural water resources within 30 years (Ibid.). Davies and Day warn that "[water] supplies [in South Africa] will no longer be able to meet demand some time between 2020 [use of all surface water] and 2040 [use of all ground water]" (1998: 7).

South Africa is an arid country with an annual rainfall average of half the global average (860mm) (DWAF, 1999) and has an extremely variable[10] climate. These realities illustrate the need for efficient water management and a reduction of excessive water consumption[11]. The importance of water conservation and WDM is imperative to meet current basic water supply goals while ensuring economic efficiency and sustainable demands.

Until recently (1995), South Africa focused attention mainly on Water Supply Management (WSM) as the solution to increasing water demand, however, this option is becoming less viable and has reached limits in several regions (Bate & Tren, 2002). This is confirmed by Postel who acknowledges the importance of conservation as "one of the most cost-effective and environmentally sound ways of balancing urban water budgets" (1992: 147).

Water supply is also becoming a more expensive and difficult means to implement (Postel, 1992). DWAF state that "the most suitable locations [in South Africa] for resource development [water augmentation schemes such as dams] have already been used" (1997b: 23). As a result, DWAF (2004) suggest that before new infrastructure is developed, WDM programmes must first be implemented, however, the importance of combining water

[9] Southern Africa has one of the fastest growing populations in the world- the population doubles or triples every 20 to 30 years (Pallett, 1997).
[10] Erratic rainfall (DWAF, 2004) and relatively high temperatures and high evapotranspiration (Bate & Tren, 2002; DWAF, 2004).
[11] Water used unnecessarily for non-essential purposes.

conservation, WDM and WSM to meet future water demand is recognised (DWAF as cited in Bate & Tren, 2002).

Demand management seeks to maximise the usage of a given volume of water by curbing inessential or low-value uses through pricing or non-pricing measures (European Commission, 1998). This approach "involves applying selective, mostly economic incentives to promote more efficient and equitable use of water" (Pallett, 1997: 102). The value of water is therefore increased by higher water tariffs and/or greater public awareness so that more value out of each litre consumed is achieved by more efficient means.

1.2.1. Disproportionate supply and access to water

Despite South Africa's change to a democratic, non-racial government in 1994, the consequences of Apartheid have left enormous social, economic and technical problems within black townships and rural areas (DWAF, 1999). Cock (1991) and Bond (2002) discuss the direct effects that Apartheid had on black urban townships in terms of access to potable water and sanitation. The "history of water in South Africa cannot be separated from the history of the country as a whole... the history of water is a mirror of the history of housing[12], migration, land, social engineering and development (DWAF as cited in Bond, 2002: 261).

Water scarcity, inequitable distribution and lack of access to clean water and sanitation are major issues in South Africa especially in former homelands, such as QwaQwa (Klugman, 1991), and townships such as Soweto (Coetzee & Cooper, 1991). According to the 2001 Census, 5 million South Africans do not have access to basic water (DWAF, 2004). In addition, efforts to address the lack of water service infrastructure have led to policies enabling all households to receive 6Kl of free water each month (Hazelton, Nkhuwa & Robinson, 2002). In June 2003, 27 million South Africans received the 6Kl (DWAF, 2004). A planned increase in service delivery to 1.25 million more households by 2008 will amount to an extra 7.5 million Kl of free water required each month!

[12] Less than 67% of households in South Africa are formal dwellings (Statistics South Africa, 2003).

Figure 1 illustrates the distribution and provision of water to various sectors in South Africa. The majority (more than 75%) is utilised for agricultural and industrial purposes, while 12% is consumed by the residential sector. Of this 12%, more than half of the treated water is used for outdoor purposes such as garden watering and filling swimming pools, while less than a tenth of this amount is consumed by black South Africans, but far the majority of the country's population (Bond, 2002).

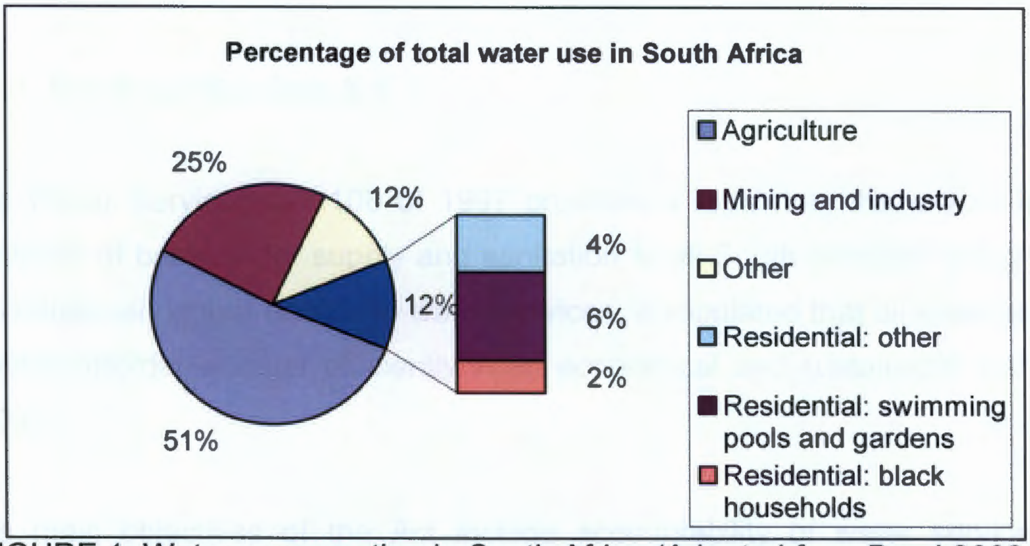

FIGURE 1: Water consumption in South Africa (Adapted from Bond 2002: 35-36).

According to the South African Constitution Act 108 of 1996, every citizen has a right to have access to clean water (DWAF, 2004). Recent legislation relating to access and supply of water in South Africa is briefly discussed to illustrate the necessity of improved water management that leads to more efficient water usage amongst all consumers.

1.2.2. The National Water Act

The National Water Act 36 of 1998 provides the legislative structure for water management using an Integrated Water Resource Management (IWRM) framework from the National Water Resource Strategy. The IWRM framework is a multidisciplinary approach to water management incorporating technical, economic, social, political and environmental components (DWAF, 2004).

The government is the public trustee of the country's water resources and is responsible for water quality and quantity (Glazewski, 2000). The Act ensures that a certain amount of water is held as the 'reserve' to meet basic human needs, for the protection of aquatic ecosystems, and to ensure water availability in the future (World Commission on Dams, 2000). The Act addresses past inequalities with regard to access and determines water allocations, water pricing and pollution control (DWAF, 2004). The decision to provide free water (6Kl per household per month) in July 2001 aimed to address both the access and inequality concerns.

1.2.3. The Water Services Act

The Water Services Act 108 of 1997 provides a regulatory framework to guarantee the provision of basic water supply and sanitation to all South Africans and gives effect to the constitutional right of access to water services. It stipulated that all water service authorities provide affordable water efficiently in an economical and sustainable manner (Glazewski, 2000).

The main objectives of the Act include accountability of water service providers, and promotion of water resource management and conservation. The Act also finds alternative ways to provide water cost-effectively, such as incorporating water conservation and demand management measures (DWAF, 1999).

1.3. Cape Town: water supply and demand

The Cape Metropolitan Area (CMA) is situated in the Western Cape Province (Figure 2) and is divided into six local councils namely, Blaauwberg Municipality, Cape Town Municipality, Helderberg Municipality, Oostenberg Municipality, South Peninsula Municipality and the Tygerberg Municipality. This study is conducted in the Cape Town Municipality and is managed by the Cape Town Administration.

The CMA with the six local councils: Blaauwberg, Cape Town, Helderberg, Oostenberg, South Peninsula and Tygerberg

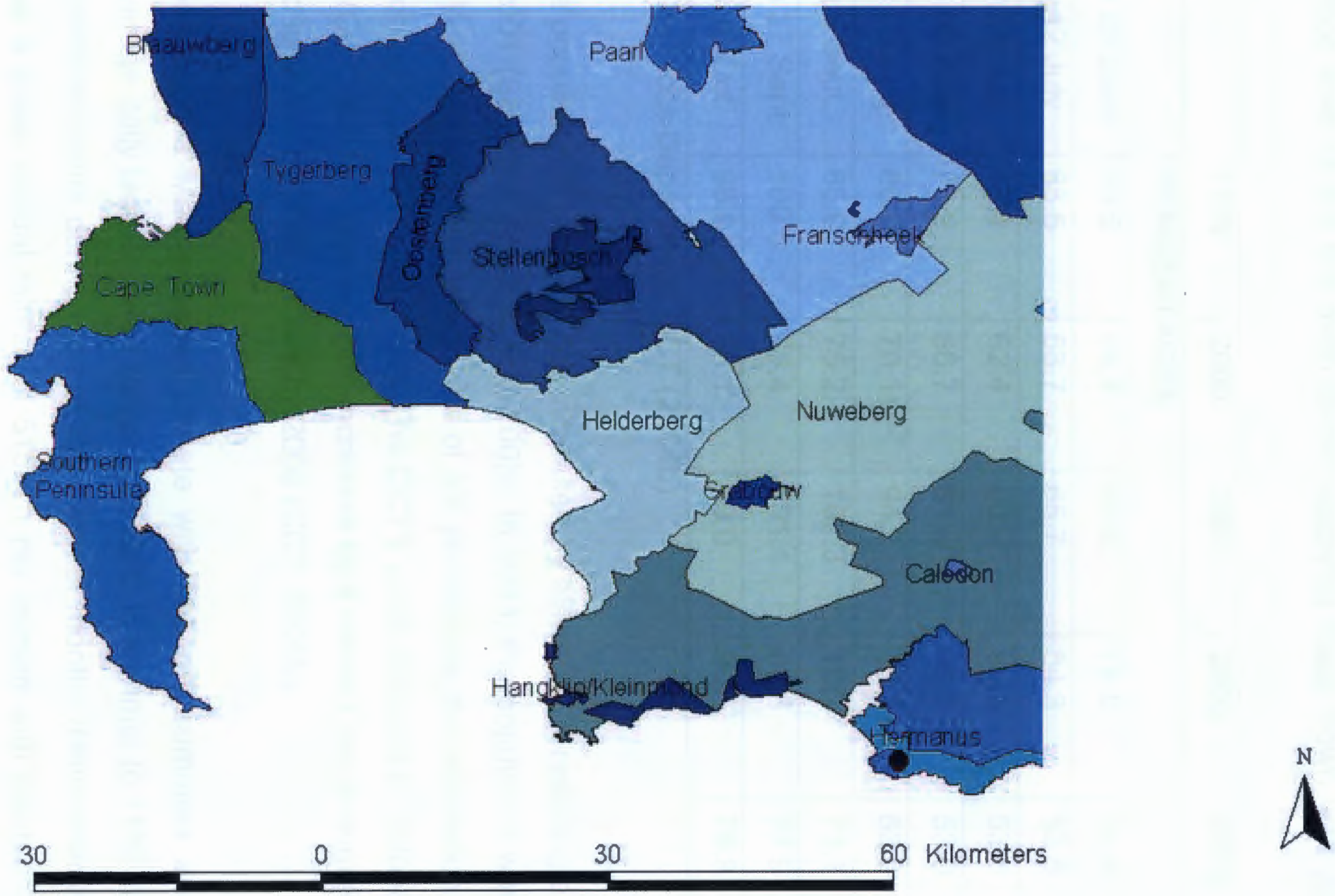

FIGURE 2: Map of the Cape Metropolitan Area and the six local councils

The table below illustrates the water storage capacity for Cape Town during 2004. The low volumes prompted the CMA to introduce water restrictions in October 2004. In 2004, dam levels were the lowest since 1999, with storage levels being less than half that of figures recorded in earlier years.

TABLE 1: Storage level of the five main dams supplying Cape Town with water (1999 - 2004)

	1999	**2000**	**2001**	**2002**	**2003**	**2004**
DAMS	**PERCENTAGES**					
% STORED on 28 June	59.5	54.4	49.6	78.9	54.6	35.9
% STORED on 12 July	65.5	53.7	65.7	84.3	53.5	37.1
% STORED on 26 July	73.4	62.4	80.0	90.5	53.6	38.9
% STORED on 02 Aug.	74.9	66.7	81.6	99.0	53.0	41.5
% STORED on 23 Aug.	86.9	70.1	94.3	100.1	63.0	56.8
% STORED on 6 Sept.	85.9	75.2	102.3	100.1	73.1	57.2
% STORED on 27 Sept.	100.6	85.4	101.1	99.6	77.9	57.1
% STORED on 18 Oct.	98.9	86.1	99.0	99.5	79.3	59.0

Source: Water Services Department, CCT (2004b)

Since 1996, the population in the CCT has increased by almost 13% reaching a total of 2.9 million in 2001 (Statistics South Africa, 2003). In 2003, the population was 3.2 million (CCT, 2001b). With an estimated growth rate of 3% per annum, the population is expected to reach 6 million by 2025 (Gasson, 2000). The CCT's water demand in October 2000 was 851Ml per day (CCT, 2001b). This demand increases by 4 percent per annum (CCT, 2004b and is expected to reach 1 200Ml per day by 2006 (CCT, 2001b).

The CMA experiences a Mediterranean climate with hot, dry summers and cool, wet winters. The average daily temperatures range from 22°C in summer to 11°C in winter. The highest water demand occurs during the hot, dry summer months (November to February). Cape Town has a mean annual rainfall of 515mm per annum with the most rain falling during winter (June, July and August).

Cape Town's metabolism[13] consumes "6.5 million tons of raw materials each week, with the majority of it being fresh water" (Gasson, 2000: 4). In Cape Town the "residential sector consumes 192.2 million tons of water" (58.9% of all water consumed in the city) (DWAF as cited in Gasson, 2000: 5). Between 30-50% of this domestic water is used for outdoor consumption (CCT, 2001b). From 1990 to 2000, water demand increased by about 4% annually (Ibid.). According to the West Coast District Municipality, recent water demand projections suggest that the increase could be as high as 10% per annum (Ibid.).

Since 1995 an emphasis on water supply to meet demand has been replaced by WDM in an effort to increase water use efficiency and manage water more sustainably in Cape Town. For example, a 'user pays' approach was introduced into Cape Town's billing system using a 'block tariff system[14]' to establish the price of water.

1.3.1. Water tariffs

The objectives of the National Water Act 36 of 1998 are to promote social equity, ecological sustainability, financial sustainability and economic efficiency. Accordingly, the National Pricing Strategy for raw water was implemented in the 2002/2003 financial year and aimed to recover costs from water consumers for water management and water supply infrastructure (DWAF, 2004). The majority of municipalities in South Africa have implemented a progressive tariff system for water use. Similarly in the CCT, a tariff system was introduced according to the level of water consumed (Table 2).

[13] All materials and commodities needed to sustain the city's inhabitants (Wolman, 1967: 167).

[14] A system of pricing, in which the cost of the product (in this case water) increases progressively in blocks as the quantity of water that is consumed increases (Pallett, 1997: 109).

TABLE 2: Domestic (full) water tariffs for the CCT (excluding VAT)

2002/2003 financial year

1st July 2002	Water consumption	Amount per kilolitre
Step 1	(0-6Kl)	R0.00
Step 2	(7-12Kl)	R2.73
Step 3	(13-20Kl)	R4.30
Step 4	(21-40Kl)	R5.46
Step 5	(41-60Kl)	R7.35
Step 6	(60+Kl)	R8.00

Source: Water Services Department, CCT (2004b)

1.4. Statement of the problem

An increasing demand for water in Cape Town, coupled with declining water availability, emphasises the need for improved water management and more efficient water usage. High or excessive consumers of potable water, especially for outdoor purposes, need to be targeted to reduce water consumption. The solution of supply augmentation to meet Cape Town's increasing water demands is impractical; environmentally, economically, and socially. It is vital that attempts be made to implement WDM strategies that are socially equitable and cost-effective. Information is the most cost-effective form of WDM and the easiest to implement.

The influence of information on water consumer behaviour in Cape Town is yet to be tested. It is not known whether information will change current water-use habits and practices in Cape Town. Furthermore, which types of information would be most influential in shifting water consumption behaviour amongst high-end water consumers has also not been ascertained. This study intends to address these two issues.

1.5. Research question

Given the current water situation in Cape Town and the importance of providing a management approach that is cost-effective in curbing water demand, information was evaluated in terms of its effect among water consumers. This study aims to answer the research question:

What kinds of information on water conservation are likely to cause households to reduce water demand?

1.6. Aims and objectives

The aim of this study is to evaluate the extent to which information can reduce water consumption amongst high-end households in Cape Town.

The objectives are therefore to:

i. Evaluate the nature of information (different types of information) presented in the form of a leaflet
ii. Establish why the information leaflets were (in)effective in reducing household water demand.

1.7. Thesis structure

Chapter 2 discusses information theory and outlines a framework for considering how people respond to information. Similarly, the literature review is discussed to provide a theoretical basis for considering why information is not used or put into practice. Barriers to, and benefits of change are explained in the Stages of Change model (Prochaska et al., 1994) using Janis and Mann's (1977) Theory of Decisional Balance. Chapter 3 explains how information is evaluated as well as the methods used to determine its effectiveness. Results from the study are graphed and presented in chapter 4. In this Chapter, group similarity is tested and the SES (income level) of the sample is investigated. The overall effect of information is evaluated, while the influence of individual leaflets during certain time periods and using different consumption categories are also examined. In the penultimate chapter (Chapter 5), reasons for the study's results are discussed in relation to empirical research and information theory. The influence of weather, for example, and other confounding variables on domestic water demand is also considered and discussed. A summary of the study results and conclusions are highlighted in Chapter 6. A few recommendations are provided in this Chapter that are based on the findings from this WDM research.

Chapter 2

Literature Review

Education and better access to information are important components for empowering people to take greater responsibility over their water use, giving people the skills to self-regulate and monitor water resources.

(Gardiner, 2001: 296)

2.1. Introduction

This chapter begins with a discussion on the literature of studies that have used information independently or combined with demand management strategies such as increased pricing, metering and/or rebates as a means to reduce resource use. The discussion has a twofold purpose: firstly, to position the role of information and knowledge in the context of demand management strategies; and secondly, to discuss consumer response to information and knowledge used in demand management studies. This is followed by a discussion of theories dealing with the way in which consumers respond to information and provides a framework for the analysis of data used in this study. In this way, the study aims to explain how domestic water consumers respond to different types of information by examining water consumption patterns over time. The Stages of Change model (Prochaska, Velicer, Rossi, Goldstein, Marcus, Rakowski, Fiore, Harlow, Redding, Rosenbloom & Rossi, 1994) and the Theory of Decisional Balance (Janis & Mann, 1977 as cited in Prochaska et al., 1994) are used to describe behaviour change.

This chapter discusses the potential for information to influence water consumption behaviour by reviewing earlier research on resource-use behaviour and literature on information theory and behaviour change. For this particular study, behaviour changes or shifts represent changes in water consumption habits and practices. Specific to this study, information encompasses a number of different types that are presented in leaflets[15]. In each leaflet, information focused on water issues such as storage level in dams, use of water in the home and scarcity. Information is provided as tips on how to save water; as potential water reductions which could be achieved by changing behaviour; monetary savings as a result of water reductions; and/or individual household water consumption presented in the form of feedback.

A response to information is dependent on a number of conditions (Hill, 1999; McGuire, 2001). Information needs to be specific and targeted to relatively homogeneous[16] groups to ensure that it is understood and relevant. Presentation needs to be vivid and salient, and the credibility of the disseminator needs to be known and respected. Clear and concise information is relevant and useful to recipients. Behaviour change requires that desired attitudes are targeted so that perceived barriers of those resistant to change are removed and the benefits are increased. This summary illustrates the variety of elements involved in individual response to information and the potential for shifting behaviour. These points are supported by relevant studies and theory and explained further in the following chapter.

2.2. Studies using information to reduce resource use

Resource crises such as the oil shortage and the subsequent oil embargo in the West during the 1970s, led to information campaigns promoting conservation attitudes through persuasive mass media (Olsen, 1981; Samuelson, 1990). Two assumptions informed these campaigns. Firstly, attitudes could be altered by persuasive appeals (Cook & Berrenberg, 1981; Olsen, 1981). Secondly, a change in attitude (that the resource shortage was genuine and severe) would ultimately influence individuals to change their consumption behaviour (Olsen, 1981). The use of 'fear appeals' was particularly popular as a means of convincing consumers to reduce their consumption (Hass, Bagley & Rogers, 1975; Becker, Seligman & Darley, 1979 as cited in Cook & Berrenberg, 1981).

The oil embargo imposed on the West in 1973 was an important catalyst for studies aimed at reducing domestic electricity consumption (Hass et al., 1975; Winett & Nietzel, 1975;

[15] A page of water information on how to conserve water that is sent to households monthly
[16] Households that have similar education levels and income (socio-economic status)

Kohlenberg, Phillips & Proctor, 1976; Seaver & Patterson, 1976; Winett, Kaiser & Haberkorn, 1976-1977; Palmer, Lloyd & Lloyd, 1977; Seligman & Darley, 1977; Craig & McCann, 1978; Winett, Kagel, Battalio & Winkler, 1978; Winett, Neale, Williams, Yokley & Kauder, 1978-1979; Winett, Neale & Grier, 1979). Results from these studies are discussed in more detail in section 2.2.1.

During the 1980s, studies focusing on domestic water consumption were undertaken largely as a result of drought in Australia, the United Kingdom (UK) and the United States of America (USA). During this period, water conservation programmes were designed to persuade consumers to reduce consumption by providing information about the nature of the resource and ways to reduce usage. The belief underlying these programmes was that knowledge changed attitudes and this led to a change in behaviour (Baumann, Opitz & Egly, 1992). Results from these studies were mixed.

Programmes that were successful in reducing consumption via information campaigns were conducted in California (Agras, Jacob & Lebedeck, 1980; Berk, Cooley, LaCivita, Parker, Sredl & Brewer, 1980) and the USA (Nieswiadomy, 1997). In Concord, New Hampshire, for example, a vigorous media campaign was attributed to have reduced water consumption by 15% (Hamilton, 1983). In Britain, "intensive public campaigns to encourage conservation" were introduced (Blackburn, 1978: 52). This publicity campaign claimed to have achieved a voluntary reduction in water consumption of 20%. Similarly in the USA, water consumption was reduced by 15% to 20% as a result of information campaigns (Gilbert, 1978; Miller, 1978). In California and surrounding areas, water demand was reduced by 10% to 20% (Griffith, 1978; Robie, 1978; Berk et al., 1980).

Despite the success of the above-mentioned campaigns, studies using information to promote resource conservation have also been ineffective. In Virginia for example, feedback and a comprehensive information booklet had no effect on domestic water consumption (Geller, Erikson & Buttram, 1983). The researchers provided possible reasons for the results. The "ineffectiveness...was mostly a function of resource cost" (Geller et al., 1983: 107).

The cost of water was too cheap due to a declining[17] block rate tariff and therefore there was a "lack of economic incentives for reducing consumption" (Ibid.). Secondly, "only one third of the targeted participants were exposed to the intervention" (Ibid.) as only the homeowner read the information booklet. In an energy conservation study in New York, Craig and McCann also concluded that the "communications may have been very effective in persuading an individual within the household [to conserve energy], but not the entire household" (1978: 87).

Another study in Texas tested the effects of information, and monetary rebates combined with information on electricity consumption over a three month period amongst 129 households (Winett et al., 1978). The 'large monetary rebate/information' group reduced electricity use by 12%. Information about how to save electricity proved ineffective in reducing electricity consumption. The group that received this information increased their consumption compared to the period prior to receiving information. The researchers attributed the lack of success to possible "weaknesses in current methodology [that] may be limiting the effectiveness of the feedback-rebate interventions in reducing air-conditioning" (Winett et al., 1978: 79).

Flack (1980) assessed numerous water conservation programmes in the USA that incorporated various strategies to reduce urban water demand. He concluded that the success of the programme depended on effective dissemination of relevant and meaningful information that was tailored to specific groups (Ibid.). Consumers need to understand why water should be conserved and have the knowledge on how to reduce water consumption (Ibid.). Stern (1976) agrees with Flack who recognises the potential for education in demand management studies.

A probable reason for the lack of success of water conservation studies is due to the fact that water is a basic necessity (Baer, 1996) and that there are no substitutes to replace it (Turnovsky, 1969; Aitken, McMahon, Wearing & Finlayson, 1994). Secondly, water demand is price inelastic[18] as consumption is unaffected by small changes in the price of water (Camp, 1978; Berk et al., 1980; Winkler & Winett, 1982; Aitken et al., 1994; Renwick &

[17] There is no financial incentive to conserve water as the more water consumed, the cheaper it is (per unit).
[18] Changes in cost or price have little effect on consumption and/or demand.

Archibald, 1998; Renwick & Green, 2000). Research has shown that the smaller the percentage of the resource cost on total household expenditure, the less likely it will be conserved (Winkler & Winett, 1982). In general, studies confirm that a lack of incentives to conserve does little to encourage consumers to reduce their consumption (Winett, Kaiser & Haberkorn, 1976-1977; Flack, 1980; Hayes & Cone, 1981; Geller et al., 1983; van der Linde, 1997).

2.2.1. Water and energy conservation studies in the 1970s and 1980s

From 1973 until the late 1980s there were a large number of studies and campaigns seeking to reduce resource demand using demand management approaches (Winett & Nietzel, 1975; Kohlenberg et al., 1976; Palmer et al., 1977; Winett et al., 1978; Winett et al., 1979; Hayes & Cone, 1981; Kantola, Syme & Campbell, 1984; Bruvold & Smith, 1988). The success of these studies varied largely in relation to the duration of the study, the sample size and inclusion of a control group, but most importantly, how data was collected and evaluated.

In most of these studies, the experimental period generally ranged from one week to a few months. The shorter the study, the less reliable the result. The long-term effects of the intervention[19] could not be investigated. Large sample sizes produce findings that are more consistent and representative of a total population. In general, these studies had small household samples that were not selected randomly. The size ranged from four households to fewer than 150. In most cases individuals were aware of their participation in the study. This could have repercussions on the results as this cognisance of their participation adds another confounding variable that needs to be accounted for during analysis. This effect was demonstrated by Thompson and Stoutemyer (1991) who showed that participants who were aware of partaking in the study reduced their water demand compared to the control group.

Another criticism of these studies is the lack of attention given to a control group to account for the effects that extraneous variables are likely to have on resource demand. Climatic

[19] An approach or strategy that is introduced in a study to influence resource-use behaviour.

factors and restrictions, for example, have significant impacts on water demand and need to be factored into the results to ensure that findings are accurate and reliable. Due to the effects of confounding variables on water demand, Syme, Nancarrow and Seligman (2000) recognised the difficulty of earlier water conservation studies to determine the independent success of WDM strategies.

Researchers who reviewed early conservation research were critical of these studies because of poor data collection methods (Hirst, 1990; Seligman & Hutton, 1981; Simmons, Talbot & Kaplan, 1984-1985; Syme et al., 2000). Consumption figures, for example, were not used to evaluate the success of the study objectively. The success of the study was determined mainly by self-reporting instruments that measured attitudes (Bruvold, 1979; Geller et al., 1983; Syme, Seligman & Thomas, 1990- 1991). A weak relationship between attitudes and behaviour changes that are self-reported has been consistently proven (Geller, 1981; Hamilton, 1983; Hirst, 1984; Kantola et al., 1984; Simmons et al., 1984-1985; Hamilton, 1985; Syme et al., 1990- 1991; Moore, Murphy & Watson, 1994; DeOliver, 1999).

Hirst (1990) contends that research design and evaluations of studies were too simplistic to determine their success. Winett et al., for example, attributed the "weaknesses in [their] current methodology" as a possible reason for the results which demonstrated the inability of information to change water consumption behaviour (1978: 79). Geller et al., conclude that "there have been few attempts to design and evaluate education and behavioural interventions for promoting water conservation" (1983: 106). These limitations of earlier conservation studies point to the need for objective evaluation methods to accurately test the influence of demand management strategies on resource-use behaviour.

2.2.2. The effect of information on resource use behaviour

To date there has been little research effort to evaluate the effect of information on resource-use behaviour. Syme et al., suggest that "very little has been published in recent years that systematically evaluates the role of information in reducing water use" (2000: 541). This deficiency is also highlighted by Duggan and Banwell's (2004) recent review of information studies which intended to create a model of effective information dissemination.

Syme et al., (2000) undertook a meta-analysis of studies using information campaigns[20] to reduce water demand in households. These researchers identified the need for an objective measurement of the effect of different types of information to assess the overall impact of information campaigns on water demand (Ibid.). Similar issues were discussed in a review of energy conservation studies (Seligman & Hutton, 1981). Studies were unable to identify which types of information were most effective in reducing electricity consumption. The researchers concluded that future studies should test how different people react to different types of information (Ibid.).

In summary, explanations for the poor response to information to conserve water were fourfold: the success of different information types was not measured objectively; data collection methods were not systematic; evaluations did not identify which types of information were effective and why; and specific attributes influencing individual responsiveness to information were not ascertained.

2.2.3. Water demand management in the developing world

Palencia (1988) found that by the late 1980s, only two major water demand studies in developing countries had been undertaken. To date, no research has been conducted in developing countries to test the independent influence of information on water-consumption behaviour, or to establish the reasons for (non-)responsiveness to specific types of information.

Recent studies in Southern Africa tested combinations of water demand strategies. These strategies were measured against actual consumption figures of visitors to the Kruger National Park (Preston, 1994). The user-pays approach, a data logger indicating usage, explanations by the researcher, posters and notices, a conservation book, newsletters, incentives and retrofitting were some of the demand management initiatives used in the study. The study claimed to have reduced water consumption by 74% and electricity by

[20] For this study, 'campaign' is defined as a series of coordinated and/or organised activities (radio advertisements, posters, and leaflets) to inform and/or educate the public on water conservation and related issues.

52%. These results illustrate the potential of WDM strategies to reduce resource use on a small scale.

The Greater Hermanus Water Conservation Programme (GHWCP), a WDM study in the southern Cape (Figure 2) incorporated a variety of demand management strategies that included informative billing (see Appendix 1), retrofitting, newsletters and education at schools. The informative bill provided consumers with information of monthly household performance with respect to water consumption for a period of one year. Information in the form of tips on how to save water was also provided. The programme achieved a 32% reduction in water demand within the first 4 months of the study (Hester, 2000 and DWAF 1997a -see Appendix 2). Although the results were impressive, success of specific strategies proved difficult to identify as too many demand management approaches were introduced simultaneously. However, residents were supportive of the study and identified informative billing as extremely effective in increasing their awareness and motivation to reduce water consumption (personal communication B. Whittaker, July 2003).

A similar project conducted in Windhoek, Namibia achieved results comparable to the GHWCP. The WDM programme reduced water consumption by 30% (Allison, Hester, Kombe, & von Druten, 2000). In addition, an education campaign further decreased demand by 16% (Ibid.).

These local WDM studies illustrate the potential for information to reduce domestic water demand. The theory underlying different responses to information is discussed further in section 2.3.

2.3. Information theory

Recent research has contributed new theories on how information is perceived, as well as explanations of how people respond to information (Hobson, 2003; Duggan & Banwell, 2004). In general, research has established that responses to information depends on numerous factors such as the type of information, the recipient and individual beliefs (Baumann et al., 1992; Hill, 1999; Bell, Greene, Fisher & Baum, 2001) and the time and context in which information is presented (Hill, 1999; Feather, 2000). Each of these factors will be discussed in the next section.

2.3.1. The nature of information

Information has been defined as a "category of concepts which our minds take in, consciously register, to which meaning can be attributed and which normally modifies our state of knowledge" (Hill, 1999: 22). Although knowledge and information are interrelated, these two words differ in the sense that information is a prerequisite for knowledge. Knowledge is therefore the outcome of receiving information as it can change with the addition of new information. Hill concisely defines the difference between knowledge and information- "one can be fully informed without being thoroughly knowledgeable, but one cannot be thoroughly knowledgeable without being fully informed" (1999: 29). The definition of knowledge is therefore complicated and broad as individuals gain knowledge by experience and learning. The interdependence between information and knowledge means that individuals are continuously being exposed to vast amounts of information that in turn may modify individual knowledge.

Before new information is accepted or stored as knowledge, it is evaluated. Acceptance or rejection of information depends on whether it conflicts or agrees with pre-existing ideas and already-held information (Costanzo, Archer, Aronson & Pettigrew, 1986; Duggan & Banwell, 2004). Knowledge is therefore "information that has been authenticated, validated or thought to be true" (Mason, Mason & Culnan as cited in Hill, 1999: 29) and is therefore continuously being modified by new information.

Different types of information have varying effects on individuals. Response to information depends on its content, the way in which it is presented and how it is communicated (Kantola et al., 1984; Hill, 1999; Bell et al., 2001). Each of these factors are discussed separately with the intention of identifying specific types of information most likely to influence behaviour.

2.3.1.1. Types of information

Kantola et al., (1984) discuss two different types of information and their purpose. Information can be provided in the form of tips to advise individuals on how to change behaviour. Alternatively, information in the form of feedback, can motivate individuals to act on the tips (Ibid.).

Different types of information presented to consumers have demonstrated varying success in changing consumption behaviour. Information provided before a behaviour is called the 'antecedent' approach and intends to change attitudes that lead to a change of behaviour (Bell et al., 2001). The 'consequent' approach provides information after a behaviour has been performed and aims to reinforce the behaviour (Ibid.). Success rates from studies using the antecedent approach in which information is presented in the form of tips and facts have varied (Winett & Nietzel, 1975; Blackburn, 1978; Hamilton, 1982; Kantola et al., 1984; Thompson & Stoutemyer, 1991; Syme et al., 2000). Consequent strategies that have used feedback techniques have proven more successful in reducing resource consumption (Winett et al., 1976-1977; Hayes & Cone, 1977; Winett et al., 1978; Hayes & Cone, 1981).

Certain types of information are more effective in influencing consumption behaviour than others. In New Jersey, USA, Becker (1978) evaluated the impact of feedback and the setting of consumption goals with respect to domestic energy consumption. Feedback included information about how much electricity each electrical appliance consumed. Participants also personally selected a low (2%) or high (20%) reduction goal in energy consumption. Results showed that the greatest reduction (of between 13-15%) in energy consumption was achieved by households that received 'feedback information[21]' together with a commitment to reduce consumption by 20%. Households that aimed to reduce consumption by 2% without receiving any feedback increased their consumption by 6% (Ibid.). This study demonstrated the potential for reducing consumption provided that substantial targets were personally selected, and when feedback assisted consumers to evaluate their performance in relation to their goals.

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[21] Feedback is defined as "any procedure where "subjects are taught to discern their own behaviour through contingent stimulation" (Hayes & Cone, 1981).

Feedback varies in terms of the form in which it is provided. Feedback can be presented as units consumed (kilolitres per month) or in monetary terms, percentage increases or decreases in consumption compared to previous months, as well as future consumption predictions based on current use (Palmer as cited in Hayes & Cone, 1977; Hayes & Cone, 1981). Information provided as social commendation in which consumers are congratulated or criticised [in the form of smiling or frowning faces (Winett et al., 1979)] or decals/ stickers (Seaver & Patterson, 1976) significantly increased the effectiveness of feedback and its consequent effect on reducing resource consumption.

Feedback has proven most influential in changing behaviour (Winett et al., 1976-1977; Becker, 1978; Hamilton, 1985), especially when it informs consumers about their performance (Winett, Hatcher, Fort, Leckliter, Love, Riley & Fishback, 1982; Winett & Kagel, 1984; Aitken et al., 1994; Deedat, Pape & Qotole, 2001). Knowledge of individual consumption levels has achieved the greatest success (Hamilton, 1985; Bruvold & Smith, 1988; Syme et al., 2000). Feedback allows for comparisons to be made between individual performance compared to those of similar circumstances, and has proven effective in achieving reductions of between 20-30% (Dennis, Soderstrom, Koncinski & Cavanaugh, 1990). Feedback is most effective when consumption averages and targets are set according to individual socio-economic status[22] (SES) and household characteristics (property size and occupant number) because the feedback is meaningful, relevant and comparable (Dennis et al., 1990).

The potential to alter and reinforce behaviour through feedback appears considerable. In Maryland, Washington D.C., information in the form of feedback was preferred over self-monitoring. Recipients who received feedback reduced their electricity consumption by 13 percent compared to those who monitored consumption themselves (Winett et al., 1979). Cook and Berrenberg (1981) list a number of approaches to encourage conservation behaviour but identify feedback as particularly important. Knowledge of individual consumption has shown to be positively related to greater efforts to conserve (Hamilton, 1985; Bruvold & Smith, 1988). This correlation was also acknowledged by Syme et al., (2000). Feedback has been found to prompt, motivate, cue and positively reinforce

[22] SES is defined and dependent on annual income and level of education. Individuals who have low levels of education and relatively small (if any) income are characterised into the lower socio-economic group.

consumers to reduce their demand for electricity (Winett et al., 1978-1979) and water (Aitken et al., 1994).

2.3.1.2. Communicating information

Effective communication of information is essential if it is to be understood by recipients (Kochen, 1975; Costanzo et al., 1986). Research identifies a number of ways to increase the influence of information on recipients. Winett and Kagel (1984) and Syme et al., (2000) recommend that the message and related information be specific to the behaviour. The value of information lies in its use (McGuire, 2001), such as being able to save money and/or improve one's life as a result of the information (Feather, 2000). Information needs to explain how it is going to benefit the recipient. This means that information must clearly define what the desirable behaviour is, how the cost of consumption is related to consumer behaviour, and how the expected behaviour relates to monetary savings. The focus on loss (how much money will be lost if a behaviour is not performed) rather than gain (associated with the new behaviour) is more influential in changing behaviour (Costanzo et al., 1986; Dennis et al., 1990). Studies have demonstrated that economic incentives influence conservation behaviour (Winett & Nietzel, 1975; Hayes & Cone, 1977; Winett et al., 1978; Samuelson, 1990).

Studies also show that a recall of information depends on its simple and clear presentation in a vivid and personalised manner focusing on individual rather than on group actions (Winett et al., 1978-1979; Hill, 1999; Syme et al., 2000). In a water demand study in Melbourne, Australia, Aitken et al., concluded that "careful presentation of simple information can induce significant behavioural changes in the recipients" (1994: 155). Vivid, creative, interesting, original, and innovative information is remembered best (Hill, 1999). The language must also not be demanding or threatening to recipients (Winett & Kagel, 1984).

Effective communication necessitates that the information provider be perceived as credible with regard to his/her expertise and the authenticity of the information (Winkler & Winett, 1982; Costanzo et al., 1986; Dennis et al., 1990; McGuire, 2001). Credible information successfully reduced electricity demand in New York (Craig & McCann, 1978). Water consumption was also reduced in Iowa when the local government, who was perceived by consumers as extremely trustworthy, provided information on water conservation (Lee & Warren, 1981).

Flack (1980) and Aitken et al., (1994) recommend that for information to be communicated effectively, it needs to be adapted to specific groups of people. Strategies aimed at changing behaviour need to be sensitive to special needs of groups and individuals with respect to differing backgrounds, cultures, priorities, needs and morals, as well as literacy, education levels and interests. These requirements are discussed in the next section where psychological and positional factors influence the response to information and related changes in behaviour.

2.3.2. Psychological and positional factors

Individual response to and use of information depends on certain psychological and positional factors that determine both openness to and selection of information (Costanzo et al., 1986). The need for a comprehensive understanding of the psychology behind behaviour to conserve resources before information campaigns are planned, in addition to understanding consumer perceptions and prejudices in performing specific behaviours, is recognised by Syme et al., (2000). Psychological factors specific to a recipient influences response to and processing of information. Positional factors comprise the circumstances of the recipient's environment that support or prevent a response or behaviour from occurring. Behaviour change is thus dependent on both psychological and positional factors. For example, if individuals do not have the resources to change, a new behaviour will not be attempted. This is explained further in the following section and summarised in Figure 3.

2.3.2.1. Psychological factors influencing individual response to information

Hill argues that an individual's response to information depends on "...the way [in which] it has been disseminated[23] and the timing of it" (1999: 279). More specifically, it depends on

[23] Disseminated information is information that is disclosed, revealed or provided to individuals.

how information is presented, the content and subject matter (Hill, 1999). Any response to information depends on individual choice of selection, firmly held assumptions and beliefs, intellectual abilities and the readiness of the mind to exploit information (Costanzo et al., 1986). Another factor influencing a response is whether information is accidentally received or actively pursued (Hill, 1999). This will depend on individual openness and/or willingness to receive information- the greater the willingness, the more likely the information will be read and used (Duggan & Banwell, 2004). Baumann et al., (1992) demonstrated that although there was a positive response to information programmes that aimed to reduce water demand, the response was dependent on whether consumers were convinced that they should conserve. Individual response therefore depends on a number of mutually exclusive factors that interrelate and influence each other.

McGuire (2001) attempts to explain the complex relationship between human response and information by considering 'output persuasion steps'- a series of stages through which an individual progresses once information is received. He suggests that a recipient of information 'advances' through a variety of stages before information is accepted and remembered. These stages are pertinent to this thesis and warrant further discussion.

McGuire (2001) identifies the first stage in which recipients are initially exposed to information. This information is then evaluated in relation to already held beliefs and assumptions. New information can "confirm already held beliefs, add to existing beliefs and knowledge, correct or modify one's existing knowledge, and/or open up a completely new field of knowledge" (Hill, 1999: 22). New information can create an uncertainty or a 'cognitive dissonance[24]' that forces one to decide whether to accept or reject this information. This 'dissonance' was validated empirically when participants were informed of the inconsistency between previously measured conservation attitudes (that it was their duty to save) and actual consumption levels (Kantola et al., 1984). If information is considered relevant, valued and/or fits within already held beliefs, the recipient is more likely to maintain interest in the information (Feather, 2000). This process occurs at the third stage in the McGuire framework.

[24] "Incongruity or disharmony among a person's beliefs, knowledge, and behaviour" (Kaplan, 1998: 154).

The process continues when the content and components of the information are understood while new information is being absorbed and further learning occurs. The fifth stage describes how new information is assessed in relation to existing knowledge, with the possibility of accommodating new knowledge. Knowledge of a specific topic increases the ability of an individual to gain and process more information through an enhanced level of understanding (Rowley & Turner, 1978). Similarly, in the next stage relevant skills are acquired such as learning how to achieve certain ends.
The seventh stage is characterised by a change in attitude following an agreement and acceptance of the information. Stage eight represents the acceptance of information and storing of knowledge in the memory. The ninth stage represents retrieval of the information when it is required. In the tenth stage the recipient decides whether or not to act on this new information. The recipient is likely to act on the new information provided it is perceived as worthwhile.

In a study in New Hampshire, USA, participants most knowledgeable about the resource made greater efforts to conserve than those with limited knowledge (Hamilton, 1985). The relationship between knowledge and action was also demonstrated in a Polish study on waste management (Grodzinska-Jurczak, 2003). The penultimate stage in McGuire's typology, termed 'post-action,' occurs when the newly performed behaviour is integrated and stored in memory and is referred to as 'cognitive integration'. In the final stage, recognition of the new behaviour as beneficial or worthwhile can cause the recipient to attempt to persuade others to behave in the same way (McGuire, 2001: 32).

The intention of discussing this framework was to demonstrate the difficulty and complexity of response to and acceptance of information and its varied effect in influencing behaviour amongst recipients. Response to information is non-linear, open-ended and unpredictable (McGuire, 2001) and as discussed earlier, is dependent on the recipient, his/her pre-existing beliefs and attitudes (Hill, 1999). Based on information theory, it can be assumed that in this study, any response to information will vary considerably due to the large sample size and subsequent heterogeneity of the sample, both of which are discussed in Chapters 3 and 5. Positional factors also influence the likelihood of whether a change in behaviour will occur and are discussed in the next section with respect to water-use behaviour.

2.3.2.2. Positional factors influencing behaviour change

Positional factors are defined as characteristics of an individual that relate specifically to his/her social, economic and environmental circumstances. Positional factors include 'home-dependent' factors such as SES, number of occupants in a household, and property size, all of which are likely affect whether a behaviour change will occur or not (Whitcomb, 1991).

In the context of domestic water consumption, certain positional factors will affect whether shifts in water-use behavior will occur. If, for example, information clearly demonstrates the benefits of retrofitting and a recipient decides to install dual-flush toilets; whether this action will be performed, will depend on positional factors characteristic of the individual. These include "disposable income, home repair skills and knowledge, and home ownership" (Costanzo et al., 1986: 523). It is these factors that are most likely to support or prevent a behaviour from occurring. Money for example, is needed to purchase the necessary equipment and/or pay a plumber to install the retrofitting device. If an individual chooses to personally install the device, both knowledge and skills on how to install a dual-flush toilet mechanism are necessary (Kantola et al., 1983). Research has shown that homeowners are more likely to invest money to conserve water than individuals in rented accommodation (Costanzo et al., 1986).

SES plays a role in changing water-consumption behaviour. Households of higher SES tend to live more extravagantly and consume more water by using washing machines and other water-consuming appliances compared to lower socio-economic groups (Renwick & Archibald, 1998; Renwick & Green, 2000; Loh & Coghlan, 2003). Wealthier households usually own larger properties which may include swimming pools. The positive relationship between garden size and/or a swimming pool and water demand has been regularly demonstrated (Whitcomb, 1991; Renwick & Archibald, 1998; Renwick & Green, 2000; Jacobs, Geusteyn, Loubser, van der Merwe, 2004; Renzetti, 2003). Consequently households consuming large amounts of water for gardens and/or swimming pools have the greatest potential for water reductions with little effect on personal comfort or convenience.

The effect of a new behaviour on personal comfort and convenience influences whether it will be performed (Winkler & Winett, 1982; Simmons et al., 1984-1985; Hamilton, 1985; Syme et al., 2000). Outdoor water consumption can be reduced with little effect on personal comfort and/or convenience. Olsen (1981) and Samuelson (1990) identify these two barriers (personal comfort and convenience) as significant in influencing behaviour change.

In conclusion, response to information programmes relating to use of the information and related behaviour change is largely dependent on psychological and positional factors. Interpretation, acceptance and use of information leading to a reduction in consumption relies solely on the recipient and his/her SES, beliefs and needs, household characteristics and positional factors. Response and effectiveness to conservation programmes using information to promote water reductions is thus extremely variable.

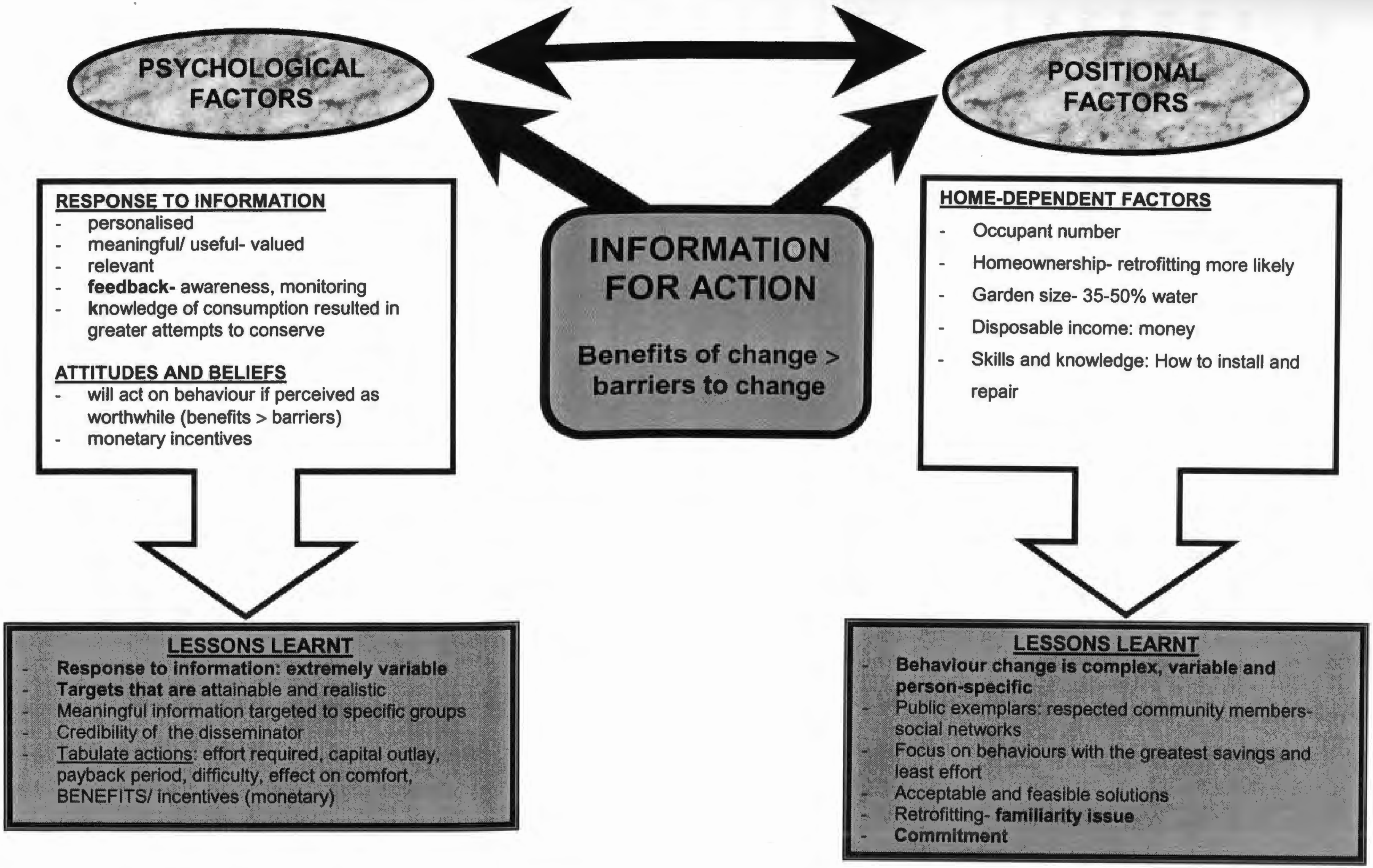

FIGURE 3: Psychological and positional factors influencing behaviour

2.4. Behaviour change

Increased awareness, greater intentions and/or changes in attitude have not always translated directly into changes in behaviour (Seaver & Patterson, 1976; Geller, 1981; Kantola et al., 1984; Moore et al., 1994). In Perth, Australia, research on domestic water use demonstrated the relationship between specific attitudes and consumption behaviour (Loh & Coghlan, 2003). After the study it was concluded that there was great potential for "a massive education campaign... to promote responsible water usage behaviour" by changing specific attitudes (Ibid.: 31).

In Australia, attempts were made to promote sustainable consumption amongst households by identifying 'barriers to action' and considering how individuals read and react to 'sustainable consumption information' (Hobson, 2003). Extensive research of literature on sustainable consumption and/or behaviour change across many disciplines demonstrated the complexity and difficulty in altering practices due to a variety of factors identified and discussed by Hobson (2003: 102- 103). Studies have investigated the relationship between knowledge and behaviour in an attempt to identify those factors that inhibit a response (Hobson, 2003; Tucker & Speirs, 2003). Aitken et al., concluded from their water demand study in Australia that "behaviour change requires stronger inducements and better targeted information" to effectively decrease water demand (1994: 156).

Beliefs such as the effect of the new behaviour on personal health and comfort, actions that require high effort and low pay-off, as well as perceptions of being able to make a difference are identified as having potential to influence individual consumption (Olsen, 1981; Samuelson, 1990). Therefore, despite intentions to change, personal reasons for not doing so will influence whether the new behaviour will be performed or not. In Perth, Australia, for example, having a lush garden for recreational purposes and good resale value on the house was more important than saving water (Syme et al., 1990- 1991). Olsen (1981) identified two of the most common reasons for conserving resources: saving money and solving the energy problem. Thomas, Syme and Salerian (1987) identified the "potential for campaigns to be effective in changing significant water-related behaviours if appropriate attitudes are targeted" (as cited in Syme et al 2000: 554).

Behaviours perceived as most convenient and familiar, requiring minimal effort while producing the greatest savings, were more likely to be adopted (Simmons et al., 1984-1985). The difficulty in changing behaviour is therefore a result of personal perceptions and attitudes that influence whether intentions to change will translate into action. Theory suggests that attempts to change specific attitudes should focus on target behaviours that are easily performed and most beneficial to the individual. Individuals are best able to alter their behaviour when they have specific knowledge of the consequences of their behaviour (Seaver & Patterson, 1976).

Another factor influencing the likelihood of behaviour change is the potential for households to reduce their water consumption. This potential relies in the per capita consumption of individual households (Hamilton, 1983). Households that waste water have a greater capacity to respond to conservation programmes as it is easier to reduce consumption when decreases have little or no effect on personal convenience and comfort.

In the next section, behaviour change is explained using theory that provides a framework from which to discuss water consumption behaviour. Prochaska et al., (1994) and other behavioural theorists strongly recommend combining models in an attempt to explain and predict behaviour change. The Trans-theoretical model (Prochaska et al., 1994) combined with the 'Theory of Decisional Balance'[25] (Janis & Mann, 1977 as cited in Prochaska et al., 1994) provides a conceptual framework to explain behaviour change in the context of water consumption. The model was developed from health psychology to explain how individuals change behaviour through a process of rational decision-making.

The Trans-theoretical model is considered an "integrative and comprehensive model of behaviour change" (Prochaska & DiClemente, 1983, 1984, 1985, 1986, 1992 as cited in Prochaska et al., 1994: 39). This model describes the process from inaction to action through a number of stages. The framework comprises five stages, each of which are discussed in combination with Janis & Mann's (1977) 'Theory of Decisional Balance' (as cited in Prochaska et al., 1994) to explain how individuals rationalise and make decisions before altering behaviour. The Theory of Decisional Balance focuses on the barriers to, and

[25] Individuals make decisions to change their behaviour by weighing up the pros of (benefits) and cons to (barriers) changing that particular behaviour.

benefits of change that enables a shift across these stages. Figure 4 simply illustrates the progression of behaviour change. These factors are specific to the individual and are elaborated on in the next section.

2.4.1. The Trans-theoretical and Theory of Decisional Balance models

The 'Precontemplation' stage, the first stage, is characterised by individuals who have not considered changing their current behaviour. This lack of contemplation is explained using the Theory of 'Decisional Balance' as the barriers to change are perceived as a greater obstacle than the benefits of change. It is possible to shift this position of inaction by enabling an individual to reflect on a situation and alter thinking.

With respect to this thesis, the presentation of information aiming to reduce water consumption needs to demonstrate that changing current behaviour or habits will benefit the consumer. As the benefits of change increase and appear worthwhile, there is a concomitant shift in thinking and attitude. This stage of the Trans-theoretical model is referred to as the 'Contemplation' stage. At this stage, individuals can question whether the benefits are worthwhile. Apathy may be a reason why the new behaviour is not performed. People resist change if this involves unfamiliar actions that require a change in routine (Simmons et al., 1984-1985; Costanzo et al., 1986). Other reasons for not changing include the effect of the new behaviour on individual comfort and health (Olsen, 1981). These perceived barriers, represented as attitudes or beliefs need to be altered in conjunction with increasing the benefits of change.

In the third or 'Preparation' stage, additional information emphasising the benefits of change while reducing the perceived barriers to change, aims to increase commitment and willingness amongst individuals. The importance of commitment in influencing behaviour is demonstrated in Australia where greater commitments to conserve water reduced consumption (Kantola et al., 1983). Both of these factors are positively related to the associated credibility and trust of the individual who communicates the message (Samuelson, 1990). In the 'Action' stage, a change in attitude occurs as the benefits of change are greater than the perceived barriers to change. Incentives (generally financial) influence this shift in behaviour- a shift also occurring in the tenth stage of McGuire's framework. Similar to McGuire's (2001) last stage, the final stage in this model is the 'Maintenance' stage in which the benefits of performing the 'new' behaviour are realised and the behaviour is accepted as worthwhile to the individual and is therefore maintained.

The application of the Trans-theoretical model to the design of information to be presented in this demand management study should be apparent. Behaviour change is more likely to occur with increased willingness and commitment once the benefits of, and barriers to change are made clear. An important goal in WDM is to alter specific attitudes, increase commitment and intentions to act by increasing the benefits, while reducing the perceived barriers. In this study, different types of information are tested using five different types of information leaflets. The potential for the leaflet as a medium through which to disseminate water information is discussed in the following section.

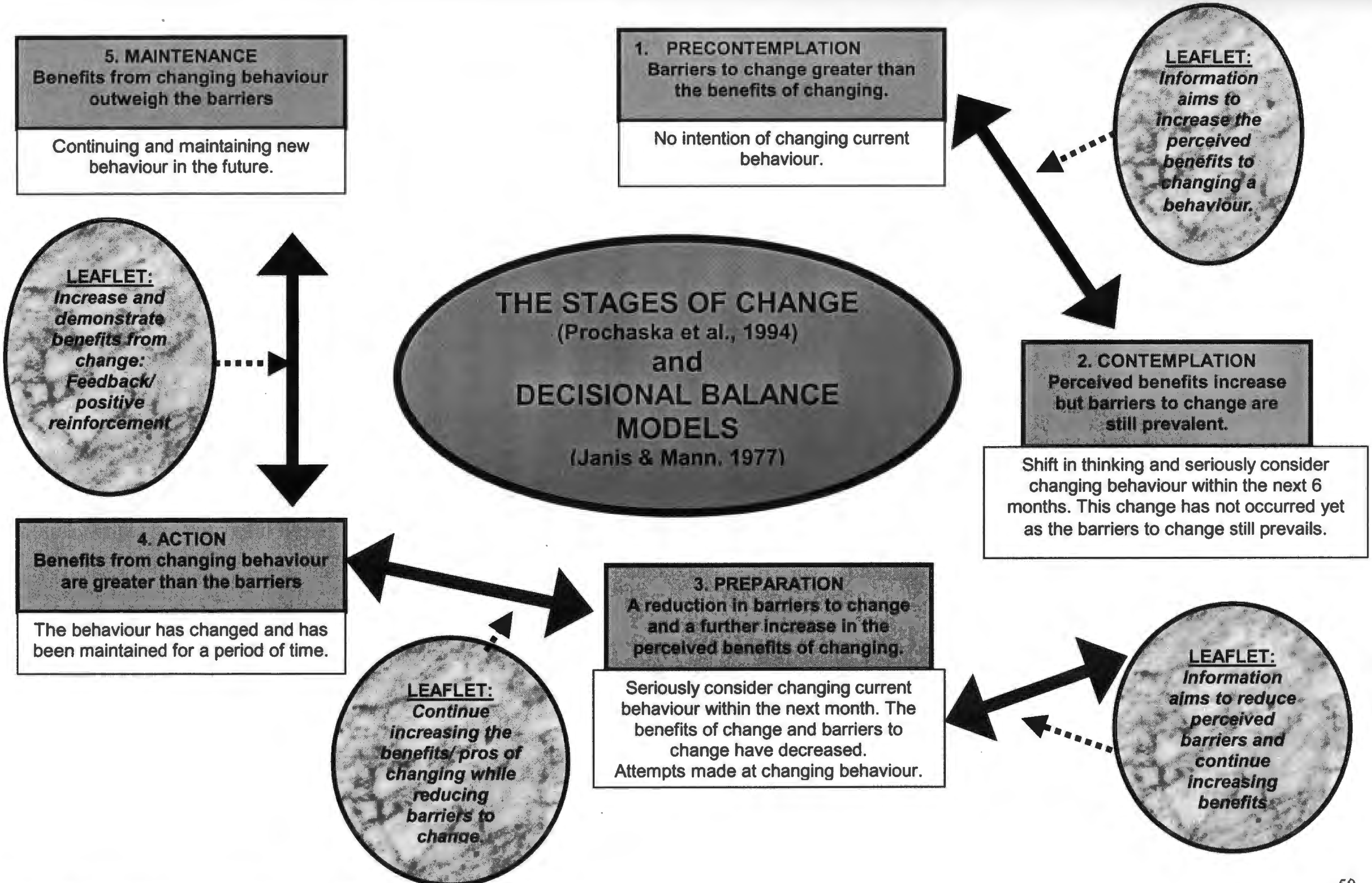

FIGURE 4: The Stages of Change and Decisional Balance models

2.5. Information in the form of a leaflet

Van Vugt (2001) discusses two different resource management approaches. In the structural approach, utilities intervene directly by introducing mandatory reductions such as restricting resource usage. The social-psychological approach is less intrusive and aims to alter the way in which people think about and value a resource (Ibid.). The latter approach involves voluntary reductions by increasing public awareness by presenting relevant information to consumers (Thompson & Stoutemyer, 1991). Studies have shown a preference for voluntary participation in conserving resources (Flack, 1980; Olsen, 1981). This is more likely if the public perceives water conservation initiatives as realistic and necessary. The success of residential water conservation campaigns was also found to be dependent on acceptable and feasible solutions to the homeowner (Syme et al., 1990-1991) and is strongly related to the positional factors discussed earlier in 2.3.2.2.

There have been mixed findings with respect to the influence of information in reducing resource consumption. This success is dependent on the type of information, how it is presented, and whether the correct attitudes are targeted. Awareness of individual consumption has also shown to be strongly related to greater attempts at conservation (Hamilton, 1985; Bruvold & Smith, 1988; Syme et al., 2000). In a discussion on environmental education, Smyth (1995) recognises knowledge as a prerequisite for understanding and increased awareness that enables one to make intelligent choices and behave accordingly. This was confirmed in a water conservation study in Denver, Colorado whereby overall water demand was reduced by 21%- a decrease attributed to "the understanding and cooperation of customers" (Miller, 1978: 63). Costanzo et al., (1986) recognise the potential for using the monthly utility bill as a means of increasing awareness of consumption because it is the only aspect visible to the consumer.

Other researchers identify the utility bill as an effective medium through which to influence resource-use behaviour. Yates and Aronson (1983) for example, suggest ways to increase the effectiveness of the monthly household bill to change consumer behaviour by clearly showing the benefits of conservation in addition to providing information that is varied and useful. Costanzo et al., (1986) are far more forthright in what needs to be included in an informative bill. They suggest a detailed, highly visual and comprehensive utility bill in which consumers are given feedback on their monthly consumption performance. More specifically, Yates & Aronson (1983) suggest relevant and meaningful information can be achieved by providing consumption figures comparable to other households of similar characteristics, as well as including 'supersaver' exemplars to encourage further savings.

2.6. Summary

A review of earlier studies using information to promote resource conservation point to the need for a scientific method of evaluation that objectively measures how information can influence behaviour. Furthermore, the lack of research in developing countries identifies the need for research to promote resource conservation in a local context. An exploration of how people respond to information and how attitudes and beliefs affect intentions and behaviour has been discussed. Complexities regarding the varied response to information and related influence on behaviour change are demonstrated by the psychological and positional factors specific to individuals. Relevant information can shift behaviour, but this depends on a variety of factors and variables that interplay and influence the magnitude of change.

Actions that directly benefit individuals are more likely to be attempted than those where the benefits are not achievable. Information in the form of feedback has proved effective in influencing behaviour probably due its motivational and reinforcing properties (Seligman & Darley, 1977; Winett et al., 1978-1979; Kantola et al., 1984; Winett & Kagel, 1984; Aitken et al., 1994).

The need to test the nature of information, it's related effectiveness, while identifying reasons why specific types worked or not, is crucial for future conservation initiatives that aim to reduce the consumption of resources. Furthermore, reasons why attempts were (not) made to reduce consumption need to be ascertained. These reasons relate directly to the perceived barriers and benefits of behaviour change. Future conservation initiatives should focus on reducing these perceived barriers to change so that greater success is achieved in prospective programmes. The potential of an informative bill to independently realise these objectives has not yet been confirmed. This study intends to evaluate different types of information presented as information leaflets using water consumption data to objectively measure success. The research design and methods to analyse the results of the study are discussed in Chapter 3.

Chapter 3

Research Methods

The best way to solve emerging threats to the world's fresh water is by rethinking how we use and manage our scarce resources [and] look at ways to increase our efficiency of use.
(Dr Gleick, President of the Pacific Institute as cited in the Pacific Institute for Studies in Development, Environment and Security, 2005).

3.1. Introduction

This study aims to evaluate the influence of different types of information on consumer behaviour with respect to domestic water consumption. This Chapter discusses the rationale for selecting the research design and the methods used to collect and analyse the data. Response to different types of information is evaluated by testing five different types of information presented in an information leaflet that was posted monthly to 1 900 randomly selected households in Cape Town over a period of five months. A telephone survey was conducted at the end of the study to confirm initial results and establish reasons why information was (un)successful in reducing water demand. The research design and related methods of this study are discussed in the following sections.

3.2. Research design

In Chapter 2 a review of the literature on energy and water consumption indicated the need to improve future research and methods of evaluation. The main criticisms of studies conducted in the 1970s and 1980s, was the inadequate and simplified methods of evaluation that often did not measure or identify which types of information were more successful than others (Seligman & Hutton, 1981; Syme et al., 2000). Secondly, information and other demand management strategies were not adapted to a specific group of consumers and/or suburbs of similar SES (Renwick & Archibald, 1998). Finally, the majority of studies used self-reporting instruments. These have been criticised because of the discrepancy between what individuals say and actually do (Geller; 1981, Simmons et al., 1984-1985; DeOliver, 1999).

A multitude of variables including positional and psychological factors influence how people understand, accept and use information. As a consequence, attempts to measure a response based on types of information is problematic. The influence of information on water consumption is thus pilot-tested, with the aim of designing an information leaflet that could be included with the CCT's monthly utility bill.

The assumption underlying this research is that different types of information will induce a different response that can be measured by analysing monthly household water consumption.

3.2.1. Measuring the influence of different types of information

Few studies have attempted to test the independent effects of information on consumption behaviour (Syme et al., 2000; Duggan & Banwell, 2004). As discussed earlier, findings were mixed. This study lends itself to outcome evaluation[26] for a number of reasons. Firstly, the study aims to answer the research question to determine whether the intervention using different types of information was successful or not. Water consumption data is used to infer changes in water-use habits or practices in a household. As water consumption data is interval and continuous, statistical analyses can quantify and evaluate changes in water consumption behaviour. Any changes in behaviour will be attributed to the specific information leaflet, as overall effectiveness is determined by comparing changes in the control group's water consumption with that of each of the five experimental groups selected in this study. The extent of any behaviour change is measured by analysing household water consumption data. The decision to use water consumption data to determine behaviour change was due to the weak relationship demonstrated between self-report and actual changes in behaviour (Geller, 1981; Simmons et al., 1984-1985; DeOliver, 1999) and the easy accessibility of water consumption data available monthly by the CCT.

[26] Outcome evaluation research aims to answer the question of whether an intervention (programme, therapy, policy or strategy) has been successful or effective (Mouton, 2001: 160).

3.2.2. Information leaflets

Research has shown that individuals will not consider changing a behaviour unless the benefits of performing the new behaviour outweigh the barriers (Janis & Mann, 1977 as cited in Prochaska et al., 1994). Behaviours therefore need to be perceived as rewarding or beneficial before a change occurs. Benefits or incentives to change vary with individuals. The benefits could, for example, be monetary, provide a sense of personal satisfaction or achievement and/or a feeling that one is making a difference. Effortless behaviours that are most beneficial to individuals are more likely to be attempted than inconvenient behaviours requiring effort and/or providing little incentive. The need to make homeowners aware of which actions constitute meaningful conservation practice has been recognised (Simmons et al., 1984-1985; Syme et al., 1990-1991).

In this study, different types of information aimed at reducing the perceived barriers to change such as effort, time and inconvenience, while providing alternatives that would benefit consumers such as monetary savings was tested amongst water consumers. A theme was selected for each of the five months so that information could be presented logically and be practical to consumers (see Appendices 3-27). In July, general water information was provided to consumers to familiarise households on water-resource facts and the importance of water conservation. Information on household water leaks and how to repair them were provided in August. In September, the leaflets contained information on water use in the kitchen and laundry. Water usage in the bathroom, shower and for toilet flushing was provided in October. In November, the start of summer, information on water-use for outdoor purposes was provided. The logo of the local municipality (the Water Services Department from the CCT) was displayed on the leaflets in an effort to increase the integrity of the information provider.

A sample of 2 300 high-end water consumers was randomly selected from the CCT's consumer database (see 3.3.1). Households were then randomly placed into one of six groups. Group 1 received tips on how to save water. Tips were concise and presented in a non-demanding manner (see Appendices 3-7). Group 2 received information on potential water-savings resulting from changes in current water habits. The 'incentive' for consumers was personal satisfaction of knowing that changes would make a difference to the supply of water resources. Activities that achieved the greatest water savings were selected for the information leaflets. Smiling and/or frowning faces were chosen and included as social commendation. Wasteful activities had a frowning face, while more efficient actions were given a smiling face (see Appendices 8-12).

One of the objectives of this water demand study is to identify the most cost-effective and practical approach to promoting water conservation. Although economic approaches such as rebates and price increases have effectively reduced consumption (Winett et al., 1976-1977; Winett et al., 1978; Hayes & Cone, 1981), providing rebates to households would be extremely costly for the CCT in the long term. The third treatment group therefore received information on potential monetary savings accruing from changes, resulting from more efficient water-consumption habits. Smiling and/or frowning faces were also provided with these activities (see Appendices 13-17).

The fourth group received a combination of information including tips, facts, feedback, as well as potential water and monetary savings (see Appendices 18-22).

Feedback has successfully reduced resource use amongst consumers (Seligman & Hutton, 1981, Winett & Kagel, 1984). This is due to the fact that relevant and personalised information is more meaningful and useful to consumers than general information (Winett et al., 1978-1979; Hamilton, 1985). Frequent (several times a week) feedback is most effective in influencing behaviour (Winett et al., 1978-1979). The CCT posts a monthly utility bill to consumers, likewise, the feedback leaflet was sent to group 5 each month (see Appendices 23-27).

3.2.3. Sample population

Syme, et al., acknowledge the difficulty of evaluating the independent effect of information on water consumption due to the "possible interaction with other policy instruments such as pricing change" (2000: 539). Most studies conducted during the late 1970s until the late 1980s, did not use control groups in their analyses. Instead the influence of information was determined by comparing predicted consumption patterns based on prior data with actual consumption data generated during the study.

There are a number of extraneous variables that cannot be regulated in a field experiment, yet they have significant effects on the dependent variable (water consumption). As this study is conducted in a natural setting of the household, there is no control over water tariff changes. Significant increases in water tariffs have reduced residential water demand (Winett et al., 1976-1977; Winett et al., 1978; Flack, 1980). Weather phenomenon also plays a role in the amount of water is consumed (Berk et al., 1980; Whitcomb, 1991; Renwick & Green, 2000). Temperature and rainfall for example, influence outdoor water demand (Renzetti, 2003; Jacobs & Haarhoff, 2004). A control group is used in this study to evaluate the varying effects that extraneous variables have on general water consumption. The selection of a control group provides an account of external sources of variance (Seligman, Becker & Darley, 1981 as cited in Samuelson, 1990). Similar to many WDM studies, such as the GHWCP (see Appendix 2), this study calculated the percentage change in water consumption for each of the experimental groups. In addition, this particular study will compare each group's percentage change in water consumption with that of the percentage change of the control group.

Holiday periods can disrupt the normal pattern of household water demand due to the variability in the usual occupant number. In this study, each of the five experimental groups consisted of 380 households. Due to this large sample, it was anticipated that consumption affected by changing household circumstances would be smoothed and aggregates would be stable enough for analysis. The control group consisted of 400 households. This group did not receive an information leaflet.

3.2.4. Water consumption data to evaluate different types of information

Studies have demonstrated the inaccuracy between self-reporting on how much water was saved and actual reductions in consumption. Researchers estimate that self-reporting tends to show inflated results by as much as 30% (Berk, Schulman, McKeever & Freeman, 1993 as cited in Syme et al., 2000). In this study, water consumption data was collected from the CCT independent of households each month and used to objectively quantify the influence of information on behaviour.

3.2.5. The telephone survey

Empirical studies that have used information among other demand management strategies during 'crisis[27]' situations to reduce the consumption of resources especially water, have produced mixed results (Hass et al., 1975; Blackburn, 1978; Gilbert, 1978; Griffith, 1978; Hamilton, 1983; Deedat et al., 2001). In an evaluation of numerous water conservation studies using information campaigns, Syme, et al., (2000) recognised the need for clearly defined objectives to provide relevant and specific information on how to improve campaigns. Furthermore, "there [was] an under-use of quasi-experimental techniques and qualitative analysis" (Ibid., 2000: 539). Syme et al., recognised that "changes within individuals and their causes have not been precisely identified" (2000: 559). This raises the question of the need to identify individual reasons for consumption changes.

International studies have identified a number of attitudes that influence water consumption behaviour. These attitudes represent the perceived barriers to and benefits of changing individual behaviour. Prochaska et al., (1994) and Janis and Mann (1977 as cited in Prochaska et al., 1994) have demonstrated the importance of reducing the barriers to change (such as actions requiring effort, effects on individual comfort and health) while increasing the benefits of change (monetary savings, personal feeling of making a difference).

In this study, a telephone survey was conducted to identify reasons for changes in water consumption, while identifying the perceived barriers to change (why consumption patterns persisted or increased). The importance of knowing these perceived barriers for future research on WDM is vital, as attempts can be made to alter these attitudes that inhibit change while promoting the benefits of change. If certain attitudes are targeted, specific types of information can be very cost-effective in reducing water demand. The utility bill, for example, is already provided to households monthly and can be used to disseminate information.

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[27] Crisis is related to resource availability whereby reserves are depleting at rapid rates and are not being sufficiently replenished resulting in dangerously low supplies.

Household characteristics such as occupant number and size of the garden significantly influence water demand. Households in this study were randomly selected from the CCT database. The sample of households was heterogeneous in terms of SES and therefore positional factors that influence the potential for water reductions varied greatly. The telephone survey aimed to identify these extraneous factors that would have influenced household water consumption. The survey aimed to confirm and clarify initial findings from the water consumption data. In addition, the survey was used to establish reasons for behaviour changes and clarify why specific types of information were (dis)liked and/or most effective in influencing behaviour change. Finally, the survey intended to identify the perceived barriers to change to explain why water conservation is not practised in certain households in the CCT.

3.3. Research methods

3.3.1. Sample selection

The Cape Metropolitan Area (CMA) under the jurisdiction of the Cape Metropolitan Council includes six administrative Municipalities (Cape Town, Tygerberg, Blaauwberg, Helderberg, Oostenberg and South Peninsula) (Figure 2). Each Municipality is responsible for billing water consumers each month within their administrative area.

Up until the end of August 2003, the CCT used the ProMIS[28] legacy system as a means to calculate monthly water accounts. During this time, accounts were generated by a consulting company (Jokumsen Data Services cc) to the CCT. ProMIS is an accounting system that was used by the CCT from 1995 to 2003.

Since 2000, the six Metropolitan Local Councils amalgamated into one administration. From the 1st of September 2003, the ProMIS system was replaced by a new SAP[29] accounting system that invoiced all Cape Town water consumers from one location.

[28] Professional Management Information System
[29] Systems, Applications and Products

Studies have shown that the largest reductions in water consumption are made by households that initially consume the greatest amount of water (Hamilton, 1983). Large consumers of water were therefore selected using aggregates calculated over a one year period. The study began in February 2004. As the CCT had no recent records of water consumption data for one year (water data was only available from September 2003), the closest period from which one-years worth of water data was available for the sample selection was from July 2002 to August 2003. The top 25% of water consumers were extracted by Jokumsen Data Services cc as they had access to this data from the ProMIS legacy system.

All active water consumers were captured from 1 July 2002 to 31 August 2003. There were approximately 175 000 water consumers serviced by the Cape Town Administration during this period. The top 25% of water consumers were extracted from this original dataset of 175 000 users amounting to 43 363 users.

The study focused on domestic water consumers as the incentives for reducing water demand directly benefit the household in terms of monetary savings and/or water reductions. Furthermore, households have greater control over how much water is used, and are billed for water according to a rising block[30] tariff system. All non-residential consumers, such as schools, sports clubs, universities, institutions and libraries, were excluded from the sample. A careful analysis of the sample revealed that it was also necessary to exclude a number of consumers from the database for the following reasons:

i. Water accounts of businesses/ companies, institutions (schools and old age homes), Trust funds, as well as water accounts that were not paid for by the owner.
ii. Monthly accounts sent to individuals other than the actual household, for example, postal addresses displaying 'care of'[31] or consumers whose postal addresses were unknown.

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[30] The more water one uses (according to certain consumption steps), the more it is charged for per unit.

[31] For example, individuals who rented or if trust funds, estate agents and/or banks dealt with and paid for the account.

iii. Property addresses displaying unknown streets or unnamed roads. Flats and property addresses that were either 'care of'; had postal codes from other provinces; and/or were without erf numbers.

iv. Water consumers from the sample that lived in Khayelitsha, Langa, Nyanga, Gugulethu, Cross Roads and Samora Machel.

Numerous reasons justify the removal of the latter consumers to minimise the potential for biasing results. Firstly, households of low SES have little potential for reductions because it is assumed that generally water is used for basic necessities. Consumers whose water costs constitute a large percentage of their total monthly expenditure are more likely to be vigilant in the amount of water consumed (Renwick & Green, 2000). This positive income-consumption relationship has been proven empirically (Samuelson, 1990; DeOliver, 1999). Individuals of low SES generally live on small properties with little need for water for outdoor purposes. The potential to reduce water consumption is therefore limited. Thirdly, due to the high illiteracy rates, related low education levels, and the fact that the majority of these residents do not speak English as a first language, the likelihood of misinterpretation of the information and/or the inability to understand the graph is expected. Results could therefore be biased and affect the reliability and validity of the findings.

In total, 18 448 consumers were deleted from the original sample population group, leaving a sample of 24 915 (or the top 20% of) domestic water consumers. To ensure that the sample was representative of consumers in the CCT, 9.23% (2 300) of consumers were randomly selected from the sample of 24 915 households.

The sample was representative of households from a variety of suburbs and socio-economic backgrounds. The final sample was sorted in ascending order according to 'name' to avoid bias in the group composition and randomly assorted into one of the six groups. Five groups were selected, each receiving a different type of information leaflet, while the sixth group was selected as a control group. Each experimental group comprised of 380 households, while the control group consisted of 400 households.

3.3.2. Research administration

In this study, percentage changes in water consumption for each of the five experimental groups (relative to the control group's percentage change) were established to evaluate the effectiveness of the different information leaflets.

Syme et al., reviewed numerous water conservation studies that tested the effect of information campaigns on domestic water demand and concluded that not only were there very few methods of evaluation, but their success "depend[ed] on the methods used to assess them" (2000: 551). Studies using regression-analysis for example, demonstrated limited success, an occurrence probably as a result of multicollinearity[32] relating to the effects of numerous variables on results (Syme et al., 2000). Findings were broad and vague, and therefore did not allow for specific suggestions in terms of improving future campaigns (Ibid.). They recommended using qualitative reviews and quasi-experimental evaluations for improved accuracy of findings (Ibid.).

In this study, attitudinal information was collected at the household level using a telephone survey similar to the study conducted by Bruvold (1979). Similar methods to Bruvold's (1979) study were used whereby the success of the intervention was measured as a percentage change in per capita use between two time periods. Actual consumption data was used for this water demand study, while Bruvold (1979) included actual and estimated consumption data for the analysis.

Prior to the study, variance between each of the six groups was tested. It is important that group differences before the study are identified, as potential variance between groups would need to be factored into the analysis. Accounting for group differences ensures that study results can be attributed to the information leaflets and not as a result of initial group differences. Uniformity in the geographic distribution of households was tested within each group by using postal codes as a point of reference.

[32] "...a failure to discriminate between the components of the campaign" (Syme et al., 2000: 543-544).

Prior to the experimental period, each group's monthly consumption average (calculated from September 2002 to September 2003) was also determined to establish variance that may introduce inaccuracies into the analyses. This variation needs to be factored into the analysis to avoid bias in the study findings.

During the study period, information leaflets were disseminated from July 2004 until the end of November 2004. Specific information leaflets were sent to each experimental group, a total of 1 900 households. Over a five month period, individual households from each experimental group received a page of specific water information (see Appendices 3-27).

The control group accounted for the effects offered by extraneous variables such as climatic factors and/or tariff changes on water consumption. As this research is an experiment conducted in the natural setting (the household) as opposed to a laboratory, there is no control over these extraneous variables. The percentage change in water consumption of the control group was therefore factored into the percentage change from each of the five experimental groups. The control group did not receive the leaflet, but individual water consumption data was monitored monthly from July 2004 to December 2004. Water consumption data for the same months from the previous year (2003) was also obtained.

3.3.3. Water consumption data

Water consumption data was used to measure the overall effect of information on behaviour over the five month study period. Initially it was intended to use the long term average consumption of each group, calculated from 1999 to 2003, to compare the mean consumption for the same month of 2004. However, due to the change from the ProMIS legacy system to the SAP system, data pre-August 2003 was not accessible. July 2003 and August 2003 consumption figures were, however, obtained from Jokumsen Data Services cc. Another reason for not using the monthly five-year average was the potential of introducing errors in the water consumption data. The longer the period of time, the greater the likelihood of variations in water consumption. The restrictions imposed in 2001, for example, significantly influenced water demand and would thus need to be factored into the analysis. Variations in consumption could also have occurred as a result of fundamentally different consumption habits that result over time such as changes in household demographics and/or building alterations. Five-year fluctuations (regarding changing household circumstances) could potentially be much greater than if the 2004 data was compared to the same month from the previous year. The decision was thus made to use monthly water consumption data from 2003 compared to the same month during 2004 as the former figures would be more representative of current individual household consumption than five-year consumption averages (personal communication Dr. J. Hofmeyer, November 2004).

A simple tabulation of the water data used in the analysis is provided below. Monthly water consumption data for each household was provided in kilolitres by the CCT from July 2003 until November 2004.

TABLE 3: Water consumption data that was used for the analysis

	July 03	July 04	Aug 03	Aug 04	Sept 03	Sept 04	Oct 03	Oct 04	Nov 03	Nov 04
Intvn = intervention	PRE-intvn	POST -intvn	PRE-intvn	POST -intvn	PRE-intvn	POST-intvn	PRE-intvn	POST -intvn	PRE-intvn	POST-intvn
GROUP 1	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)
GROUP 2	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)
GROUP 3	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)
GROUP 4	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)
GROUP 5	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)	380 (Kl)
GROUP 6 (Control group)	400 (Kl)	400 (Kl)	400 (Kl)	400 (Kl)	400 (Kl)	400 (Kl)	400 (Kl)	400 (Kl)	400 (Kl)	400 (Kl)

The table illustrates that the study includes interval and continuous (water data in Kl) data, as well as categorical data (evident by the six groups). The independent variable (the information leaflet) was evaluated in terms of its effect on the dependent variable (individual household water consumption).

Water consumption data obtained from the CCT was initially examined to establish whether there were any irregularities or outliers in the data. Households consuming more than 300Kl per month were deleted from the sample as it was felt that these figures were unrepresentative of monthly household consumption and could bias findings. Individual users displaying 'blanks[33]' in the spreadsheet were also deleted as analyses could not be performed where data was unavailable. The remaining 2 144 households were therefore used for the analysis.

Water consumption data from July 2004 to December 2004 was obtained from the CCT for each of the five groups. Percentage changes were calculated using data from the experimental period, compared to monthly consumption data for the same months from the previous year (2003). The control group accounted for the effects that extraneous variables had on water consumption- their percentage change was thus factored into each of the five group's percentage change (calculated using 2003 and 2004 water consumption data) (personal communication Professor L. Underhill, February, 2005).

The effect of the restrictions, introduced on 1st October 2004, combined with the leaflet was also examined by comparing the pre-restriction period with the restriction period. Percentage changes for each of the groups for July and August were compared with the percentage changes for October and November.

3.4. Study limitations

A number of limitations were identified and minimised where possible to ensure that findings were unbiased, reliable, valid and representative of water consumers in the CCT. The limitations are discussed together with their potential to influence the results.

[33] Where no data was shown for a particular month.

Extraneous variables (leaks, changes in occupant numbers, emptying and filling the swimming pool) could not be eliminated from the analysis. These confounding variables would result in weaker causal assertions between the information leaflet and water consumption changes. Home-dependent variables (Whitcomb, 1991) directly influence water demand and subsequent potential for reductions. This shortcoming was acknowledged in the study findings, and attempts were made to account for this effect in the telephone survey. The telephone survey aimed to confirm the results and clarify explanations for consumption changes.

Realistically it was impossible to obtain specific household information (such as garden size and swimming pool ownership) because of the large sample size (2 300 households). The potential for the leaflet to be ineffective amongst certain households is thus acknowledged. The information leaflet posted in November, for example, would be of limited value to households that did not have gardens or swimming pools. The use of the 2001 Census data to obtain this information could prove unreliable as this data is at least four years old. To ensure that groups were similar in terms of garden and/or swimming pool ownership, each sample group was examined for comparability in terms of their suburb of residence (see 4.2.1). Wealthy suburbs are more likely to contain properties with larger gardens and swimming pools than areas of low SES (Bruvold & Smith, 1988; Dandy, Nguyen & Davies, 1997).

The occupant number for each household was unknown when the sample of high-water consumers was selected. There is thus potential that the sample of 2 300 consumers were not necessarily the highest water consumers and this is acknowledged and discussed in Chapter 5. The importance of focusing on high-end water consumers is critical. The more water that is used for luxurious purposes such as garden watering, the greater the potential for reductions. It is crucial that future research identify high water consumers by initially calculating per capita consumption for each household in the sample.

Evidence that the sample did not consist of the highest water consumers has great implications for the potential for reductions and subsequent ability of information to influence water demand. The sample consisted of a variety of water consumers of differing SES and water needs. In this study, suburbs ranged from to Camps Bay to Mannenberg to

Penati Estate. Households from these suburbs differ markedly in income, property size and related per capita water demand. As previously discussed, the less water that is wasted, the smaller the potential for reductions to be made by households.

The sample selection has the potential to introduce bias in the results due to the possibility of sampling error. This was minimised by generating a random sample of households using a computer software application.

An unanticipated shortcoming occurred during the study period. Water restrictions were introduced on October 1st 2004 with the aim of reducing consumption by 20%. Water restrictions that were introduced in Cape Town during 2001 achieved a 15% reduction even though the aim was to cut water usage by 10% (CCT, 2001b. Similarly, the abnormal patterns of rainfall during 2004 could also influence water demand for outdoor purposes. A large sample of 400 households thus formed the control group to account for the effects that the above extraneous variables had on water demand. The introduction of the restrictions in October brought about numerous confounding variables that could have influenced the study findings. Although the control group aimed to account for the effects of extraneous variables on consumption, other information provided during this period would have added an additional variable that could have possibly influenced behaviour. Water-related information, for example, was sent to households by the Municipality and provided daily by the media. This adds an additional confounding variable into the study's results, as tips on how to save (that were independently tested in the study) were available in local newspapers.

Awareness of participation or volunteering to partake has been shown to directly influence studies (Thompson & Stoutemyer, 1991; Preston, 1994). Communication with participants prior to the study has also made households aware of a research programme. Geller et al., (1983) acknowledge the negative effect that awareness has on results as cognisance thereof limits the feasibility for large-scale intervention in the future. Participants, cognisant of a research study act differently than if unaware. People act or self-report according to what is most acceptable to society, thus behaving in a more 'socially desirable' manner (Becker, 1978; Olsen, 1981; Hamilton, 1985). As this study is investigating changes in actual water consumption behaviour, informing individuals of their participation would incorporate an additional extraneous variable into the study results. It was therefore decided that households would not be informed of the study due to the possibility of introducing additional bias in results.

3.5. Telephone survey

Surveys were conducted telephonically as they are relatively inexpensive to complete and able to achieve a high response rate. Telephone surveys are an efficient and cost-effective method to gather data (Groves & Kahn, 1979; Oppenheim, 1992) compared to door-to-door interviews that cost between two (Groves & Kahn, 1979) and five times as much as telephone surveys (De Vaus, 2002).

In this study it was anticipated that the response rate from the survey would be high since respondents had received information leaflets by post for the past five months. As a result it was assumed that respondents could have developed an interest in water conservation prior to the survey.

3.5.1. Aims of the survey

The telephone survey aimed to confirm the initial results of the water consumption data. The survey would therefore validate what the independent variable demonstrated statistically. It was also important to ascertain individual reasons for their response to different types of information. These reasons could improve the quality of a monthly informative bill as explanations for (dis)liking the information leaflet would be instrumental in the future design of water accounts. Open-ended responses could also verify how reductions in water consumption were achieved.

Extraneous variables influencing water demand, for example, leak detection and repair, changes in occupant numbers could also be identified from the survey so that the individual effect of the leaflet on water consumption could be determined. The survey also identified extreme changes in water-use behaviour that may not necessarily have occurred as a result of the leaflet.

The main aim of the survey was to identify the over-riding variable that positively influenced water consumption since extraneous variables mentioned previously affect water consumption. The survey therefore intended to validate the overall impact that the information leaflet had on household water demand.

3.5.2 Telephone survey design

The survey intended to ascertain why water consumption had increased or decreased. Therefore depending on whether groups increased or decreased their consumption, survey questions were altered slightly so that the wording was applicable to each of the groups (see Appendices 28, 29 and 30). The five survey questions were kept short and simple, and developed to ensure that the aims of the study were met.

The questions generally tested attitudes or opinions. The questions were open-ended, however, options were available to the interviewers for easy completion and prompting if necessary. Open-ended questions allow respondents to freely express themselves in their own words. Answers to open-ended questions are spontaneous and rich in content, a characteristic fundamental in achieving the survey's aims. Open-ended questions are also useful to clarify the meaning of answers and determine opinions of respondents. Open-ended questions also encourage respondents to provide answers they possibly would not have normally given if specific options were provided (Foddy, 1993).

Field coding was applied to answers by the interviewer who circled appropriate categories following a response. Extra space for additional information was included under each question, and the options of 'other' and 'please specify' were provided for responses that were not mentioned or already included in the survey.

Response rates to surveys have shown to vary considerably (Groves & Khan, 1979; Czaja & Blair, 1996). Based on previous research, it was assumed that not all respondents would participate in the survey. It is important to calculate this response rate as the lower the percentage, the greater the potential for inaccurate results. On a separate call-sheet (modified from Lavrakas, 1987), interviewers were requested to note the outcome of each telephone call (see Appendix 31). Attempts were made to use the original 150 households that were randomly selected for the telephone survey. Engaged and/or unanswered numbers were redialled and 'call-backs' were made so that most of the original 150 respondents completed the surveys.

Each telephone interview began with a short introduction to explain the survey and guarantee confidentiality of individual answers (see Appendix 32). Telephone interviewers were also required to ensure that the information leaflet had been received and read by the interviewee. A 'fall back sheet' was also provided if respondents were unwilling to participate in the study (see Appendix 33). Interviewers were able to explain the survey and related aims, what the data would be used for, explain respondent selection, as well as provide a telephone number to respondents for queries or uncertainties about the survey.

3.5.3. Selection of survey groups

Due to time constraints, initial basic calculations were made to establish which group(s) displayed an increase or decrease in water consumption relative to the control group's percentage change in water demand. Averages and actual kilolitres saved, as well as the percentage change (factoring in the control groups change) were calculated so that specific groups for the telephone survey could be identified. A total of 150 surveys were completed.

Households that increased their consumption in the group that displayed the greatest reduction in consumption were deleted for the survey. Similarly, households that decreased their consumption in the group that displayed the greatest increase in water demand were also deleted. A total of 150 households were used for the telephone survey. It was assumed that households displaying the greatest increase or decrease in consumption could potentially bias findings as consumers that had made modest attempts to reduce their consumption would not have been surveyed. The magnitude of individual household's percentage change in consumption was therefore not considered for respondent selection for the telephone survey. The effect of the information leaflet on all water consumers could thus be ascertained.

Due to the small sample number of households (50 in each group) there is potential for margins of error that could result in findings being statistically insignificant. Practically, however, due to time and money constraints, the sample size could not be increased. The aims of the survey were to confirm initial findings by clarifying reasons for changes in consumption. The survey retains its power and capacity to capture unusual or striking anecdotes from respondents which could illustrate or substantiate statistical findings.

3.5.3.1. Pilot survey

The telephone survey was piloted to increase reliability and ensure that the survey was comprehensible, logical and answered correctly by respondents (see Appendix 34). The pilot survey was conducted amongst 15 households randomly selected from the experimental groups. An indication of the number of respondents required to complete the 150 telephone surveys was also calculated using the pilot response rate. Telephone calls were eliminated from the response rate calculation when respondents i) were not at home, ii) did not receive the information leaflet, iii) if the line was engaged, iv) there was no answer, v) the telephone number was non-working, vi) there was an answering machine message, and vii) if language was a problem to the respondent.

3.5.4. Telephone survey coding

Qualitative data was obtained from the 150 surveys. Three interviewers were selected to conduct the telephone survey. These interviewers were trained to administer the survey to reduce any uncertainties regarding any of the questions in the survey (see Appendix 35). On completion of the surveys, the data was independently coded and categorised by the researcher.

3.5.5. Limitations of the telephone survey

Attempts were made to minimise interviewer and respondent bias by conducting the survey telephonically and by limiting the number of interviewers. Interviewers were also trained together so that all questions relating to the survey were answered and they could familiarise themselves with the survey.

The influence of unanswered calls or unavailable respondents on the response rates was minimised by providing a call- back sheet to ensure that unanswered calls were redialled and incomplete surveys filled in (see Appendix 31). Even though the effect of non-matching or unavailable telephone numbers on response could not be rectified, they were recorded for later analysis.

Potential language barriers that could bias results were removed as only those respondents who received water bills in English were used in the study.

3.6. Summary

Reviews and meta-analyses of earlier conservation studies testing information and/or other demand management approaches illustrate the need for a sound research design in order to evaluate information and its effect on water consumption. For the purpose of this study, attempts were made to reduce bias in the findings, increase validity and reliability of results with the ultimate aim of producing findings that were representative of large domestic water consumers in Cape Town.

In this study, the research design and methods effectively answered the research question, while the study's aims and objectives were met. Water consumption data was used to objectively evaluate the influence of information on behaviour. This effect on behaviour was scientifically measured using water consumption data, combined with factoring in the effects of extraneous variables on water consumption by using the control group's percentage change in water consumption. The telephone survey confirmed results, while answers clarified reasons for changes in water consumption behaviour. The random selection of the highest 2 300 water consumers ensured that the sample and results were representative of households serviced by the CCT.

Chapter 4

Results

It would be wise for other nations to actively promote the ethic of water conservation, and to start with such programmes before the water situation becomes critical.

(Pallett, 1997: 108)

4.1. Introduction

Individual household water consumption data is used to objectively evaluate the effectiveness of different types of information. Prior to the experimental period, each of the six sample groups are compared for similarity to establish any initial differences that may influence study results. The study measures the effect of different types of information to influence water consumption amongst households, and seeks to establish the most effective type. As climatic factors influence water demand, both temperature and rainfall figures are presented in the interpretation and are discussed later. Results from the telephone survey are also provided with the aim of confirming and/or clarifying the study findings. The main conclusions are summarised in the final section, all of which are elaborated on in Chapter 5.

4.2. Sample of water consumers

In this study, the sample consisting of 2 300 households was randomly assigned to one of six groups. Each of the five experimental groups consisted of 380 households, while the control group contained 400 households. This large number of households within each group was created in order to account for abnormal and irregular changes in consumption amongst individual households. These include changes in occupant numbers and/or leaks within the household. Furthermore, the control group aimed to account for the effects that certain external variables had on water consumption. These extraneous variables include climatic changes such as temperature and rainfall, water restrictions and changes in water tariffs.

Prior to the study period, it was crucial that any disparities or irregularities between any of the six groups were identified to ensure that group differences were taken into account before the leaflet was disseminated. Differences in initial water consumption averages and/or the SES between groups could affect overall water consumption. Households of lower SES, for example, generally consume less water than wealthier households. Due to the fact that households were randomly assigned to one of the six groups, it was assumed that groups would be comparably similar. The six groups were tested for similarity.

4.2.1. Testing for similarity and comparability amongst the sample groups

Groups that are comparable in terms of average water consumption and SES allow for accurate comparisons to be made during the analysis. The greater the number of extraneous variables such as SES and/or initial water consumption figures amongst groups, the less reliable the study results. Homogenous groups allow for more accurate findings to be made regarding the effect of information on water-consumption behaviour as it is possible to present information that is relevant to specific households.

Group comparability was determined by testing for similarity with respect to the geographic distribution of households in each group. For each group, individual households were sorted according to postal code. Postal codes identify specific suburbs in Cape Town. It is assumed that households with the same postal code reside in the same suburb. The number of households occurring in each postal code category was tabulated, grouped and graphed (Figure 5). In total there were 56 different postal codes in the sample. As expected, the groups were comparable with each other in terms of their geographic distribution as a similar number of households in each group fell within each postal code category.

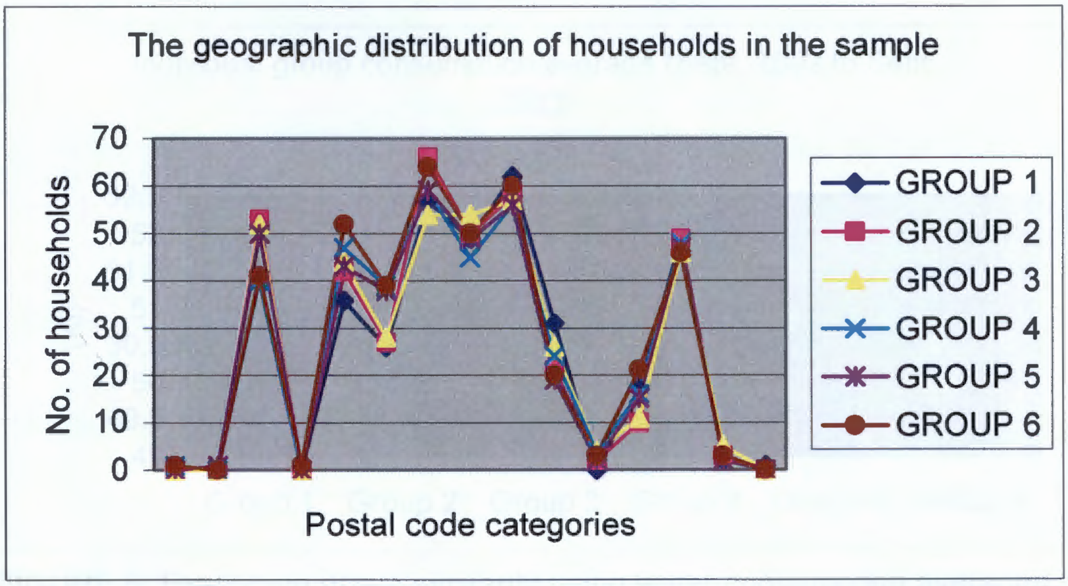


FIGURE 5: Group comparison testing similarity using postal codes as an indication of geographic distribution

The average household in the CCT consumes 27Kl of water each month (personal communication D. Ramsay, October 2003) and on average has 3.72 occupants (Statistics South Africa, 2003). This translates into an approximate consumption of 7.25Kl of water per person per month. Households in the study sample consumed an average of 50,9Kl of water or 13.68Kl per person each month.

Average monthly water consumption for each experimental and control group over a one year-period was calculated to establish the similarity amongst the groups in the amount of water they consumed (Figure 6). It is vital that the initial consumption averages and similarity for each group be ascertained so that changes in water demand compared to the study period are accurately calculated. Group consumption averages were calculated using data from September 2002 to September 2003. The average monthly consumption figures for the total sample was 51Kl. Individual groups deviated slightly from the sample average, however, this variation was negligible.

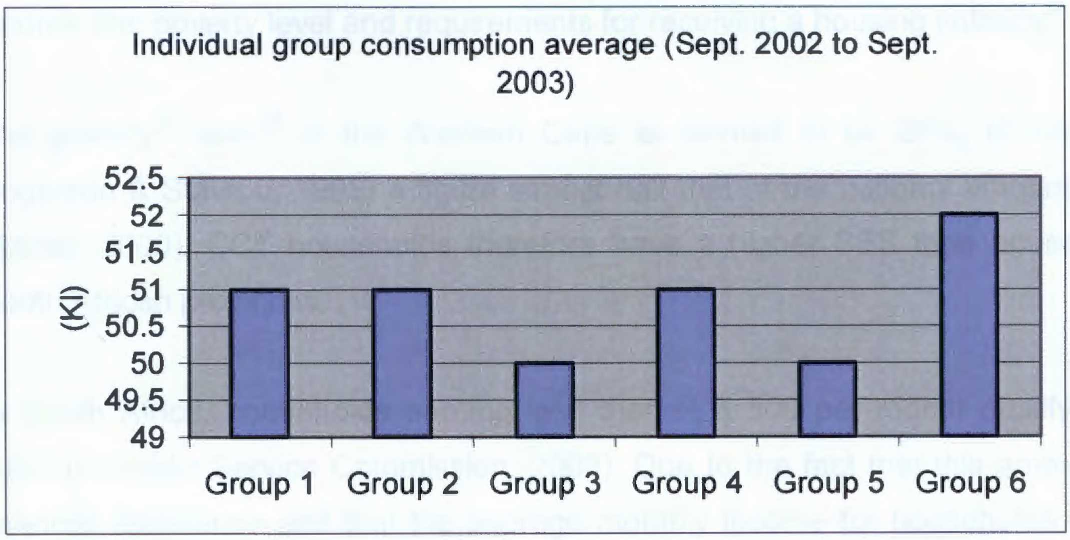


FIGURE 6: Examining group similarity using water consumption averages

4.2.2. Defining the sample into low, middle, and high socio-economic groups

Monthly household income extracted from the 2001 Census data was used to categorise the suburbs and the sample into low, middle or high SES. The limitation of using self-reported individual earnings is recognised. There is potential for inaccurate disclosure of income that is either under or over-reported. Additionally, declared earnings have the potential to be much higher as "household income did not provide a measure of total income" and the related "accuracy in representing relative income was unknown" (Statistics South Africa, 2003). For the purpose of the study, however, available income data was adequate to provide a broad understanding of the SES of the sample.

The top 20% of water consumers were extracted from the CCT's database and 2 300 households were randomly selected from this dataset. It was assumed that descriptions and classifications of the sample would be representative of 20% of the highest consumers. The Cape Town population is heterogeneous as income levels and education varies greatly across the City and residential suburbs. Therefore, accurately categorising the suburbs into one of the three socio-economic groups proved difficult. A lack of available classification criteria meant that categorisation had to be achieved using available income information from various South African sources. The three socio-economic groups identified above, were categorised according to externally defined criteria that included average monthly income, the poverty level and requirements for receiving a housing subsidy[34].

The poverty[35] level[36] in the Western Cape is claimed to be 28%, (Budlender, Mokate, Rogerson & Stavrou, 1998) a figure almost half that of the national amount (50%) (Nation Master, 2000). CCT households therefore have a higher SES than households in other South African provinces.

In South Africa, households earning less than R 3 500 per month qualify for a housing subsidy (Public Service Commission, 2003). Due to the fact that this amount qualifies for financial assistance and that the average monthly income for households in the Western Cape Magisterial District is R5 071 (Statistics South Africa, 2000) it was decided that R3 500 would act as a benchmark in classifying households of low income status. Furthermore, Statistics South Africa (2003) collected income information "without probing about informal income, enterprise profits or income in kind". It was therefore assumed that the "income is understated for most of the population". The 2001 Census used specific income categories (R1 601 – R3 200) and (R3 201 – R6 400) to categorise income groups. Households that received R3 200 or less per month were identified as low income.

The South African Advertising and Research Foundation (SAARF) used the Living Standards Measure to determine SES using a variety of instruments such as monthly income, access to running water, education and transport. For the SAARF study, individuals who earned between R6 455 to R11 566 per month were considered of middle class (SAARF, 2004). As this range was used for individuals of middle SES, and information from the Census data was categorised according to household income, the individual middle class range needed to correspond with the household income data from the 2001 Census. Suburbs were thus considered of middle income status if households

[34] The National Housing Policy specifies that all housing subsidies or grants offered be met with a contribution from the recipient- either in the form of funds or labour (www.safrica.info/ess_info/sa_glance/social_delivery/govthousing.htm).

[35] "the denial of opportunities and choices most basic to human development to lead a long, healthy, creative life and to enjoy a decent standard of living, freedom, dignity, self-esteem and respect from education and employment" (Paccoud, 1998 as cited in Statistics South Africa, 2000: 54).

[36] Households considered living below the poverty line receive an income of less than R800 per month (Dr Hirschowitz as cited in Statistics South Africa, 2000).

from the Census data earned between R3 201 to R25 600 per month. High income households earned more than R25 601 per month.

Census 2001 data was used to identify the SES of each of the suburbs in the sample. For each suburb, the percentage of households falling within each of the income groups discussed above was calculated. The income group or SES for each of the suburbs was determined by identifying the highest percentage of households that fell in either the low, middle or high income ranges. Suburbs were identified and labelled into one of the three income groups.

According to Census data and using the defined income categories, 55.7% of households in the CCT earned less than R3 200 per month (Statistics South Africa, 2003). Forty percent of households in the CCT earned between R3 201 and R25 600 per month (Ibid.). A mere 4.3% of households in the CCT earned more than R25 601 each month (Ibid.) and were considered of high SES. When examining the SES of CCT households with that of households from the sample (Table 4), the results are comparably similar. There was a similar percentage of households of specific SES in the study sample compared to the figure from the Census data. Fifty-four percent of users were considered low income (earning less than R3 200/ month). Forty percent of suburbs were of middle income status and 6% of the sample was of high SES.

In this study it was assumed that the group of high water consumers were of high SES. Households of higher SES have larger properties and/or swimming pools: both of which require large amounts of water (Bruvold & Smith, 1988; Dandy et al., 1997). The low percentage of users in the sample considered of high SES was thus surprising. This is identified as a limitation for the study as the sample appears to consist mostly of households of low SES. In general, the lower the income group, the higher the occupant number, the smaller the property size, and the less the potential for reductions to be made as water is generally used amongst lower socio-economic groups to meet basic needs (Palencia, 1988; Samuelson, 1990; Whitcomb, 1991; Kablan, Alhusein, Alkhamis, 1999; Almeida, Schaeffer & Lebre La Rovere, 2001; Colton, 2002). The lower the amount of water used, the smaller the scope for potential reductions.

TABLE 4: Establishing the overall SES of the sample compared to the 2001 Census data

		CCT households	Sample of 2 300 households
< R3 200/ month	LOW	55.7%	54%
R3 201 ≥ R25 601/ month	MIDDLE	40%	40%
> R25 601 / month	HIGH	4.3%	6%

Adapted from the 2001 Census (Statistics South Africa, 2003)

No data was available on the number of occupants per household. Individual household monthly water consumption figures are irrelevant in terms of establishing the potential for water reductions if occupant numbers are unknown. Per capita consumption figures indicate the potential for water reductions to be made by individual households. This is due to the fact that generally the more occupants in a household, the lower the income and SES of that household (Bhorat, 2002) and the lower the consumption of water. Due to the nature of the study in terms of the large sample number and the unavailability of data, it was impossible to obtain occupant numbers for each specific household.

4.3. Study analysis

The change in accounting systems from ProMIS to SAP in September 2003 resulted in skewed results when calculating percentage changes using water consumption data from September 2004 (Figure 8). Due to the potential for September's figures to bias results, data for this month was deleted for the study analysis.

4.3.1. The influence of information on domestic water consumption

The difference in consumption in each experimental group (from July to November 2003 compared with July to November 2004) was compared with the control group's overall percentage change during the same period (Figure 7). During the study period (July, August, October and November), the experimental groups reduced their overall consumption from 262 117Kl in 2003 to 225 687Kl in 2004. This amounted to a saving of 36 430 Kl or a near reduction of 15% in water consumption. The control group consumed a total of 58 410Kl in 2003, and 50 239Kl in 2004. This reduction of 8 171Kl also accounted for a 15% decrease in water consumption amongst this group.

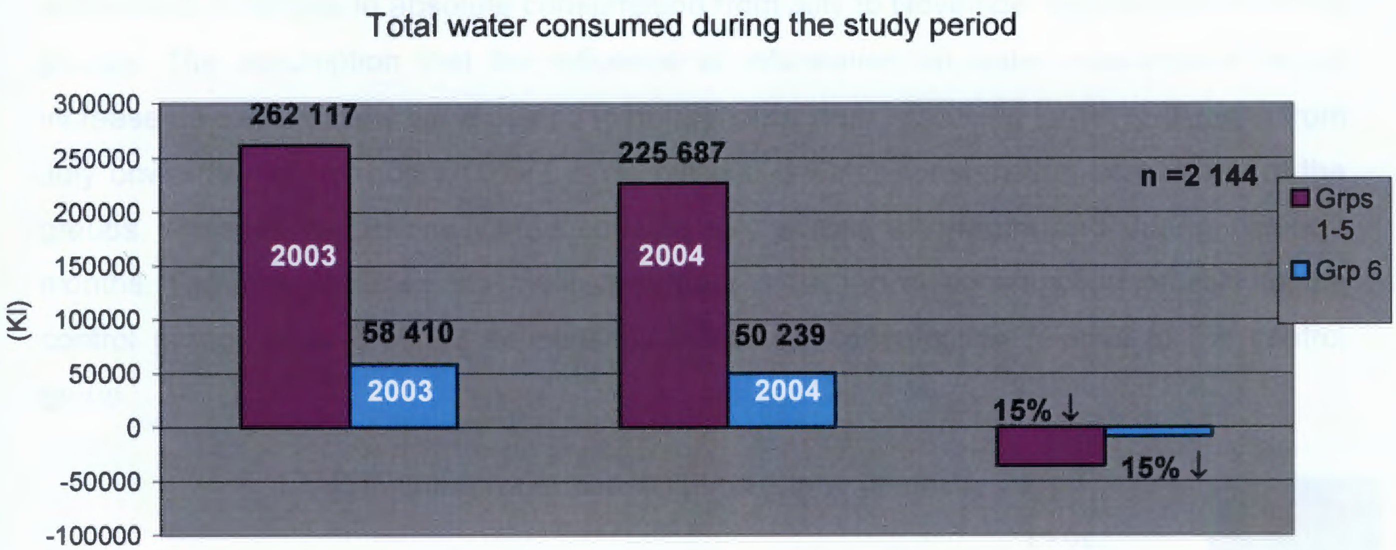


FIGURE 7: Water consumed: Groups 1-5 versus group 6 (excluding September): 2003 versus 2004

4.3.2. An analysis of different types of information

Figure 8 displays a change in absolute consumption for each group of households for the same month in 2004 compared to the previous year (2003). The absolute change for September for all groups appears to be exaggerated when compared to the other study months. This inaccuracy is possibly attributed to the change in accounting system from ProMIS to SAP in September 2003. Data for September was therefore deleted from the overall analysis due to the potential for bias to influence results.

For the duration of the study period, (July, August, October and November), all groups, except for group 3 in October, reduced their consumption relative to the same month in 2003. Water consumption for group 3 increased by 125Kl in October. In order to account for the effects of extraneous variables on general water consumption, the control group's change in consumption needed to be factored into the analysis. In doing this, group 4 (combination information leaflet) displayed the greatest reduction of 925 Kl during the four month study period. Group 5 showed an insignificant reduction (of 41Kl) relative to the control group's change in consumption. Group 3 was identified as least effective in reducing water consumption.

In Figure 8 there is no cumulative effect of any of the information leaflets over time as anticipated. Changes in absolute consumption from July to November vary across all of the groups. The assumption that the influence of information on water consumption would increase as more leaflets were posted to households, thus producing larger reductions from July onwards, did not occur. There is no pattern in water consumption across any of the groups. Absolute reductions varied considerably across all groups and during different months. Group 4 obtained the most consistent reduction in consumption relative to the control group, while group 3 consistently increased consumption relative to the control group.

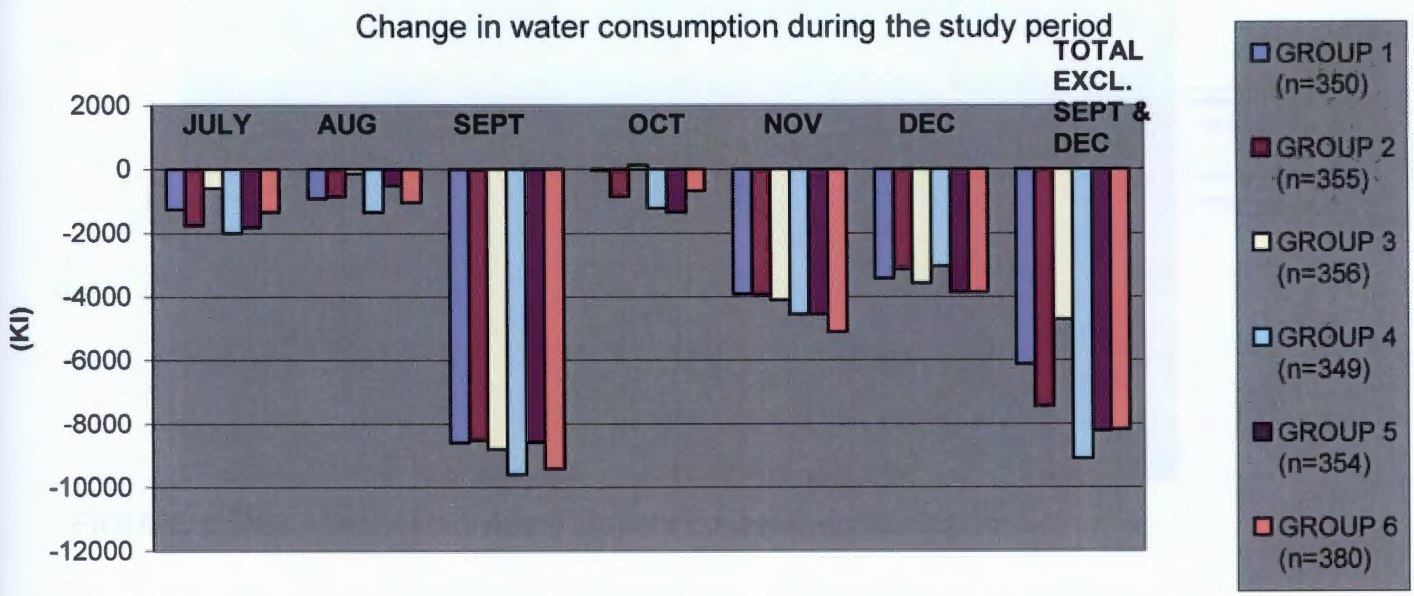


FIGURE 8: Absolute change in Kl consumption: Groups 1-6 (2003 compared to 2004)

4.3.3. The influence of different types of information on each experimental group

In order to establish the influence of each type of information on water consumption, the control group's percentage change in consumption was factored into each of the experimental group's percentage change. Figure 9 illustrates the varied effect of the information leaflet on water consumption. During the study period (July, August, October and November), information in the form of tips (group 1), potential water (group 2) and monetary savings (group 3) did not reduce domestic water consumption and even demonstrated an increase in water demand. Although group 4 indicated a reduction in water consumption in the first month of the study, this percentage change was not maintained for the study period. The feedback leaflet was relatively ineffective during the first two months of the study period. During October and November, however, this leaflet was successful in reducing water demand by 5% and 2% respectively.

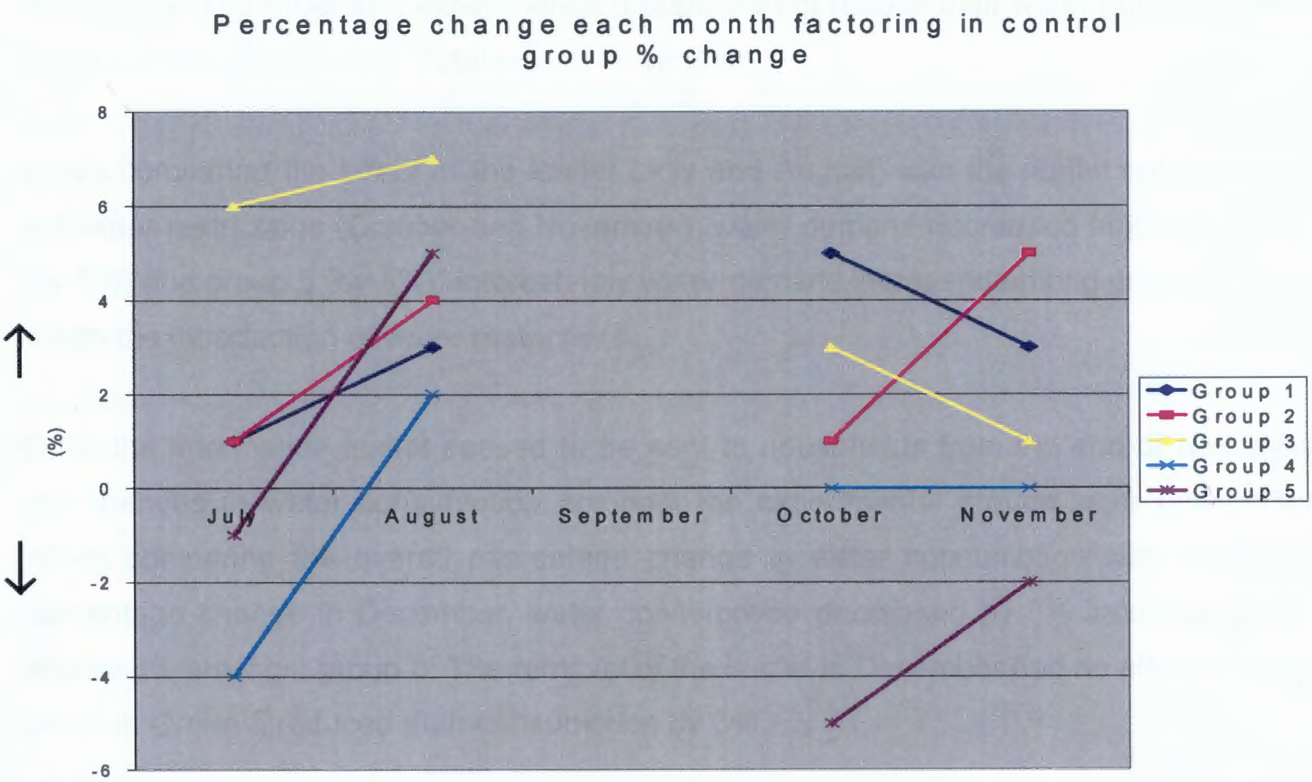


FIGURE 9: The effect of individual leaflets on water consumption

4.3.4. The influence of the leaflets on water demand during different time periods

In Figure 10 it is evident that overall, groups 1, 2 and 3, that is those receiving specific information leaflets, increased water consumption by 2%, 2% and 3% respectively during the study period. Group 4 and 5 were the only two groups to reduce their water consumption, with the former group achieving a slightly larger reduction (2%) in consumption overall, compared to group 5 (1%). Prior to the water restrictions, all the experimental groups except for group 4 (who achieved a 2% reduction) increased their water demand. Water restrictions were introduced by the CCT on October 1st 2004. The effect of the restrictions combined with the information leaflet on residential water consumption was investigated. The percentage change in water consumption for each of the experimental groups was calculated for October and November (see 'post' in Figure

10). In order to account for the effects of extraneous variables on water consumption, the control group's percentage change was factored into each experimental group's initial percentage change in water consumption. Consequently, group 5 reduced their water consumption by 4% when the information leaflets were combined with the water restrictions. The other four experimental groups did not reduce their water demand relative to the control group during October and November.

When comparing the effect of the leaflet (July and August) with the leaflet combined with the water restrictions (October and November), water demand decreased amongst group 3 (by 5%) and group 5 (by 5%). Interestingly water demand increased among groups 1, 2 and 4 with the introduction of water restrictions.

Once the information leaflet ceased to be sent to households from the end of November, the changes in water consumption amongst the experimental groups were unexpected. When comparing the overall percentage change in water consumption with that of the percentage change in December, water consumption decreased by 5% amongst group 1 and by 8% amongst group 3! The removal of the leaflet in December had no effect on group 2 and 4. Group 5 reduced their consumption by 3%.

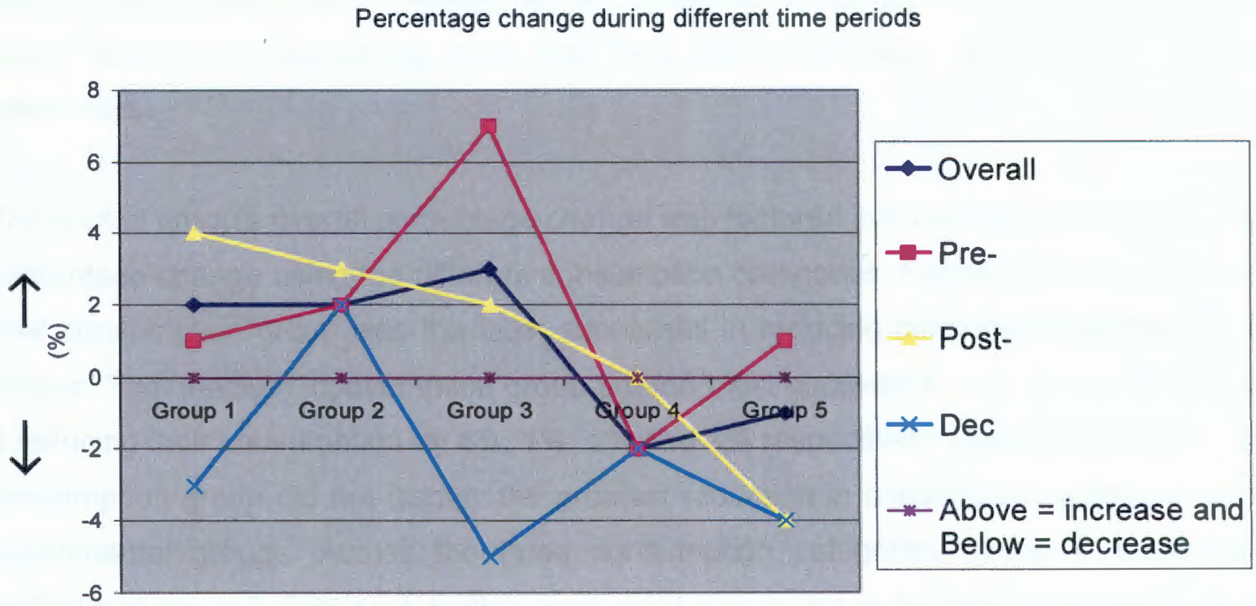


FIGURE 10: The effect of the leaflet pre-restrictions, during the restrictions and after the leaflet was removed

4.3.5. Potential water reductions amongst high, medium and low consumption groups

The assumption that households consuming more water have a greater potential to reduce consumption was investigated. The sample of the highest 20% of water users was proportionately divided into three consumption categories so that an equal number of consumers occurred in each consumption category.

'Low'-consumption households consumed 31Kl or less of water each month. The medium category consisted of households that consumed between 32Kl and 43Kl of water per month, while the high consumers used more than 44Kl each month. The three consumption ranges for each of the divisions appeared logical for a number of reasons: the average monthly consumption for a CCT household is 27Kl. It was therefore not surprising that the 'low' category included households who consumed slightly more than 27Kl as this sample was meant to have consisted of the highest 20% of water consumers. The average monthly consumption for the sample group averaged 50.9Kl. Taking into consideration this amount, the 'medium' consumption range appeared slightly less than expected. However, as the CCT uses 40Kl as a benchmark to calculate sewerage tariffs (consumption over this amount is assumed to be for outdoor purposes), (personal communication Water Services Department, CCT, October 2003), it was assumed, therefore, that the 32Kl to 43Kl range was fairly representative of medium water consumers. Amongst the sample of high water users, households consuming more than 44Kl per month were considered to be 'high' consumers.

The control group's overall percentage change was factored into each experimental group's percentage change using the different consumption categories. Figure 11 indicates that the 'low' consumption group was the least successful in reducing consumption across all five groups. The 'medium' consumption group proved most successful, with groups 1, 3, 4 and 5 reducing their consumption by 4%, 1%, 1% and 7% respectively. Unexpectedly, the 'high' consumption group did not display the greatest reduction in consumption across all of the experimental groups. Across the three consumption categories, group 4 (combination leaflet) and group 5 (feedback leaflet) were most successful in reducing water use, with the greatest decrease being achieved by group 5 (of 7%) in the 'medium' consumption category.

The initial assumption was incorrect for this particular sample of water users. Households consuming more than 32Kl per month are recommended as the focus for future WDM initiatives.

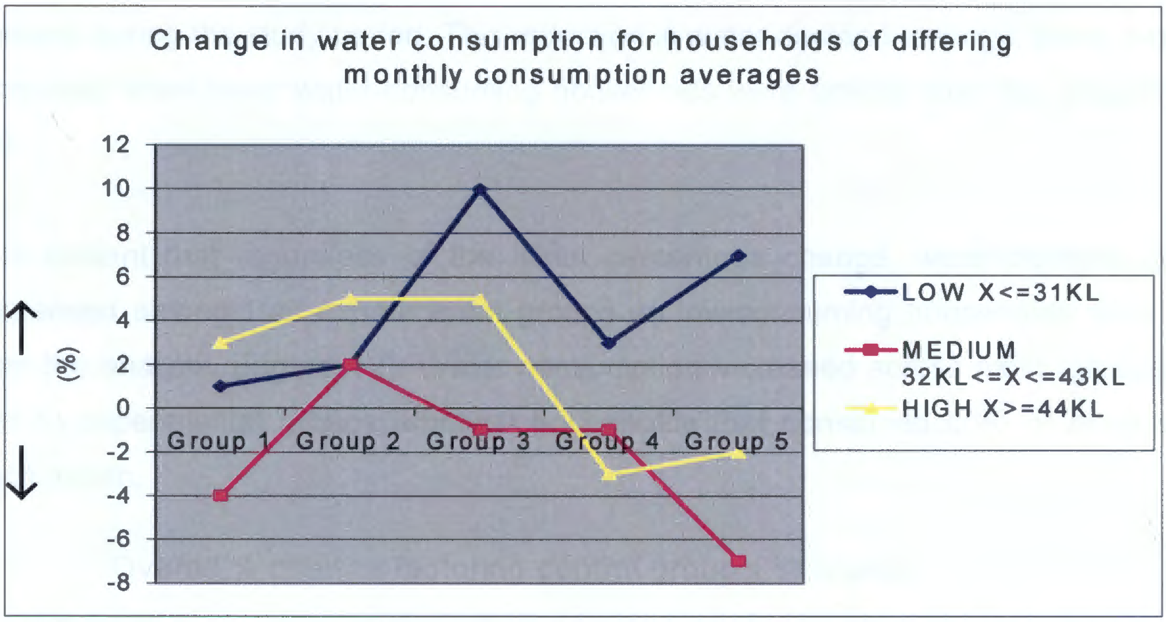


FIGURE 11: Percentage water consumption change (factoring in control group's change) excluding September

4.3.6. The effect of the leaflets on different consumption categories

In Figure 7, information was shown to have had no effect on the sample's water demand. It was therefore decided to investigate whether the influence of information was greater amongst higher water consumers. Households were categorised into various consumption groups by calculating the monthly average consumption from July 2003 to June 2004. This period was used to categorise water consumers as the leaflets had not yet been implemented and it was assumed that this consumption data was most recent of the household's current water demand. Consumption categories were selected at five kilolitre intervals and the overall effect of information was evaluated for each of the five experimental groups. The control group's percentage change was factored into each of the five groups initial percentage change in water consumption. These categories aimed to identify households that consumed the greatest amount of water and establish whether there were any relationships between larger consumers and related reductions. Households consuming less than 35Kl per month were deleted from the sample.

Overall, leaflets that provided information on water tips (group 1), potential water (group 2) and monetary (group 3) savings showed an increase in domestic water demand and were therefore ineffective in reducing demand. Leaflets providing a variety of water information (group 4) and feedback information (group 5) were more successful in reducing water demand during the study period. This reduction in water demand amongst these two groups increased when lower water-consuming households were omitted from the dataset (Figure 12).

It is evident that regardless of the initial percentage change, water demand generally decreased amongst all experimental groups as low-consuming households were deleted from the analysis (Figure 12). Water consumption increased across most (groups 1, 2, 3 and 5) experimental groups amongst households that consumed 50Kl or more of water each month.

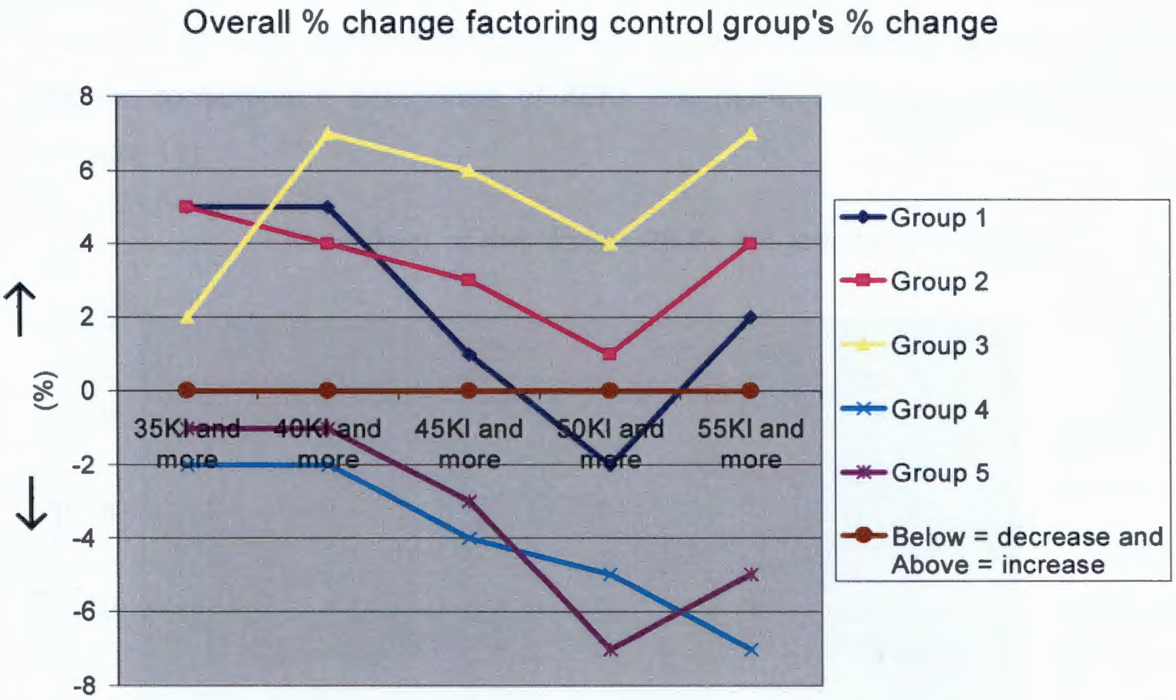


FIGURE 12: The effect of the leaflet during the study period on households of different water consumption

4.3.7. The temporal effect of different types of information

The influence of the leaflets on households grouped into the various consumption categories was also investigated during different time periods (Figure 13 and Figure 14). The independent effect of the restrictions on household water consumption in December was also investigated (Figure 15).

Prior to the restrictions in July and August, information in the form of tips (group 1), potential water reductions (group 2), monetary savings (group 3) and feedback (group 5) was ineffective in reducing water demand. Information in the form of potential monetary savings was least effective and consumption increased on average by 10% across all consumption categories. Specific information also had little effect on water consumption in groups 1, 2 and 5. No distinct pattern in water consumption changes was evident. The combination leaflet (group 4) was most effective in reducing household water consumption. The greatest reduction in water demand of 6%, 5% and 9% was achieved by group 4 and occurred in the higher consumption categories of 45Kl and more, 50Kl and more and 55Kl and more (Figure 13).

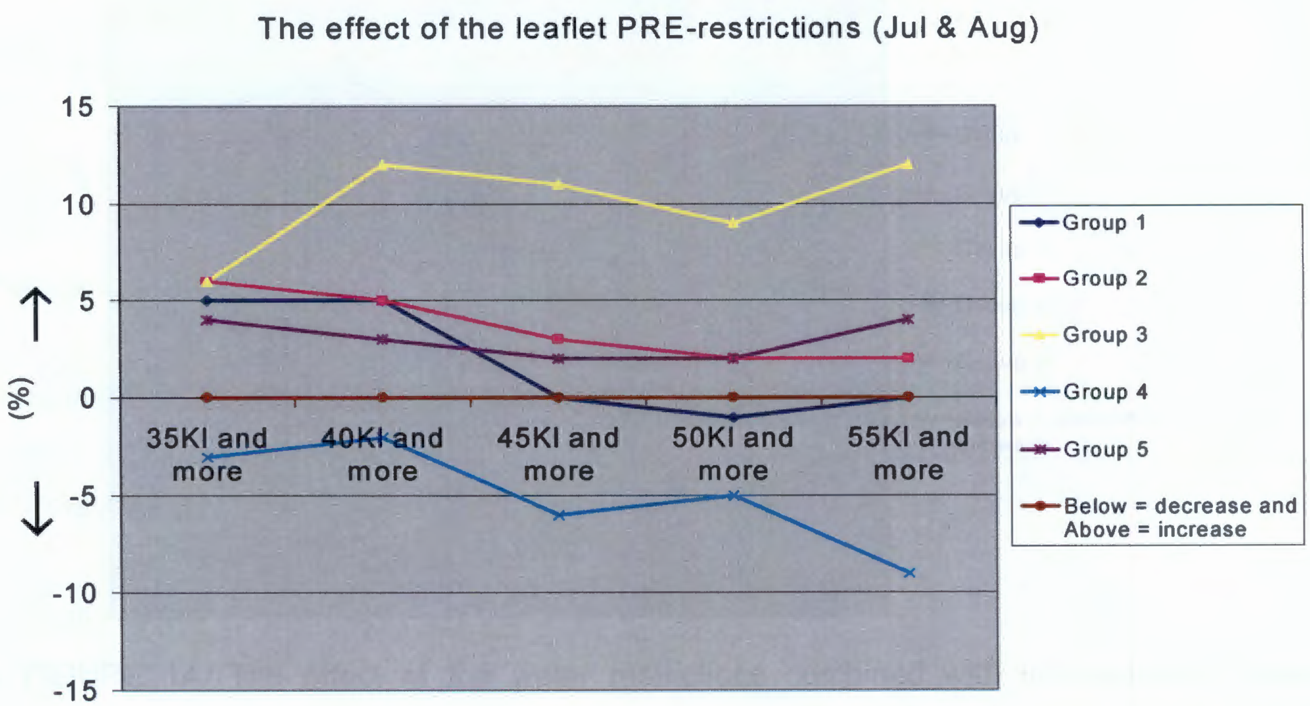


FIGURE 13: The varying effect of information on the different consumption groups before the restrictions

The introduction of the water restrictions in October brought about an additional extraneous variable into the analysis. The influence of the leaflets combined with the restrictions on domestic water demand was investigated (Figure 14). Information in the form of tips (group 1) and on potential water savings (group 2) had little effect on household water demand. Information on potential monetary savings (group 3) was more effective than when the leaflet was provided separately in July and August. Reductions were, however, minimal and the leaflet had a little influence on reducing water demand.

Water demand for group 4 gradually decreased as lower-water consuming households were omitted from the analysis. The greatest decrease (7%) was achieved by households consuming more than 55Kl of water each month. Water consumption amongst group 5 reduced substantially with the introduction of the restrictions. The leaflet, combined with the restrictions brought about an average reduction in water demand of 10.5% with the greatest decrease of 16% occurring amongst households consuming 50Kl or more each month.

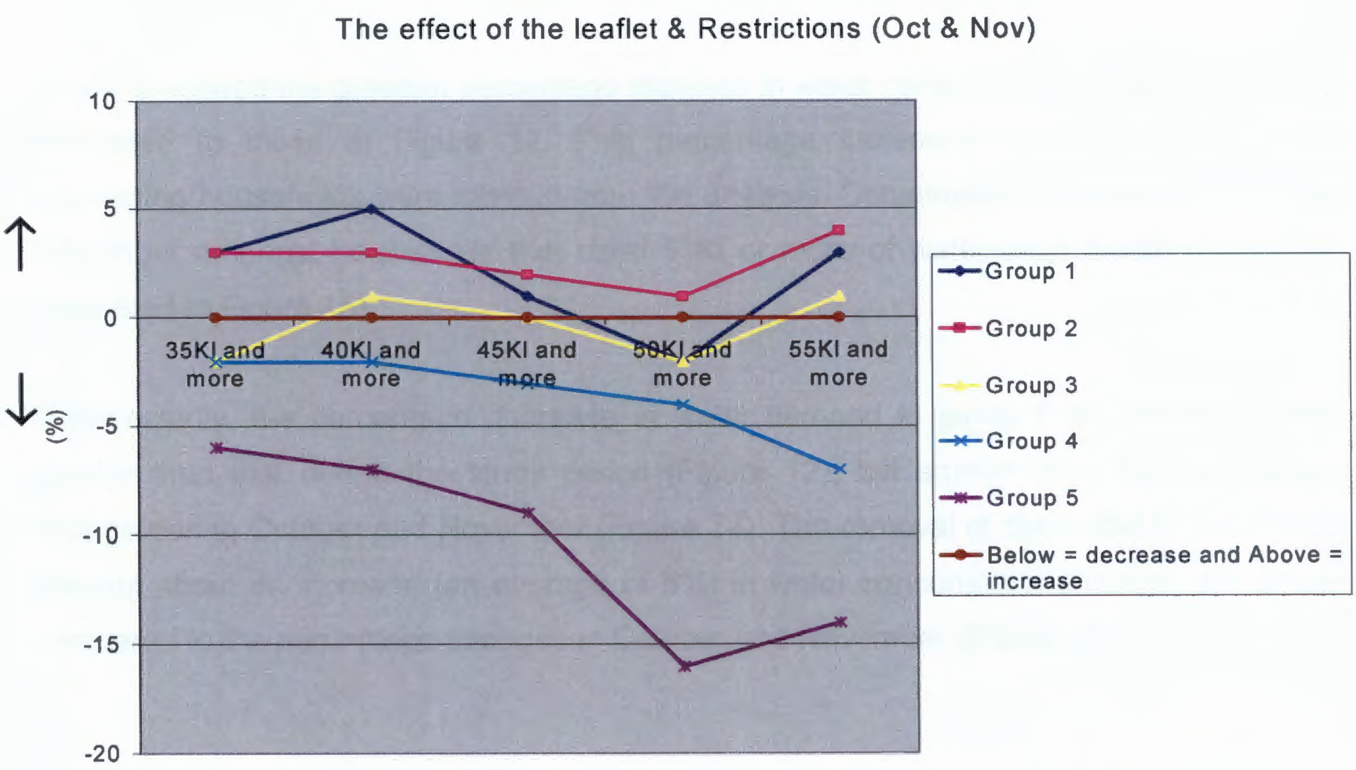


FIGURE 14: The effect of the water restrictions combined with information on water demand for households of differing monthly water consumption

The information leaflets were discontinued in November signalling the end of the intervention period used in the study. The independent effect of the water restrictions on household water demand was examined across the various consumption categories. As anticipated, on removal of the information leaflets, water demand across all households of differing consumption categories generally increased (Figure 14 compared to Figure 15). The increase was more prominent amongst groups 1, 2, 3 and 4.

Households in group 1 that consumed more than 50Kl of water each month substantially increased their consumption by as much as 13% (Figure 12 compared to Figure 15). Similar consumption patterns occurred in group 2 in which water demand also increased by 13% amongst households consuming more than 50Kl of water (Figure 12 compared to Figure 15). Unexpectedly, group 3 achieved a large reduction in water demand during December amongst households consuming 35Kl to 44Kl of water each month when compared to consumption figures in Figure 14. Consumption increased amongst households in group 3 that used more than 50Kl of water each month when the leaflet was discontinued (Figure 14 compared to Figure 15).

Group 4 showed the greatest percentage increase in water consumption when figures were compared to those in Figure 12. This percentage increased further as lower-water consuming households were omitted from the analysis. Consumption increased by 14% in December amongst households that used 55Kl or more of water each month (Figure 12 compared to Figure 15).

Unexpectedly, the percentage decrease in water demand in group 5 for December was greater than that during the study period (Figure 12), but smaller than the percentage change during October and November (Figure 14). The removal of the leaflet in December brought about an increase (an average of 5%) in water consumption amongst this group compared to the percentage changes in October and November (Figure 14).

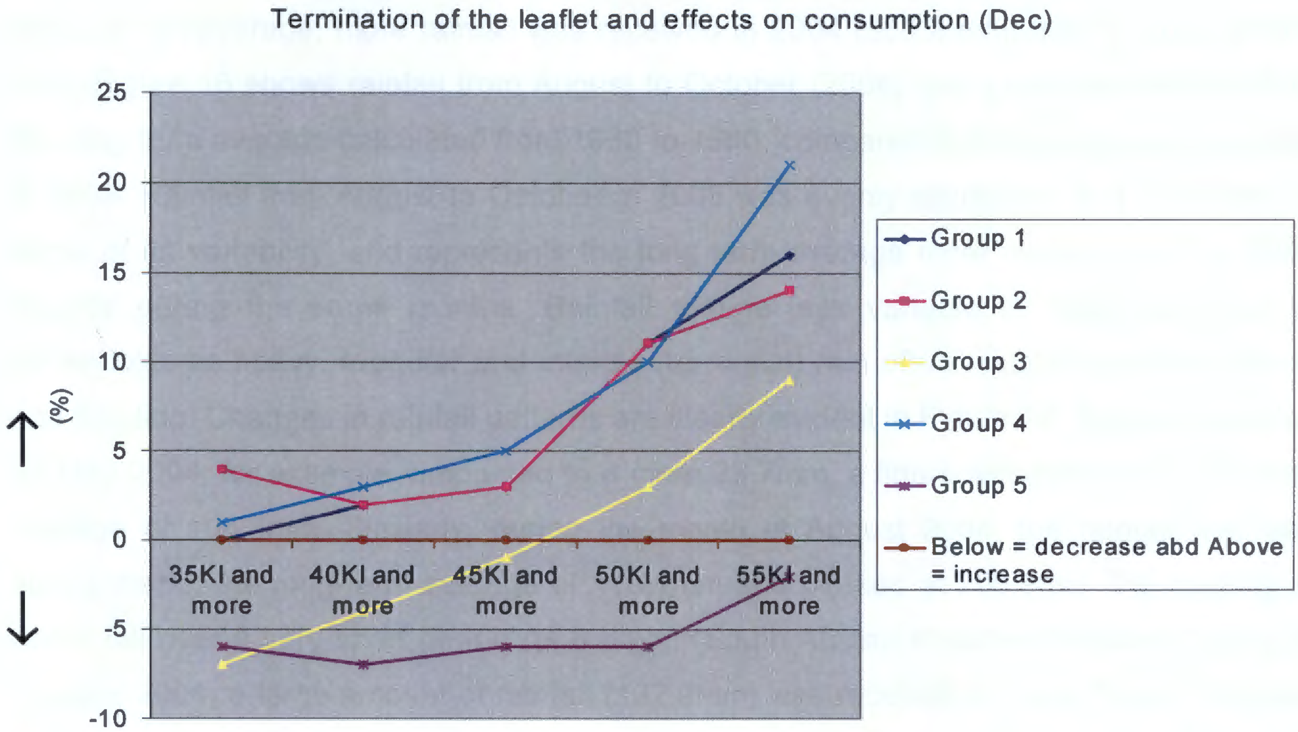
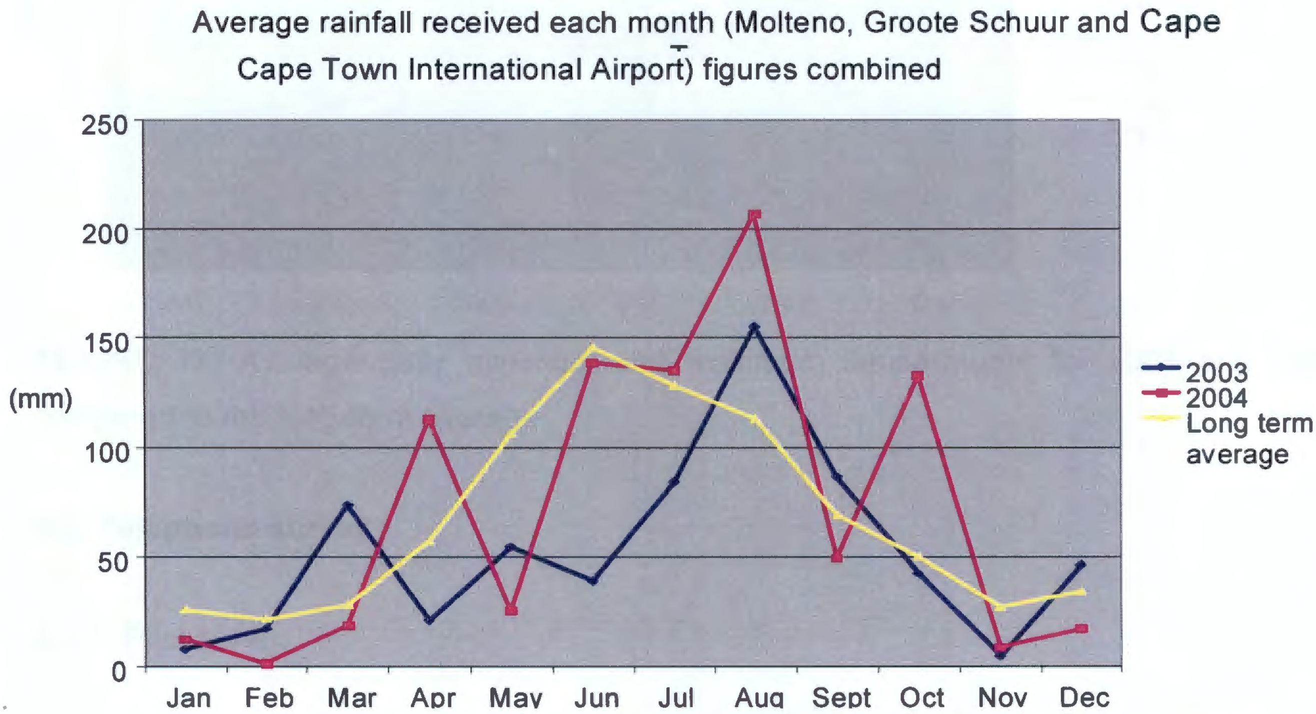


FIGURE 15: Percentage change in water consumption on removal of the information leaflets

4.3.8. The influence of rainfall and temperature on water demand

Water requirements for the garden and swimming pool depend on the temperature and the amount of rainfall that is received. Temperature and rainfall influence the amount of water consumed with slight temperature increases (of 1°C) increasing water consumption (Berk et al., 1980). Rainfall averages were calculated using data from three weather stations in Cape Town. The long-term average was recorded over a thirty-year period from 1960 to 1990. The long-term average for each of the three recording stations was 777.4mm/ annum for Molteno, 1147.4mm/ annum for Groote Schuur, and 498.8mm/ annum for the Cape Town International Airport (South African Weather Services, 2005). Molteno and Groote Schuur recording stations are situated on the mountain slopes. Substantially more rainfall is received by these stations compared to the one at the Cape Town International Airport where the topography is flat. The average of all three stations is more representative of Cape Town's monthly rainfall than if data from one recording station was used. Rainfall figures from the three recording stations were therefore used to calculate the amount of rainfall received in Cape Town.

Although on average, more rainfall was received in 2004 (860.2 mm) than in 2003 (634.8 mm), Figure 16 shows rainfall from August to October (2004) being less representative of the long-term average calculated from 1960 to 1990, compared to that which was recorded in 2003. Rainfall from August to October in 2003 was evenly distributed and consistent in terms of its variability, and represents the long term average more closely than the 2004 records during the same months. Rainfall that is less variable is more beneficial to households as heavy, irregular and intense (torrential) rain often results in surface run-off and flooding. Changes in rainfall patterns are clearly evident in Figure 16. Rainfall recorded for May 2004, for example, amounted to a mere 25.7mm, a figure well below the long-term average of 106.2mm. Similarly, during the month of August 2004, the rainfall was well above that of the long-term average of 113.1mm and peaked at 206.9mm- the majority of which fell over a very short period (of 6 days) (South African Weather Services, 2005). In October 2004, a large amount of rainfall (132.9mm) was received in Cape Town. This was almost three times more than both the long-term average and the amount received in October 2003. In November, rainfall in 2003 (4.3mm) and 2004 (8.8mm) was much lower than the long-term average of 27.1mm.



Source: South African Weather Services, 2005

FIGURE 16: An average of total rainfall received (2003 and 2004) compared to the long-term average across the three recording stations in Cape Town

Slight increases or decreases in temperature can have considerable effects on evaporation rates and subsequent water use. The higher the evaporation rate, the more water is needed. When comparing the average daily maximum temperatures from July to November 2004 with that of the long-term average, it is evident that during 2004, average daily maximum temperatures were slightly higher. Likewise the average daily minimum temperatures recorded from July to November 2004 were also slightly higher than those recorded over the 30 year period.

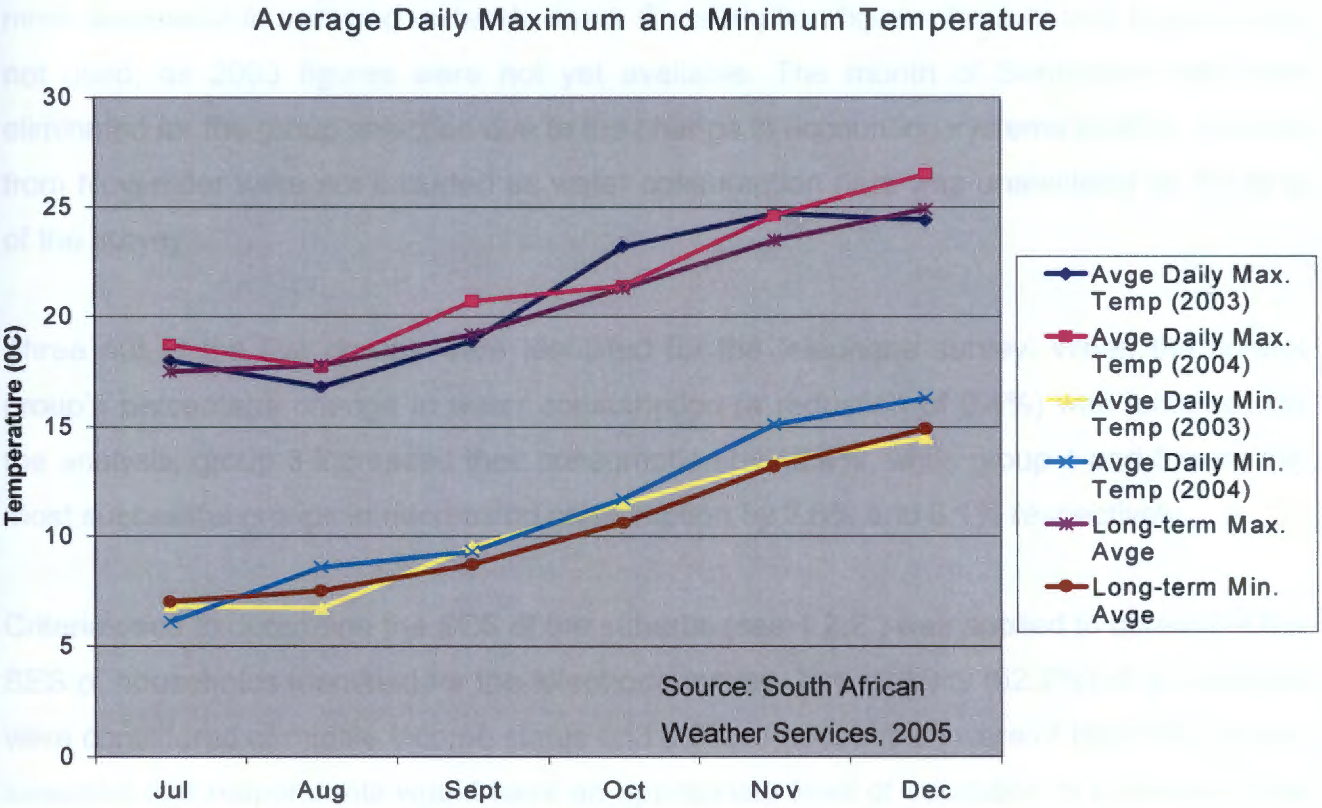


FIGURE 17: Average daily minimum and maximum temperatures for 2003 and 2004 compared to the long-term average

4.4. Telephone survey

4.4.1. Pilot survey

The response rate from the pilot survey was particularly high (83.3%). There were a number of possible reasons for the high response rate. Due to the nature of the topic (as a result of the information leaflet and the media), water-related information was possibly of particular interest to respondents. Secondly, the 'introductory blurb' provided at the beginning of the survey aimed to explain the survey and objectives to the respondents (see Appendix 32). Thirdly, interviewers stated that they were from the Water Services Department and explained that the survey intended to improve the design of the utility bill. Finally, an assurance of confidentiality was given to interviewee responses.

4.4.2. Telephone survey

Water consumption data from October were used to identify groups that were least and/or most successful in reducing water demand. Consumption figures for July and August were not used, as 2003 figures were not yet available. The month of September was also eliminated for the group selection due to the change in accounting systems in 2003. Results from November were not included as water consumption data was unavailable at the time of the survey.

Three out of the five groups were identified for the telephone survey. When the control group's percentage change in water consumption (a reduction of 9.4%) was factored into the analysis, group 3 increased their consumption by 12.4%, while group 4 and 5 were the most successful groups in decreasing consumption by 2.6% and 6.1% respectively.

Criteria used to determine the SES of the suburbs (see 4.2.2.) was applied to determine the SES of households identified for the telephone survey. The majority (62.2%) of households were considered of middle income status and 5.9% of households were of high SES. It was assumed that respondents would have an appropriate level of education to understand the relatively simple questions posed by the survey.

TABLE 5: Socio-economic status of the three survey groups combined

SES	**PERCENTAGE**
LOW	31.8%
MIDDLE	62.2%
HIGH	5.9%

For each group, individual household water consumption data for October was examined by subtracting monthly consumption in 2003 with that from 2004 to establish which households had reduced consumption. Households were then coded '0' for no change, '1' for increases and '2' for reductions. Households for each group were sorted in ascending order. Households in group 3 that displayed no change in consumption or reduced their use were deleted from the group. Twenty-nine percent of households in group 3 increased their water consumption in October. The average increase for these 110 households amounted to 12.5Kl. Both groups 4 and 5 reduced their consumption relative to the control group. Therefore households that increased their water use were deleted from each of these groups. Fifty-seven percent of households in group 4 reduced their consumption with the average decrease being 15.2Kl. A smaller percentage (43%) of households in group 5 reduced their consumption in October.

Consumers were sorted by name to avoid any bias in the survey selection. Telephone surveys were thus completed across a large sampling frame and over most geographical areas. Statistically, each household in the sample had an equal chance of being selected through random sampling (Oppenheim, 1992).

A total of 150 surveys were conducted telephonically. This amounted to 30.5% of the total number of households (492) available for surveying from the three selected groups. Fifty households from group 3 were randomly selected. The same selection process for households that decreased their use was conducted for groups 4 and 5. Due to the possibility of non-response, a further 50 households were randomly selected from each of the groups.

Findings from the survey confirmed the results obtained from initial water consumption data. As data from the survey answers was nominal, answers were unable to be tested statistically. Consequently, the number of respondents providing the same answer was counted and percentages calculated (Oppenheim, 1992). The frequency of similar answers were counted and then compared with sub-groups within each group for each question. To account for differences within the sub-samples, the frequency distributions were converted into percentages for easy comparisons.

4.4.3. Response rate

The telephone survey aimed to confirm initial findings and establish what specific type of information was useful in reducing water consumption and why.

<u>Five questions asked in the telephone survey:</u>

1. What were the main reasons why consumption increased/ decreased?
2. Was the information leaflet read?
3. Was the information leaflet useful and why (not)?
4. Should the information leaflet continue to be sent out?
5. Why do households in general not save water?

4.4.4. Findings of the telephone survey

Respondents in group 3 were asked to give reasons for their increase in water consumption. The majority of households did not have explanations for their increased consumption. Some attributed the increase to more people living in the household at the time of the study. Others were uncertain of the increase, but thought that it may have been due to additional water requirements for the swimming pool, with some households being shocked and/or worried about their increase.

Groups 4 and 5 responded positively to the information leaflets showing an overall decrease in consumption of 2.6% and 6.1% respectively relative to the control group. The main reasons expressed for the decrease was greater effort to conserve water due to the restrictions and an increase in awareness as a result of the information leaflet. The main reasons for the reductions were attributed to less garden-watering and reuse of grey water as well as continuous attempts to change current water use habits. Some respondents also found and fixed toilet and tap leaks.

The usefulness of the information leaflet amongst respondents was investigated (Figure 18). Of the 74% of respondents who read the information leaflet in group 3, 56% found the information leaflets (specifically the information on leaks) useful. A respondent running a crèche in Beacon Valley, for example, found the information leaflet to be very informative and subsequently educated the children on efficient water usage.

Sixty-four percent of the 88% of respondents who read the information leaflet in group 4 found the information leaflet useful (Figure 18). Four respondents put the information leaflet on the fridge while others educated tenants and/or family members using the graph. The usefulness of the information leaflet was attributed to the graph that was very effective in showing the differences that a change in water habits had on consumption. As a respondent put it… it's [the graph] like a "pat on the back that one is doing well" thus acting as a motivator and gave positive reinforcement. According to respondents in group 4, the information leaflet provided useful information and tips on retrofitting, fixing leaks and changing water-use habits. The graph in particular increased awareness and motivated households to monitor their consumption.

Most (92%) of respondents in group 5 read the information leaflets with 80% finding them useful. Generally the respondents felt the graph was very useful as it allowed for easy monitoring and comparisons (Figure 18).

Overall, 16% of all the respondents found the information leaflet ineffective as information was thought to be common sense. The majority (67%) of respondents found the leaflets useful, with the main reason being the feedback graph that increased awareness of their consumption and to a lesser degree, the tips on how to save water. A tabulation of responses to the information leaflet is provided in Appendix 36.

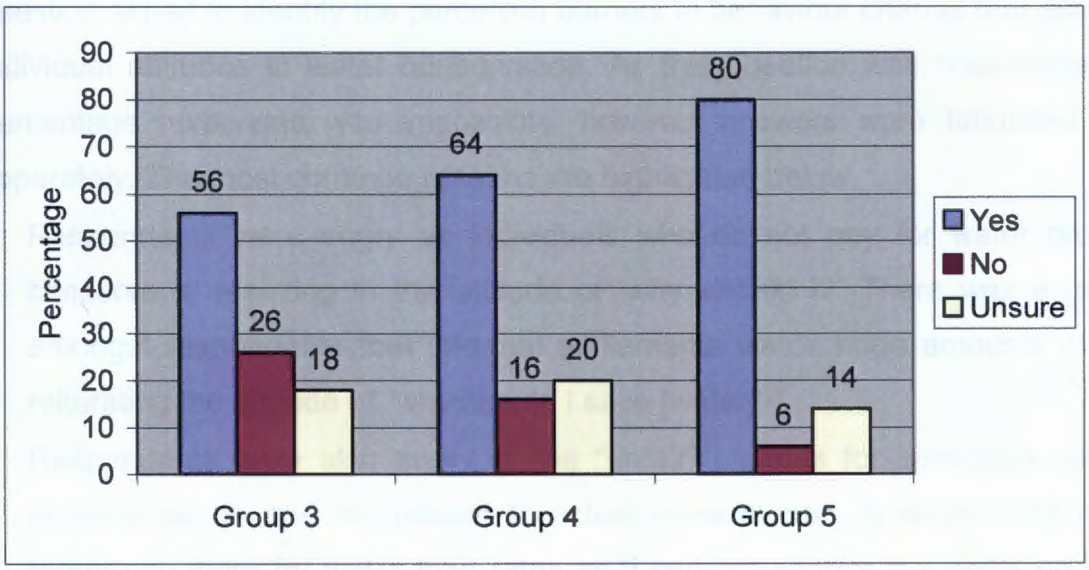


FIGURE 18: Were the information leaflets useful?

In response to the question 'should the information leaflets be continued?' (Figure 19), the majority (54%) of group 3 agreed. A much higher percentage (78%) of group 4 and group 5 (82%) felt the leaflets should be continued. On average 71% of all respondents wanted to receive the information leaflet in the future because the leaflet was helpful and increased awareness. Fourteen percent of all respondents did not want the leaflet continued citing concern about costs associated with production and postage. It was also felt that the information was common sense. A tabulation of verbatim responses is provided in Appendix 37.

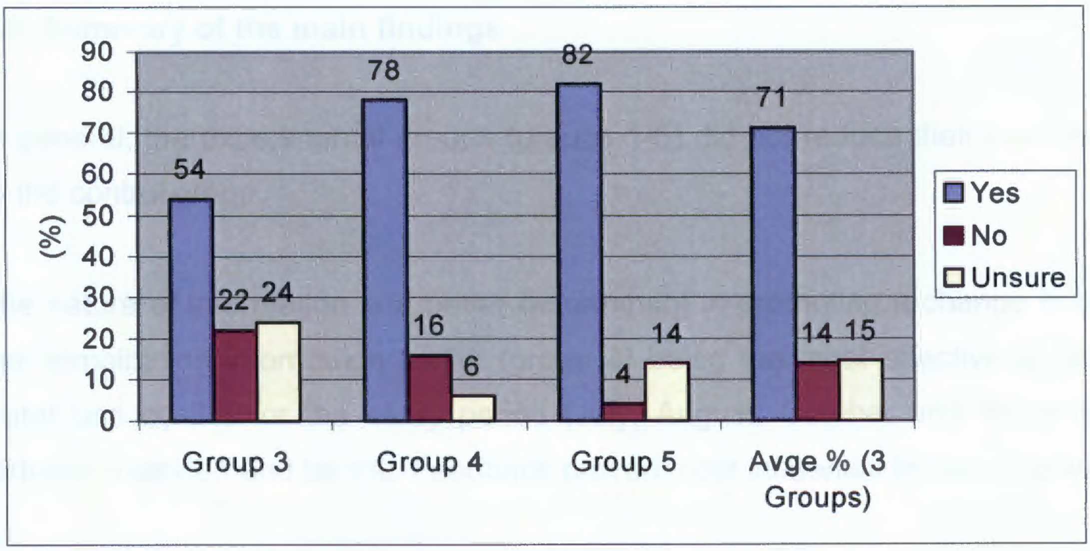


FIGURE 19: Should the information leaflets be continued?

The final survey question investigated reasons why households do not save water. This question aimed to identify the perceived barriers to behaviour change that related directly to individual attitudes to water conservation. As this question was open-ended, calculating percentage responses was impossible, however answers were tabulated and counted separately. The most common reasons are highlighted below.

- Respondents were angry as individuals who do not pay for water probably do not conserve it, resulting in the attitude of 'why should I?' There was a general feeling amongst respondents that informal settlements waste huge amounts of water- again reiterating the attitude of "why should I save [water]?"
- Respondents were also angry at the "unfair" charges for sewerage costs related to property prices and not related to actual consumption. A respondent said he would rather pay more for water than rates as "I can not contest the water price as I pay for what I use."
- Others did not feel the CCT was making an effort to save water and felt that the Municipality needed to "practice what it preached".
- Another reason given was the general attitude of people that it is "not my problem, but the CCTs". Many of the respondents identified the need to change the attitude of all users so they become responsible for their actions.

Many respondents recognised the importance in changing the entire mindset of households in Cape Town regarding reusing water as "people will only save water if they think they should."

4.5. Summary of the main findings

In general, the experimental groups (groups 1-5) did not reduce their consumption relative to the control group.

The nature of information is a better determinant in promoting a change in behaviour with the combination information leaflet (group 4) being the most effective in reducing overall water use by 2% for the study period (July, August, October and November). Group 5 reduced their demand by 1%. Feedback proved most influential in reducing water demand.

After the implementation of water restrictions, the feedback leaflet (group 5) proved most successful in reducing water demand (a 4% reduction).

In examining the different consumption categories, it was concluded that higher-water-consuming households should be focused on for future conservation initiatives.

The telephone survey confirmed the usefulness of the leaflet to households, with the majority of respondents wanting them continued.

With reference to earlier empirical findings and the theory of response to information and behaviour change that was discussed in Chapter 2, possible reasons for the study's findings are discussed in the next Chapter. The discussion chapter intends to provide a rationale for information's inability to influence residential water consumption behaviour while justifying certain findings with respect to the context of the study.

Chapter 5

Discussion of Results

Water conservation has had negative connotations for many people because it unintentionally implies hardship and inconvenience associated with rationing. However, water conservation is not simply a matter of using less water through restrictions. It is about careful management of water supply sources, use of water saving technologies, reduction of excessive demand and many other actions.

(British Columbia, 2005)

5.1. Introduction

Thus far this study has presented information that will be used to explain how different types of information influence water consumption behaviour. This chapter discusses the main findings and compares these to initial assumptions and empirical studies discussed earlier in the literature review.

5.2. Interpretation of the study results

To date, empirical studies that have evaluated the influence of information on consumer behaviour along with other demand management strategies, have achieved mixed results. A number of reasons were given to explain these results in Chapter 2. The relationship between the results from these empirical studies and this study are discussed further.

5.3. The overall effect of information on domestic water demand

This study demonstrates that information has no significant effect on domestic water demand. This conclusion is largely at odds with similar studies. Some studies have shown that information increased consumption (Winett et al., 1978; Geller et al., 1983), however, the majority of studies have shown that different types of information, particularly information that provides personal feedback, is successful in reducing water consumption (Winett et al., 1982; Winett & Kagel, 1984; Hamilton, 1985; Baumann et al., 1992; Aitken et al., 1994; Deedat et al., 2001). Three studies conducted in South Africa, namely, in Hermanus (Hester, 2000), the Kruger National Park (Preston, 1994) and Windhoek (Allison et al., 2000), all reported that information influenced consumers to reduce water consumption. As a consequence of these and other studies, it was anticipated that information provided in this study would not only prove to be significant, but that different kinds of information would result in different responses that could be objectively determined. In this sense, the results from this study were not only unexpected, but also disappointing.

During the study period (July, August, October and November, 2004) the control group reduced their water demand by 15% compared to 2003. This reduction has to be factored into the analysis to account for the effects of extraneous variables such as weather, pending water restrictions, rising water tariffs and reports of water shortages presented in the media (Hayes & Cone, 1981). Possible reasons for the reduction in water consumption of the control group are discussed later.

In general, a number of variables are known to influence water demand. Research has shown that significant tariff increases (Morgan, 1974; Preston, 1994; Dandy et al., 1997; Hester, 2000) and/or climatic changes (Seaver & Patterson, 1976; Loh & Coghlan, 2003; Jacobs & Haarhoff, 2004) affect domestic water demand. In general, residential water demand is price inelastic (Berk et al., 1980; Winkler & Winett, 1982; Aitken et al., 1994; Renwick & Archibald, 1998; Renwick & Green, 2000) because water is a basic necessity and there are no substitutes to replace it (Turnovsky, 1969; Aitken et al., 1994). In certain circumstances, reducing the demand for water is often difficult, especially when the resource is already being used sparingly and efficiently. The effects of each of these variables on water demand are discussed in the sub-sections that follow.

5.3.1. Climatic factors

Studies have demonstrated a relationship between water demand for outdoor purposes (garden and swimming pool) and changes in climatic factors (Berk et al., 1980; Whitcomb, 1991; Renwick & Green, 2000; Renzetti, 2003). A low rainfall raises the demand for water used for outdoor purposes (Jacobs & Haarhoff, 2004).

For the duration of the study period (July to November) rainfall for 2004 deviated greatly from both the long-term average and rainfall figures recorded during the same months in 2003 (Figure 16). In total, substantially more rainfall was received in 2004 than 2003 for the corresponding months of July, August and October. In October, for example, 132.9mm of rain was received in 2004 compared to 42.6mm in October 2003. This was two and a half times more than the long-term average of 50.1mm. It is assumed that the increase in rainfall in 2004 contributed to the control group's overall (15%) reduction in water demand. A change in water demand amongst the five experimental groups did not decrease after the control group's change in consumption was factored into each experimental group.

The average daily maximum and minimum temperatures for 2003 and 2004 were compared for the duration of the study period (July, August, October and November) (Figure 17). Except for October, the average maximum temperatures in 2004 were slightly higher than those in 2003. Average temperatures were, however, comparable to those in 2003, and resembled the long-term average temperature. There were no notable differences in temperature that could have influenced water demand during the study period.

5.3.2. Changes in the price of domestic water

Climatic factors alone cannot explain the large percentage reduction in water demand attributed to the control group. Changes in water policy and tariff increases implemented by the CCT during the study period may have been a causal factor leading to the 15% reduction in water demand. Although water demand is generally price inelastic, significant tariff increases are known to reduce domestic demand (Stern, 1976; Winett et al., 1976-1977, Flack, 1980). Consumer responsiveness to price does, however, depend on SES. Low-income groups are more responsive to price increases (Renwick & Archibald, 1998). A price increase places greater pressure on limited household budgets resulting in a decrease in the consumption of water (Flack, 1980; Winkler & Winett, 1982).

From July until November 2003, besides the annual water tariff change on the 1st July 2003 (Table 6), no restrictions or other mandatory reductions were introduced in Cape Town during this period. In reality, the price of water actually decreased on average by 14% compared to the cost of water for the previous year (2002/2003). This could explain an increase in consumption during 2003. Research has shown an inverse relationship between tariffs and demand (Geller et al., 1983). If a resource is considered relatively inexpensive, the incentive decreases and likewise, the potential to conserve the resource (Dandy et al., 1997; Syme et al., 2000).

On the 1st July 2004, water tariffs increased by 7.5% at all stages of the stepped tariff rates. These increases may appear negligible since the unit cost of water for Cape Town for the previous year had already decreased compared to the 2002/2003 unit cost (Table 6). Until recently, potable water tariffs in Cape Town were the cheapest in the country (Water Services Department, CCT, 2003). The consumption of 50Kl per month, for example, cost R208.00 in Cape Town, while the same quantity cost R360.50 in Durban (personal communication Water Services Department, CCT, 2003). Water is undervalued if it is perceived to be an inexpensive commodity (Baer, 1996). Respondents in the telephone survey confirmed that they felt that households were not conserving water as the supply was taken for granted and water was too cheap to make people want to conserve. If a resource is too cheap, there is no financial incentive for consumers to reduce consumption (Olsen, 1981; Geller et al., 1983; Sameulson, 1990). A financial gain or loss is often a prerequisite for changing behaviour (Winett & Nietzel, 1975; Winett et al., 1977; Olsen, 1981; Samuelson, 1990).

Individuals who benefit financially from reducing their consumption are most likely to change their behaviour (Hamilton, 1983; Winett & Kagel, 1984). The smaller the amount spent monthly on water bills relative to the total household expenditure, the less likely the resource will be conserved (Winkler & Winett, 1982; Renwick & Green, 2000). However, lower socio-economic groups respond better to price changes than wealthier households (Cunningham & Lopreato, 1977 as cited in Olsen, 1981; Renwick & Archibald, 1998). Research shows that behaviour change is closely linked to an understanding of how compliance is going to benefit the individual (Feather, 2000; McGuire, 2001). Furthermore, behaviour that is rewarded through incentives is more likely to be repeated than behaviour that does not benefit the individual (Cook & Berrenberg, 1981). Janis and Mann (1977 as cited in Prochaska et al., 1994) suggest that behaviour change and the benefits to change need to be available before changes are attempted.

In Cape Town, the Consumptive Water Tariff Policy was introduced in 2001. This pricing policy calculates the cost for water based on the efficiency principle of 'the more one uses, the more one pays' and is termed the 'rising step-tariff system'. Despite this policy, the cost of water for 2003 to 2004 was lower compared to the period 2002/2003 (Table 6). The decrease in the cost is unlikely to encourage efficient resource-use. Recent cost structures illustrate the CCT's efforts to provide water more equitably while promoting efficiency. An increase in the water tariff for Step 5 and 6 in the 2005/2006 budget shows a large increase (of 87.4% and 190.7% respectively) for high end consumers (Table 6). The effects of the price increases and the water restrictions are discussed further in section 5.4.

TABLE 6: Variations in domestic (full) water tariffs for the CCT (excluding VAT)

(Water tariffs during the study period)			July/Aug/Sept 2004	Oct/Nov 2004		
Water-tariff change dates	**2002/2003 1st July 2002**	**2003/2004 1st July 2003**	**2004/2005 1st July 2004**	**Restrictions 1st October 2004**	**2005/2006 1st July 2005**	
Step 1 (0-6Kl)	R0.00	R0.00	R0.00	R0.00	Step 1 (0-6Kl)	R0.00
Step 2 (7-12Kl)	R2.73	R2.00 27% decr.	R2.15 7.5% incr.	R2.32 7.9% incr.	Step 2 (7-12Kl)	R2.46 6% incr.
Step 3 (13-20Kl)	R4.30	R4.00 7% decr.	R4.30 7.5% incr.	R6.15 43% incr.	Step 3 (13-20Kl)	R6.52 6% incr.
Step 4 (21-40Kl)	R5.46	R5.10 6.6% decr.	R5.48 7.5 incr.	R10.41 90% incr.	Step 4 (21-40Kl)	R11.04 6% incr.
Step 5 (41-60Kl)	R7.35	R6.20 15.6% decr.	R6.67 7.6% incr.	R13.34 100% incr.	Step 5 (41-50Kl)	R25.00 87.4% incr.
Step 6 (60+Kl)	R8.00	R8.00	R8.60 7.5% incr.	R17.20 100% incr.	Step 6 (50+Kl)	R50.00 190.7% incr.

Source: Water Services Department, CCT, 2004 and 2005

5.3.3. Psychological factors

Human behaviour is complex, variable and unpredictable. Behaviour is not always dependent on attitudes, intentions and raised awareness (Seaver & Patterson, 1976; Geller, 1981; Kantola et al., 1984; Moore et al., 1994). A response to information, for example, is likely to be inconsistent because individual beliefs, choice of information selection and intellectual abilities among many other variables, play a role in the way information is perceived, understood and/or acted upon (Costanzo et al., 1986; McGuire, 2001). Furthermore, the content and subject matter of information, the way it is presented (Hill, 1999) and the type of information (Baumann et al., 1992; Bell et al., 2001), all influence how or whether people respond to information.

The fact that the household sample is heterogeneous, consisting of a diverse population of different cultures and SES levels (Table 4), makes the overall response to information extremely variable. The diversity of the sample population was confirmed in the telephone survey (Table 5) and is discussed in the following section. Flack (1980) and Dennis et al., (1990) suggest that it is preferable to target particular programmes and/or give information to select groups in order to ensure that it is relevant to the respective recipients. The argument here is that individuals require specific information in order to act (Craig & McCann, 1978).

Information can be ineffective when specific attitudes of consumers are not identified nor targeted in the leaflet to influence behaviour. It is argued that specific attitudes need to change before conservation of resources can be expected (Thomas et al., 1987 as cited in Syme et al., 2000; Loh & Coghlan, 2003). In this study, the sample represented a diversity of socio-economic households so that specific attitudes could not be addressed by the information leaflets. This shift in attitude in response to information is demonstrated in the seventh stage of McGuire's (2001) 'information model', and in the 'contemplation' stage of Prochaska et al., (1994) Stages of Change model (Figure 4).

The telephone survey captured the most common reasons to explain why households did not conserve water. For CCT households, attitudes to conserving water were very different to those provided by Australians. Households in Australia did not save water because a lush garden added resale value to the house at the expense of water conservation (Syme et al., 1990-1991). The respondents in the telephone survey on the other hand, did not conserve water as it was felt that informal dwellers excessively wasted water and did not pay for it. Households would conserve water if others were seen to do the same. The same reason for not conserving water was given by consumers in Southern California who felt that there was a lack of commitment by 'others' to conserve (Baumann et al., 1992).

A similar behaviour pattern was observed in a laboratory setting where false feedback was given with respect to the availability and size of a resource pool amongst a group of participants (Samuelson, Messick, Rutte & Wilke, 1984). Results showed that when individuals from the USA were told that others were exploiting the resource, they responded by increasing their consumption. The attitude that 'if they will, so will I' informed this behaviour (Ibid.). Similar research was conducted at the University of California where students who believed that others would reduce the 'harvesting' of a particular resource, opted to reduce their individual consumption of that resource (Messick, Wilke, Brewer & Kramer, 1983).

Responses from the telephone survey used in this study illustrate specific attitudes of CCT consumers and are directly related to the perceived barriers to change as discussed in Prochaska's et al., (1994) Stages of Change model. When barriers are perceived as significant and outweigh the benefits of change, consumers remain in the 'pre-contemplation' stage. The general attitude amongst Cape Town consumers was that water availability was 'not my problem, but the CCTs'.

The above discussion suggests that consumers have to be convinced of the need to conserve (Baumann et al., 1992). Researchers have attempted to address this link between consumer convictions and resource consumption. Syme et al., (2000) recognise the importance of providing specific information to consumers such as the financial cost and potential savings relating to a particular behaviour. Van Vugt (2001) recognises the importance of altering thinking with respect to the value of a resource by increasing awareness using relevant information. Thompson and Stoutemyer (1991) also discuss this relationship between value and conservation of a resource. In the telephone survey respondents agreed that 'people will only save water if they think they should'. In Cape

Town progress in water conservation is likely to be achieved when there is a greater commitment to conserve. Commitment is recognised as instrumental in changing behaviour (personal communication Professor J. Simpson, January 2005) and has been proved empirically in water conservation research (Becker, 1978; Kantola et al., 1983).

Another reason why households were not conserving water in Cape Town was the perception that the CCT was not making an effort to conserve water. According to respondents, the CCT needed to 'practice what it preached' and prove that they are in fact doing everything possible to conserve water within the City before consumers themselves will make an effort to conserve. The response suggests that the recipients did not trust the disseminator of information, which is the CCT. The credibility of the informant must be well established before information is accepted and valued (Craig & McCann, 1978; Winkler & Winett, 1982; Costanzo et al., 1986; Dennis et al., 1990; Samuelson, 1990; McGuire, 2001). This is reiterated by Lee and Warren (1981) who recognise the credibility of the local government as the most important factor to successful conservation.

The consequence of performing a new behaviour, such as the effect on personal comfort and convenience also influences whether change will occur (Winkler & Winett, 1982; Simmons et al., 1984-1985; Hamilton, 1985; Syme et al., 2000). The new behaviour needs to be perceived as worthwhile and information therefore needs to demonstrate how it is going to benefit the individual (Feather, 2000; McGuire, 2001). Excessive water consumers are more likely to reduce their consumption if it will benefit them financially (Winett & Kagel, 1984).

5.3.4. Demography of the sample and water demand

The method of sample selection has already been discussed in detail in Chapter 3. In brief, the sample was selected using aggregates of individual household water consumption. In the process it was conceded that these consumption totals may have biased the sample because the selected households may not necessarily have represented the highest water consumers. When the sample was equally divided into the three consumption categories, one third of all households in the sample consumed 31Kl or less each month (Figure 11). Since the average household of four people in the CCT consumes 27Kl of water per month, it is unlikely that the lowest third of the top 20% of domestic water users consume 31Kl or less of water each month.

When the study's sample was categorised into various socio-economic groups, it was found that more than half (54%) of the households were of low SES (Table 4). This percentage was similar to the CCT's figure provided by Statistics South Africa of 55.7%. The assumed relationship between low SES and less demand for water is based on research that has shown the link between households of low SES and below average consumption levels (Palencia, 1988; Samuelson, 1990; Whitcomb, 1991; Kablan et al., 1999; Almeida et al., 2001; Colton, 2002).

Baer (1996) and De Oliver (1999) explain the correlation between standard of living and water demand. This relationship is reiterated by Berk et al., (1980) who holds the position of the demand curve depends on household characteristics and income. The link between income (De Oliver, 1999; Renwick & Green, 2000; Renzetti, 2003) and/or levels of education to water demand has also been proven (Hamilton, 1983). Renwick and Archibald (1998) recently found that a 10% increase in income brought about a 3.6% increase in monthly household water demand.

Household characteristics or 'home-dependent' factors are also known to influence water demand (Whitcomb, 1991). This is explained by Bruvold and Smith (1988) and Dandy et al., (1997) who observed a strong correlation between property value and income, which in turn is significant in determining water demand. According to Renwick and Green, a 10% increase in property size increases the demand for water by an average of 2.7% (2000: 48). There is a logical explanation for this relationship. Generally affluent households reside in low-density areas often containing large gardens and swimming pools. Gardens consume between 30% to 50% of all water used within the home (Postel, 1992; Botanical Society of South Africa 1995 as cited in Pallett, 1997; De Oliver, 1999). The size of a landscaped area correlates strongly with water demand (Whitcomb, 1991; Renwick & Archibald, 1998; Renwick & Green, 2000; Jacobs et al., 2004; Renzetti, 2003).

Households consuming large amounts of water for outdoor purposes have potential to reduce consumption with little effect on personal comfort or convenience. Olsen (1981) and

Samuelson (1990) identify these barriers (effects on comfort and convenience) as significant in influencing behaviour change. The more water consumed for non-essential purposes such as for the garden, the greater the potential for reductions to be made, as these changes require minimal effort on the part of the consumer. Outdoor water demand is more elastic (has greater potential for reductions) than water that is used for indoor purposes (Loh & Coghlan, 2003). Suburbs that have low-density housing should therefore be more responsive to WDM initiatives.

Many of the households in the sample were of low SES. It is therefore expected that the population sample did not necessarily consist of the highest water consumers as originally intended. This was confirmed during the telephone survey as some respondents were angry after being questioned why their consumption had increased. They responded by saying that they were already doing everything possible to save water. For example, water was collected from overflow pipes by attaching a piece of string to the pipes so that the drips fell directly into a bucket for re-use. Water from washing vegetables and fruit was also reused to water indoor pot-plants. Many respondents were unsure about their increase in consumption, but stated that their household occupancy was between 6 to 8 occupants and that water conservation was difficult. The more occupants, especially children in a household, the more difficult it is to conserve water (Samuelson, 1990). Some respondents operated small businesses (hairdressing salons and/or crèches) from their home, and consequently used abnormal amounts of water. The potential for water reductions within the sample is therefore much lower than if a more representative sample of 20% of the highest water consumers (based on per capita consumption) had been selected for the study.

This discussion has significant implications for this study. It suggests that the lower the SES, the smaller the margins for change. Households that are already using water sparingly will find it difficult to further reduce consumption. This was proved by Winett et al., (1978-1979) and Hamilton (1983) who found the largest decrease in water consumption among households that initially consumed the greatest amount of water. Conservation is less likely to occur where there is a small potential for reduction since a greater effort to conserve water is needed which in turn, affects personal comfort, convenience and/or even basic water needs. Studies show that small attempts to change requiring the least amount of effort would be implemented first by households (Costanzo et al., 1986; Michelson, McGuckin & Stumpf, 1999 as cited in Syme et al., 2000). If these changes benefit the consumer, then greater effort will be made to change other behaviours (Dennis et al., 1990). Conversely, if initial attempts fail to benefit the consumer, individuals are less likely to attempt new behaviours (Ibid.). This illustrates the importance of focusing on conservation behaviours that require the least effort while producing the greatest benefit to the consumer. This was one of the reasons for the weak effect of information in the study conducted by Kohlenberg et al., (1976) because the participants were unaware of which behaviours were most beneficial in terms of savings.

The number of occupants in a household significantly influence the amount of water consumed within a household. Daily water usage for indoor purposes, such as basic hygiene, toilet flushing, drinking and cooking, constitute about 52% of all water used within the home. Although there is margin to reduce water used for indoor consumption in a household, there is much greater potential to reduce outdoor consumption (Flack, 1980). Habitual change for indoor water usage of already water conscious households is thus highly unlikely as this will require greater amounts of inconvenience and effort on their part. Monthly consumption for a household of eight people, for example, who are conservative with their usage, could be as high as a household of two people who own a large property with a swimming pool.

Winett and Winkler (1982) and Costanzo et al., (1986) recognise the potential for a large reduction in water consumption when both habitual change and technological change (for example, retrofitting) is used simultaneously. The potential for combining both these strategies to reduce water consumption was demonstrated in Yorkshire, Britain, where consumption was reduced by 21% amongst a sample of 50 000 households (Hutchings, 1995). As explained earlier in the Stages of Change model (Prochaska et al., 1994) and Janis and Mann's theory of Decisional Balance, if the barriers (high effort, inconvenience, cost) outweigh the benefits (water and monetary savings) to change, attempts will not be made to change behaviour.

5.4. The influence of information prior to and during the restrictions

Water restrictions were introduced in Cape Town in October 2004, as a consequence of the low volume of water stored in dams supplying the City with water. On 20th September 2004, the five main dams were only 57% full. In comparison to earlier years, this percentage was much higher: 75.6% in 2003, 100% in 2002 and 2001, 83.3% in 2000 and 98.2% in 1999 (CCT, 2004b). Level 2 restrictions were introduced by the CCT in an effort to reduce water demand by 20% (saving 66 million Kl of water) over a one year period and/or until the storage capacity of the dams reached acceptable levels.

Domestic gardens were only permitted to be watered for one hour twice a week. No irrigation and sprinkler systems were permitted and the washing of motor vehicles was restricted to the use of a bucket (CCT, 2004a). Information was sent to households during the first two months of the restrictions while the media provided tips on how to save water on a daily basis. Water tariffs increased significantly (by at least 90%) for households consuming 21Kl or more each month (Table 6). Since the study's sample consumed a monthly average of 50.9Kl, it was anticipated that these substantial price increases would inversely affect water demand. The restrictions imposed during the study period made it necessary to establish the effect on domestic water demand.

The restrictions introduced additional extraneous variables into the study. The effect of the information leaflet combined with water restrictions was therefore compared to the individual effect of the leaflets on water demand. Percentage changes were calculated using water consumption data from July and August, the pre-restriction period; and from October and November, the restriction period (Figure 10).

The difference between consumption patterns during the restriction period and preceding the restrictions is notable. Prior to the restrictions, the control group reduced consumption by 10%. This percentage reduction increased to 19% during October and November. The restrictions caused households to reduce consumption. Furthermore, during the winter rainfall period, minimal water is generally used for outdoor purposes (Hamilton, 1982). Therefore reductions that occurred during July and August would need to have occurred within the house because this is where the largest proportion of water would be consumed.

It was suggested earlier that more effort is required to reduce indoor water consumption than for outdoor usage in a domestic situation.

The control group's percentage reduction was factored into the consumption change of the five experimental groups over the same time period. By comparing the pre-restriction group percentage change to that of the restriction period, groups 1, 2 and 4 increased their consumption by 3%, 1% and 2% respectively (Figure 10). No explanation can be made for this slight increase, but it can be assumed that the restrictions had little effect on water demand. Although group 3 displayed the highest increase of 7% prior to the restrictions, this group along with group 5, achieved reductions of 5% each, at the commencement of the restriction period. These decreases were probably as a result of modest changes made by households during this period. As discussed earlier, small efforts to conserve are attempted first and if they benefit the consumer, larger attempts to conserve are likely to be made.

The potential of information in the form of feedback, combined with restrictions to reduce water demand was best demonstrated by group 5. Research has already shown the benefits of combining WDM initiatives to conserve water (Flack, 1980; Bruvold & Smith, 1988; Dandy et al., 1997).

In October, during the restriction period, a total reduction of 4 010Kl accrued to all six groups. This total reduction increased by 29.8% in November, more than six times the absolute amount in October and grossed 26 170Kl. The reasons for the large reduction are unknown. It is possible that households became more aware of the severity of the low volume of water stored in dams through the media, and therefore accepted the restrictions once they were officially publicised in early November. Initially there was a large amount of uncertainty with respect to the implementation of the restrictions and regulations as nothing formal had been sent to households until November.

The information leaflets used in this study were discontinued at the end of November and the effect of its removal on consumption was examined for the month of December. Rainfall in December 2004 (17.3mm) was well below the long-term average of 34.4mm (Figure 16), and almost a third less than that received during December 2003 (46.7mm). Despite the low rainfall figures in December 2004, groups 1, 3, 4 and 5 reduced their consumption compared to 2003. A plausible reason for this reduction may be due to the fact that outdoor water demand increased during the summer months (Loh & Coghlan, 2003) and therefore there is greater potential for reductions to be made during summer than winter. During December 2004, despite drier and hotter weather conditions (Figure 16 and Figure 17), it is probable that the restrictions curbed outdoor water use, forcing households to conserve water.

The cumulative effect of restrictions alone on water demand shows a general decline in water consumption for all five experimental groups from October to December (Figure 10). Some households may have accepted the severity of the water situation and sought alternative solutions to using potable water for their gardens. This was confirmed by a company that installed wellpoints as '47 [telephone calls] were received from new customers' on the 'first day of the water restrictions' with 500 telephone call enquiries being made each week in November, peaking at 250 phone calls in one day!' (De Wet Well Points as cited in the Cape Times, 6/01/2005). A drilling company received 50 telephone calls each day- a huge increase from the one or two telephone calls prior to the restrictions (P-Tec Drilling as cited in the Cape Times, 6/01/2005).

It was anticipated that the information leaflet would have a continuous and cumulative effect on consumption over time, but this was not the case. No trends in consumption patterns were observed during the study period for any of the groups (Figure 8). Syme et al., suggest over time, consumers become less accepting of efforts to reduce consumption (2000: 546). Research has shown that behaviours requiring more effort which are often inconvenient are less likely to be performed (Cook & Berrenberg, 1981; Olsen, 1981). The above discussion illustrates the difficulty and complexity of human behaviour that is extremely sensitive to personal preferences and a variety of external influences (Hobson, 2003).

5.5. The effect of the information leaflet on household water consumption

The effect of information presented on water demand in this study was evaluated for the four-month study period in order to establish which particular type of information influenced water consumption behaviour the most. Leaflets containing certain information were more successful than others in reducing water consumption. However the actual effect was not significant as suggested by earlier studies. The mixed results obtained from this study were not surprising, but the low level of significance between groups and even the increase in consumption was unexpected.

Response to information is highly dependent on subject matter, type of information and when it is provided (Hill, 1999). The efficacy of information depends on these factors which explain the varied abilities of different information types in altering water demand. Information in the form of feedback is most effective in altering resource use behaviour (Winett et al., 1976-1977; Winett et al., 1978-1979; Cook & Berrenberg, 1981; Winett & Kagel, 1984; Hamilton, 1985). It was therefore not surprising that the same findings occurred in this study. Although slight, overall group 4 and 5 were the only two groups to reduce water demand compared to the other three experimental groups. Despite the fact that these overall reductions of 2% and 1% respectively were minimal, this study demonstrated that when feedback was combined with restrictions, reductions of 4% could be achieved. If all water consumers reduced their demand for water by a small percentage, the aggregate saving of water would be significant to the City.

Another possible reason why feedback was not as successful as anticipated, was that it was provided monthly and not daily or weekly as recommended by many researchers (Palmer et al., 1977; Seligman & Darley, 1977; Winett et al., 1979; Winett et al., 1982; Winkler & Winett, 1982; Winett & Kagel, 1984).

During the restriction period, group 5 achieved a similar reduction in consumption compared to Hayes and Cone's (1981) study in Rhode Island on electricity consumption. In their study, feedback was provided monthly because of the cost and for practical reasons. Feedback is also effective if targets are relevant to households of similar size and SES (Winett et al., 1978-1979; Yates & Aronson, 1983; Dennis et al., 1990). This was confirmed by the telephone survey in which respondents were critical of the feedback-graph since it only provided average monthly consumption data for a household of four people. This amount (27Kl) was much lower than what they were consuming, implying that they were high consumers even though water was used sparingly. Many more occupants were reported to be living in the sample of households.

The importance of providing relevant and meaningful information has been acknowledged by Flack (1980), Yates and Aronson (1983) and Syme et al., (2000) and was again confirmed in this study. It was thus not surprising that feedback was recognised by many households (in group 4 and 5) as most effective in altering consumption (Appendix 36). Research has shown that personalised information is more meaningful and relevant to consumers (Winett et al., 1978-1979; Flack, 1980; Yates & Aronson, 1983; Hill, 1999; Syme et al., 2000). Information is valued if it is practical (Feather, 2000; McGuire, 2001). This relationship between personalised information and water consumption was also demonstrated in the GHWCP where the informative bill was 'overwhelmingly accepted by the public' (van der Linde, 1997: 239).

Feedback informs consumers about individual performance (Winett et al., 1982; Winett & Kagel, 1984; Aitken et al., 1994; Deedat et al., 2001). Knowledge of individual consumption levels has resulted in improved effort at conservation (Hamilton, 1985; Bruvold & Smith, 1988; Syme et al., 2000). Specific knowledge of the consequences of individual behaviour is recognised by Seaver and Patterson (1976) as vital to change behaviour. In this study, respondents agreed that the feedback graph allowed for regular monitoring of individual water consumption (Appendix 36). Feedback positively reinforces the new behaviour and is congruent with the 'Maintenance stage' of Prochaska's et al., (1994) behaviour change model.

When respondents who were successful in reducing their consumption were asked why their consumption had decreased, the most common explanation was due to the restrictions and to a lesser degree the information presented by the leaflet. Increased knowledge has shown to enhance conservation efforts as demonstrated by Hamilton (1985) and Grodzinka-Jurczak (2003). These answers were expected due to the water regulations associated with the restrictions on outdoor water use. Less garden watering and the reuse of grey water were the main reasons for the decrease in consumption.

According to the Water Services Department, it is generally accepted that water consumption of more than 40Kl per month is generally used for outdoor purposes personal communication, October 2003). This is why the CCT limits or caps sewerage tariffs at 40Kl or less for households. It can therefore be assumed that reductions in water demand during the restriction period was generally due to households consuming water at Step 5 and above in the tariff structure. It is easier to reduce consumption for outdoor purposes, and tariffs were increased by 100% within these two high-consuming Steps therefore providing a greater financial incentive to reduce consumption.

Olsen (1981) has shown that when the benefits are realised, greater attempts are made to alter personal behaviour. It was therefore anticipated that the information leaflet demonstrating monetary and water savings would be successful in reducing consumption, but that this reduction would be significantly less than the combination and feedback leaflets. The tabulation of water and monetary savings from changing current water consumption behaviour intended to increase the benefits to change as well as illustrate the ease at which these savings could be achieved (see Appendices 8 - 17). A 2% increase by both group 1 and 2 indicated that information in the form of tips or potential water savings was ineffective. Overall, group 3 proved least successful in achieving water reductions as their consumption increased slightly more than the previous groups to that of 3%.

There are a number of possible reasons for the inability of groups 1, 2 and 3 to reduce water demand. Water is relatively cheap and therefore the monetary incentive too small to change behaviour. McGuire (2001) argues that individuals will only act on new information if it is perceived as worthwhile and beneficial. This occurs in the tenth stage of McGuire's 'information response' model and in the 'Action' stage of Prochaska's et al., behaviour change model (1994). Secondly, water is not valued by consumers in terms of its social and ecological worth. Conserving water for the 'public good' was not a good enough reason for Cape Town consumers to reduce their consumption. This was confirmed in the telephone survey and discussed in section 5.3.3. of this chapter. Water is consumed for personal gain or 'self-interest', be it to service basic needs or for non-essential purposes (Samuelson et al., 1984; Samuelson & Messick, 1986; Samuelson, 1990; Van Vugt & Samuelson, 1999). This has been discussed by Berk et al., (1980) and demonstrated in Perth, Australia, where consumers did not practise water conservation because of the importance of having a lush garden (Loh & Coghlan, 2003). These observations were confirmed in the telephone survey (see 5.3.3. in this chapter). Finally, as individuals are more responsive to information that is personalised (Winett et al., 1978-1979), this may explain why the information on potential monetary or water savings and/or tips on how to conserve water was ineffective in reducing water consumption.

Research points to the need for acceptable and feasible solutions to the homeowner (Syme et al., 1990-1991) in terms of behaviours that require the least effort and inconvenience while producing the greatest benefits (Janis and Mann, 1977 as cited in Prochaska et al., 1994). In this study, the benefits of conserving were clearly outweighed by the perceived barriers of change. In conclusion, it can be deduced that if reductions can be achieved, then restrictions that mandate specific watering times and regulations, and significant price increases are most effective in influencing domestic water consumption. The addition of feedback as a WDM strategy has potential for larger water reductions amongst households when it is combined with the former WDM initiatives.

5.6. Different consumption category groups and effectiveness of information

Information was ineffective in reducing household water consumption and although certain types influenced consumption, these were insignificant. Consequently, the effect of the leaflet(s) on groups of varying consumption categories was investigated. Research has shown that large water consumers are more likely to reduce their water consumption (Hamilton, 1983). Not only is there a greater margin for reductions with little effect on individual effort and convenience, but due to positional factors discussed earlier, there is a much greater likelihood that water consumption will decrease. Table 4 and Figure 11 demonstrate the unlikelihood of the household sample being the highest water consumers in Cape Town. Consequently, households were categorised into various consumption groups by calculating the monthly average consumption from July 2003 to June 2004. This period was used as the information leaflets had not been implemented and figures were most recent and thus characteristic of the household sample.

Consumption categories were selected at 5Kl intervals and the overall effect of information was evaluated for each of the five experimental groups. These categories aimed to identify households that consumed the greatest amount of water, as well as establish whether there were any possible and significant relationships between larger consumers and related reductions.

Based on the findings from this study, regardless of how much water households consumed, consumption generally increased for groups 1, 2 and 3 (Figure 12). Groups 4 and 5 reduced their consumption overall, and as expected, this percentage reduction gradually increased as households from lower consumption categories (35Kl, 40Kl, 45Kl, and 50Kl) were eliminated from the analysis (Figure 12).

During the water restriction period the information leaflet achieved better results than when it was administered alone. Water restrictions brought about a much greater reduction in consumption amongst group 5 than group 4 (Figure 14). Amongst the former group, the magnitude of the reduction increased gradually with a steep reduction from 9% to 16% being obtained when households consuming water in the category of 49Kl and below were deleted from the analysis. This finding confirms the statement that higher consumers have a greater potential for water reductions.

As concluded previously, for feedback to be effective, it must be combined with other WDM strategies such as water restrictions and tariff increases. This has been confirmed by Van Vugt (2001) who acknowledges the importance of both structural and socio-psychological approaches to effectively reduce water demand. Group 3 also changed their consumption pattern across all consumption categories after the restrictions were introduced (Figure 13 compared to Figure 14). The water demand curve dropped dramatically from an average 10% increase in consumption (Figure 13) to a 1% decrease in consumption (Figure 14). This may be the result of the tariff increases and related subject matter of the leaflet that focused on potential monetary savings associated with changes in water consumption.

When the study was terminated at the end of November, consumption figures were analysed during December to establish whether consumption had increased (Kohlenberg et al., 1976; Hayes & Cone, 1981). As expected, consumption generally increased for groups 4 and 5 (Figure 14 compared to Figure 15) once the information leaflet was removed.

This Chapter aimed to discuss the main findings from the study and provide possible reasons for the results. These explanations were provided within the context of Cape Town and intended to justify why information overall was unsuccessful in changing water consumption behaviour amongst households.

In the subsequent and final chapter, the main conclusions from the study are highlighted.

Chapter 6

Conclusion

Economic incentives and public outreach [education and information] will not motivate everyone to conserve [water]… setting water-efficiency standards for common fixtures [showerheads, taps, and toilets] is a critical component of a reliable conservation strategy.

(Postel, 1992: 158)

Although information was ineffective in influencing water-consumption behaviour, a number of conclusions from this study can be made.

Information in the form of feedback is most likely to influence human behaviour in the case of domestic water consumption. Feedback needs to be specific to households of similar SES and 'home-dependent' factors such as occupant numbers, in order for the information to be relevant, meaningful and useful to consumers.

The study has also shown the increase in the potential of feedback to influence behaviour with the addition of restrictions and tariff increases. This finding concurs with similar research studies that have shown great potential to reduce water consumption when combinations of WDM strategies are used simultaneously. This study also confirmed that specific information that is personalised, relevant and meaningful to recipients needs to be targeted to particular households.

Results demonstrated that high water consumers need to be focused on for future water conservation research. Households from group 4 and 5 that consumed 45Kl or more of water were most successful in achieving water reductions (Figure 12). This success was more pronounced with the addition of the water restrictions in October (Figure 14). Households in group 5, for example, who consumed more than 50Kl each month, reduced their water consumption by 16%.

The feedback leaflet combined with restrictions and high water tariffs reduced the sample's water consumption by 4%. This saving, although small, would counterbalance Cape Town's annual increase in water demand for a one year period. It is recommended that the City continue to increase consumer awareness regarding water supply and related demand, both in the short and long term. There was an overwhelming response to the information leaflets in the telephone survey. The majority (71%) of respondents wanted the water information to be continued to be sent to them in the future (Figure 19). Responses in Appendix 37 clearly demonstrate the overall reaction regarding continuation of the information leaflets.

Sydney, Australia (Sydney Water, 2005) and Namibia (Allison et al., 2000) have and are successfully promoting WDM amongst domestic consumers. Both of these countries have achieved phenomenal reductions in water demand. Cape Town's policies should be modelled on these successful case studies. With current water tariffs increasing by 90% and 190% in Step 5 and 6 respectively (Table 6), the likelihood of domestic water reductions in Cape Town seems inevitable. Coupled with information, specifically feedback on individual water consumption, related targets and benchmarks, in addition to providing the current costs of water in Step 5 and 6, the probability of household water consumption reductions seems certain.

The large 15% reduction in water demand achieved by the control group was factored into this study's analysis (Figure 7). As discussed in Chapter 2 and 3, although earlier demand management research achieved significant reductions in resource consumption, many of the studies did not include a control group from which to factor percentage changes in resource use as a result of extraneous variables. This may explain why information in this study was ineffective in reducing water demand. This WDM study demonstrates the ability of specific information in the form of feedback to influence water consumption behaviour. The success amongst higher water consumers is encouraging as considerable reductions of as much as 16% are achievable when combinations of WDM strategies are provided simultaneously.

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APPENDIX 1:

An example of an informative bill used in the GHWCP

NATIONAL WATER CONSERVATION CAMPAIGN

GREATER/GROTER HERMANUS WATER

PO Box / Posbus 20 Hermanus 7200

Understand your water account/Verstaan u waterrekening

Account No Rekening Nr	00447710810	Date of Account Datum van Rekening	31/07/1997	Date of Reading Lesingsdatum	18/07/1997
Name/Naam Property Address Eiendom Adres	MUNICIPALITY VOELKLIP BEACH PARK			Erf Area	
				Erf Nr	

Meter No Meter Nr	Present Reading Huidige Lesing	Previous Reading Vorige Lesing	Consumption Verbruik	Days Dae	kl/Day kl/Dag
26937	3.222	3.208	14	30	0.47

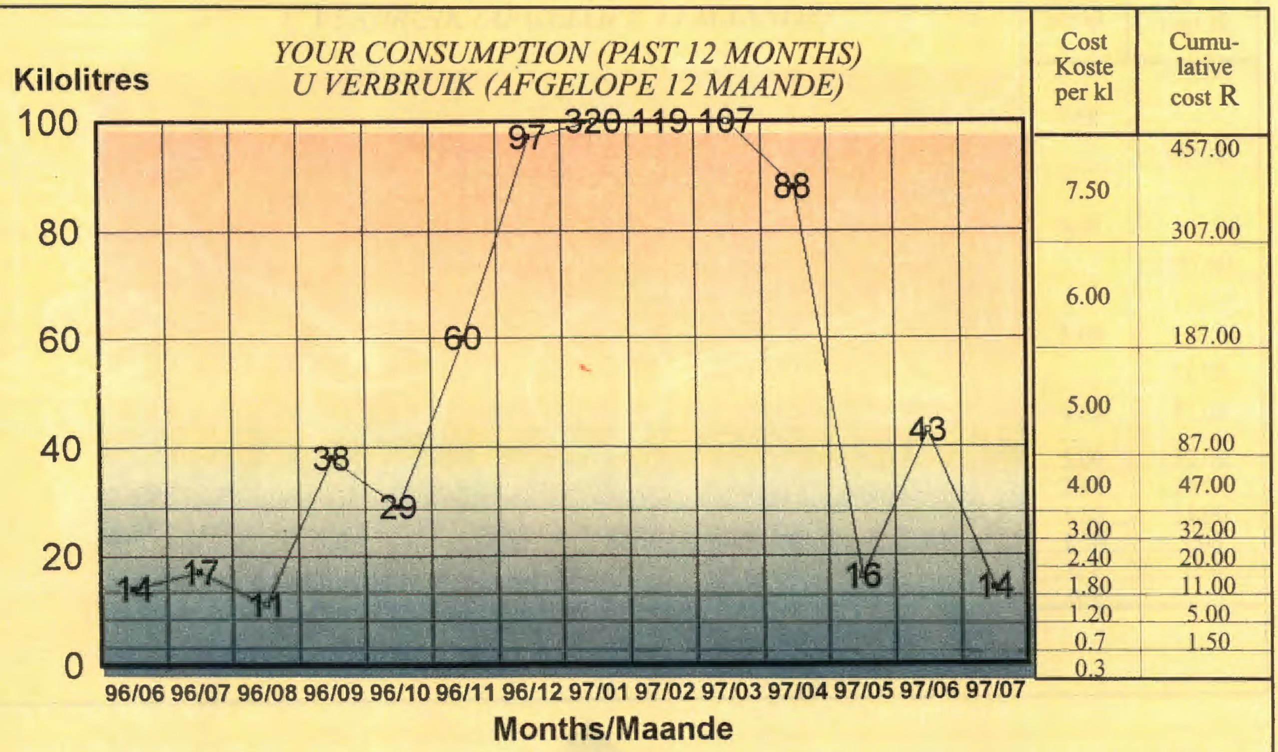
Consumption (kl) Verbruik (kl)	Cost Koste	Assurance of Supply Versekering van Lewering	VAT BTW	Total Totaal
14	R 8.60	R 35.09	14%	R 49.80

Notice Board

Kennisgewingbord

HANDY TIPS ON HOW TO REPAIR A LEAKING TOILET CISTERN:
(SEE REVERSE SIDE) HOTLINE 70 11 11

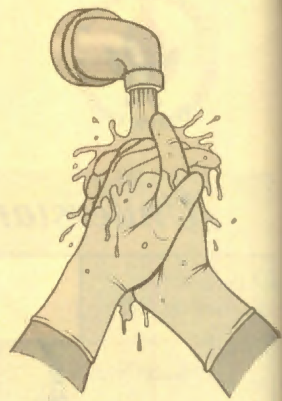
NUTTIGE WENKE HOE OM 'N LEKKENDE TOILETBAK TE HERSTEL:
(SIEN KEERSY) BLITSLYN 70 11 11



A joint venture between the National Water Conservation Campaign of the Department of Water Affairs and Forestry and the Greater Hermanus Municipality.

'n Gesamentlike onderneming tussen die Departement van Waterwese en Bosbou se Nasionale Waterbewaringsveldtog en die Groter Hermanus Munisipaliteit.

HOW MUCH WATER DO YOU USE IN A DAY?



Have you ever wondered how much water you use in a day? A water meter will give you a running total of how much water you are using and will ensure you pay only for what you use. However, in order to make your water meter work for you, you should check it regularly, especially if you wish to combat water leaks. Leaks are not only wasteful, but also expensive, especially if it is hot water that is leaking.

Fortunately most leaks are in obvious places and are easy to repair. However, once you have fixed all of the visible leaks in your home and on your property you need to be sure that there are no hidden leaks, such as those in underground pipes.

Although leaks in the mains network are the municipality's responsibility, as a householder you are responsible for all water pipes within the boundary of your property. If you suspect you have a leak, or have found tell-tale signs like damp patches that do not seem to dry up, puddles or continuously lush foliage in the garden, the best thing to do is to conduct a water meter test.

LOCATE YOUR WATER METER

The water meter is usually found near the fence or boundary where the mains water supply enters your property.

CHECK YOUR WATER METER

Once you have found the meter check if there is water flowing through it.

i. If your water meter is a digital type you will have to monitor the meter over about an hour, making sure that nobody in the house is using any water. If the reading changes then you have probably found a leak.

ii. If your water meter is the dial type, check to see if the star wheel is turning. A steady movement of this wheel, with all of your taps turned off and nobody in the house using any water, will show that you have a leak.

READ THE WATER METER TWICE

Take the first reading at night, after the day's water use has ended, or when your family is going out for a while.
Take a second reading in the morning, or just before your family gets home, before any water is used.

FIND THE DIFFERENCE

If the figures differ then you may well have a leak. Subtract the first figure from the second reading in order to find out how much water has leaked out.

WHAT TO DO IF YOU HAVE A LEAK

If you find a leak have it repaired immediately. The longer it is left unattended to the more water, and money, it will be wasting. If you decide to call in a plumber and he is going to replace a pipe, ask him to install a corrosian-resistant pipe like high density polyethelene, especially under paved areas.

The older and more established your garden is, the more chance there is that the root systems of plants like ivy have wound around underground water pipes and damaged them. Root damage to underground pipes is often responsible for costly undetected leaks.

TIPS TO REMEMBER

- Toilet cisterns and geysers can take a long time to fill after use. Make sure that they have finished filling before conducting your water meter leakage test.
- Before carrying out any repairs on your water system, close the stop-cock on the main water supply pipe to your house. This stop-cock is usually located next to your water meter.
- Make sure that everyone in your family knows where the stop-cock is in case of a leak or a flood. Make sure that it can be easily turned on and off.
- Always keep the name and number of a plumber handy.
- If you are going away ask a neighbour to visit daily so that burst pipes will be detected quickly.

OTHER AREAS ON YOUR PROPERTY WHERE THERE MIGHT BE AN OVERLOOKED WATER LEAK:

- Automatic garden irrigation system
- Garden hosepipe
- Garden tap
- Automatic dishwashing machine
- Automatic washing machine
- Swimming pool
- Toilet overflow pipe
- Showerhead
- Indoor taps
- Geyser

APPENDIX 2:

DWAF pamphlet on the success of the GHWCP

THE FIRST FOUR MONTHS: A 32% SAVING

Of the 12-point plan, only items 1, 2, 3, 4, 11 and 12 have been introduced to date. Of those being introduced, the retrofitting, water-loss management and water by-laws components are expected to reduce significantly the level of water use.

Reduction in water use:
Below is a comparison of bulk water use figures for the months of November 1996 - February 1997, and the same four months for the average of 1993/94, 1994/95 and 1995/96.

Nov, Dec, Jan & Feb	Kilolitres per day	Estimated erven	Litres used per erf per day	Total rainfall
1993/94	11 900 kl	7 900	1 506 litres	140 mm
1994/95	12 075 kl	8 200	1 473 litres	120 mm
1995/96	10 842 kl	8 600	1 261 litres	192 mm
Average 1993 - 1996	***11 606 kl***	***8 233***	***1 410 litres***	***151 mm***
1996/97	**8 644 kl**	**9 000**	**960 litres**	**168 mm**
% Saving	25,5%	(9,3%)	32%	(11,3%)

Rainfall, wind, cloud cover and temperature do influence water use - but then, average bulk water usage by neighbouring local authorities has not declined significantly in 1996/7.

Increase in Revenue from Water Sales:
There has been a significant increase in revenue (in rands) from water sales for the four months in 1996/7, compared to the same four months in 1995/6. This increase has the advantage that the implementation of the retrofit programme (which is to stretch over a period of 3 years) could be completed much sooner.

Note that it was always predicted that the bulk of the additional revenue will be raised during this peak holiday period. The budgeted amount allowed for an increase in the *old* tariffs, as well as for revenue from new erven. The surplus increase is as a result of the *new* tariff structure.

Rands	**Actual 1995/6**	**Budget 1996/7**	**Actual 1996/7**	**Surplus 1996/7**
Total	2 279 999	2 880 404	3 683 155	802 751
Increase	-	26.3%	61.5%	27.9%

What are the implications?
The additional revenue will be used to introduce fully all of the conservation measures, making it a lot easier for water-users to reduce their water consumption, and thereby their water bills. This will reduce revenue, and a new balance will be reached that is sustainable and affordable in the long-term.

Greater Hermanus's 32% reduction in water demand has enormous implications. For example, were greater Cape Town to achieve this (and there is no reason why it should not do so), it would save 80 million kilolitres of water per year. This would enable it to postpone the building of its next dam by seven years, thereby saving R780 million in interest - money that could then be profitably used. Such water savings for Gauteng would run into many billions of rand.

South Africa's Minister of Water Affairs & Forestry, Prof Kader Asmal, has called this programme, ***"...potentially the most important water management initiative ever undertaken in South Africa".***

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APPENDIX 3:

Group 1 leaflet: July 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

USEFUL TIPS AND INFORMATION TO REDUCE YOUR WATER CONSUMPTION: JULY 2004

More than 70% of the earth's surface is covered in water.

So why is there insufficient water in certain regions?

- 97% of surface water is salt water
- 2% is frozen in ice sheets and glaciers
- only 1% remaining as freshwater that can be used

Water supplies are decreasing worldwide because of:

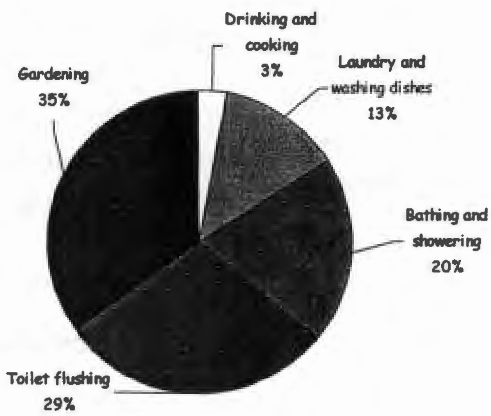
- Increasing migration of people to cities especially in Africa and Asia
- Higher standards of living and demand for more water
- An increasing population

Domestic consumption: Where does the water go?

The diagram alongside shows water use in residential households in Cape Town (1994).

The greatest potential for saving water lies in using water sparingly in the garden, toilets and bathrooms.

Households in Cape Town use 60% of all available water supplied to the city.



Tips to reduce water consumption

- Check your monthly water account. Monitor your use of water. Set realistic targets to reduce your household consumption.
- When washing your car, use a bucket of water rather than a hose-pipe.
- Sweep pathways and driveways rather than hosing them down.
- Educate your household to use water sparingly.
- Reduce electricity - almost 3 litres of water is required to generate 100 watts of electricity over 12 hours. A hot water geyser uses 40% to 60% of household electricity. Investigate the possibility of electricity saving options, e.g. using geyser blankets to insulate hot water geysers.

Over the next 4 months you will receive a monthly information sheet about water saving.

For queries related to this information supplied, contact CCT: 400 3566 (Mon., Wed., & Thurs. between 2 & 4pm). For any other water related queries, contact the Call Centre: 086 0103054.

APPENDIX 4:

Group 1 leaflet: August 2004

USEFUL TIPS AND INFORMATION TO IDENTIFY HOUSEHOLD WATER LEAKS: AUGUST 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

How much water is lost through leaks?

- Up to 52 bathfulls of water a year can be wasted if a tap is left dripping.
- A tap dripping one drop a second could waste 30 litres of water every day.
- A leaking toilet can waste up to 200 litres of water every day.
- A 1mm diameter hole in a water pipe loses 41 600 litres of water every month!

About 18% of all water supplied to Cape Town is unaccounted for.
All water supplied is treated and drinkable.

CHECK FOR LEAKS ON YOUR PROPERTY

1. Turn off all taps inside the house and on your property.
2. Ensure that geysers and toilets have not been used for the last hour (wait until they have filled up).
3. Open the water meter box. Check to see if the dial is moving. If it is moving, the chances are you have a leak.

Note: if the leak is on your property, you may need a qualified plumber to fix it. If the leak is outside your property, call the City of Cape Town to repair it. Report water leaks found in public places.

WHERE TO LOOK FOR LEAKS:

1. Dripping taps
2. Irrigation systems and taps
3. Unnatural green spots in garde
4. Washing machines
5. Swimming pool
6. Toilet
7. Showerhead and indoor taps
8. Hot water geysers.

How to check for toilet leaks

- Ensure that the toilet has not been flushed within the last 30 minutes. Press a piece of toilet paper against the inside of the toilet bowl where the water enters the pan. If the paper gets wet, there is a leak!

Or

- Ensure that the toilet has not been flushed within the last 30 minutes. Add a few drops of food dye into the toilet cistern. If dye is found in the toilet bowl before you have flushed, you have a leak!

- Check the overflow pipe from the toilet cistern and geyser for leaks.

For information on how to repair a leak, see: **www.randwater.co.za.**

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Call Centre 086 0103054

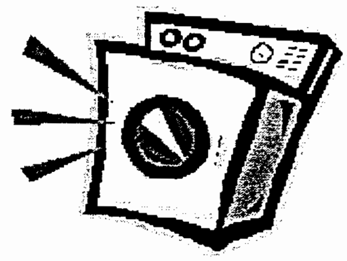
APPENDIX 5:

Group 1 leaflet: September 2004

WATER USE IN THE KITCHEN AND LAUNDRY: TIPS AND INFORMATION - SEPTEMBER 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

WATER-GUZZLERS: WASHING MACHINES AND DISHWASHERS!



- 13% of all water consumed within the home is used for laundry and washing dishes while only 3% of all water supplied to households needs to be treated as this is used for drinking.
- A washing machine uses up to 120 litres per cycle, and a dishwasher uses about 80 litres per cycle (an average sized bath holds 160 litres of water!).
- A high efficiency washing machine will use an average of 30% less water and 40 to 50% less energy (www.randwater.co.za)
- Washing dishes in a sink uses about 30 litres of water.
- Filling the kettle to the top uses about 1.5 litres of water.

HOW TO SAVE WATER EASILY IN THE KITCHEN AND WHEN DOING LAUNDRY

1. When buying a washing machine or dishwasher, find the most water-efficient (one that uses the least amount of water and offers different wash-cycles).

2. When running your dishwasher or washing machine, make sure the load is full to make the best use of water, energy and detergent. A full load uses less water than 2 half loads.

3. Decrease your use of the 'pre-wash' and/or rinsing buttons on both the washing machine and dishwasher. Set both machines for shorter washing cycles.

4. Soak and scrape dirty dishes before washing. Avoid washing dishes under running water - rather fill the sink.

5. Install tap aerators onto taps as they add air to water and therefore less water comes from the tap per second.

6. Avoid turning taps on full. A lower pressure will result in less water flowing out of the tap per second.

7. Only boil the kettle with the amount of water you require.

8. Wash vegetables and fruit in a bowl. Re-use this water on indoor plants.

9. Avoid thawing frozen food under running water. Take the food out of the deep freeze a few hours before cooking.

10. Store drinking water in a bottle in the refrigerator. This will reduce wastage from a running tap as well as ensure that water is cold to drink.

11. Visit the Thames Water website for more tips and information on water saving in your home (www.thameswateruk.co.uk)

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Call Centre 086 0103054

APPENDIX 6:

Group 1 leaflet: October 2004

SIMPLE TIPS TO REDUCE YOUR WATER USE IN THE BATHROOM - OCTOBER 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

HOW MUCH WATER IS USED IN THE BATHROOM?

- The average household (4 people) in Cape Town consumes 27 000 litres of water each month of which 5 400 litres is used for bathing/showering, while 8 000 litres of drinkable water is flushed down the toilet EACH MONTH PER HOUSEHOLD.
- An average bath holds up to 160 litres of water. This is equal to filling 80 2-litre bottles with water!
- An average shower uses about 25 litres of water per minute. A 5 minute shower everyday will use about 46 000 litres of water every year PER PERSON (www.joburg.co.za).
- An average toilet uses between 10-12 litres of water per flush. Almost 30% of all water used in the home is flushed down the toilet. Remember that this water is treated and therefore drinkable.
- For <u>each minute</u> you brush your teeth with the tap running, 9-11 litres of water is unnecessarily wasted

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EASY WAYS TO REDUCE YOUR WATER USE:

1. Take <u>short</u> showers rather than bathing - time your showers. Measure the height of your bath - do not fill it more than 100mm. Mark this depth with masking tape for future reference.

2. Fit low flow showerheads (preferably with flip switches that stop water flow when soaping). This reduces the amount of water flowing from your showerhead.

3. Turn off the tap when brushing your teeth and do not turn the taps on full. Install a flip-switch that blocks water flow when flipped upwards.

4. Use a glass of water to rinse when brushing.

5. Always use a plug in the basin when washing your hands or shaving.

6. Install a 'Hippo' in the toilet cistern. It is inexpensive and EASY to insert into the cistern. It displaces up to 3 litres of water PER FLUSH.

<u>OR</u>

7. Install a dual OR multi-flush mechanism. This allows you to control how much water is flushed down the toilet and therefore uses less water.

8. If possible install a smaller toilet cistern (with a maximum flush capacity of 7 litres).

9. Do not put anything other than toilet paper into the toilet. Other materials block pipes and use water unnecessarily when flushed down the toilet.

REMEMBER: The more hot water you save, the more electricity is saved. Therefore you save money on BOTH water and electricity costs AND the power station also uses less water and produces less carbon dioxide.

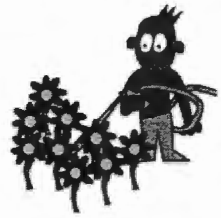
For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For <u>any other water related queries</u>, contact the Water Services Emergency Centre 086 0103054

APPENDIX 7:

Group 1 leaflet: November 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

TIPS TO REDUCE WATER USE IN THE GARDEN - NOVEMBER 2004

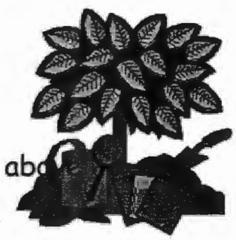


SHOCKING FACTS ABOUT GARDEN WATERING!

- 30% to 50% of all water consumed by households is used for watering gardens.
- Lawns use up to four times more water than other plants (www.capetown.gov.za).
- Up to 30 litres of water flows from a standard hosepipe each minute (Johannesburg Water, 2004).
- A water sprinkler uses almost as much water in one hour (600 litres) as a family of four would in a day (Johannesburg Water, 2004)!

TIPS ON PLANT WATERING...USING LESS WATER

- XERISCAPE = landscaping for water conservation. Grow indigenous plants (local to your area) as they are hardier and water-wise - ask your nursery for advice.
- For more effective watering, group plants with similar water requirements together into 'hydro-zones' - see www.randwater.co.za (Water-wise living: Garden).
- Dig a shallow trench at the base of plants and fill with mulch*.
- When planting new plants that require lots of water, place a 2-litre plastic bottle (cut at the base) or place a water pipe from the base of the plant roots to just ab the soil surface - this will take water directly to the roots and reduce wastage.



- Reduce your lawn size (replace with gravel or indigenous plants). Keep grass 2cm long to retain moisture (Magalies Water, 2004). Reuse grass clippings for insulation and reduce evaporation.
- Investigate installing a drip irrigation system that delivers water slowly and directly to plant roots (see Watering Systems on www.sydneywater.com.au).
- Fit a timer to garden taps. Reset timers according to the seasons.
- Investigate the possibility of reusing grey water (water from washing or cleaning) on non-edible plants. Professional grey water recycling systems are available (www.capetown.gov.za).
- Mulching your garden provides an insulation layer (keeping the soil cool), reduces evaporation and inhibits weed growth (www.randwater.co.za).

* loosen the top layer of soil and cover with a thick layer of organic (natural and decomposable) matter preferably a mixture of compost and dried grass cuttings or leaves)

For general information on water-wise gardening, visit www.sydneywater.com.au or www.randwater.co.za
For Tips to Cope with Drought, visit www.thameswateruk.co.uk
For information on waterwise plants, visit www.webfoundry.co.za/wdm2/html/

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Water Services Emergency Centre 086 0103054

APPENDIX 8:

Group 2 leaflet: July 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

USEFUL INFORMATION TO REDUCE YOUR WATER CONSUMPTION: JULY 2004

More than 70% of the earth's surface is covered in water.

So why is there insufficient water in certain regions?

- 97% of surface water is salt water
- 2% is frozen in ice sheets and glaciers
- only 1% remaining as freshwater can be used

Water supplies are decreasing worldwide because of:

- Increasing migration of people to cities especially in Africa and Asia
- Higher standards of living and demand for more water
- An increasing population

Households in Cape Town use 60% of all available water supplied to the city.

Water is used to generate electricity at power stations. Nearly 3 litres of water is required to generate 100 watts of electricity.

Saving water through sensible actions

1Kl = 1000 litres = 1m³ of water

Action ☹	Action ☺	How much water could be saved EVERY YEAR
Washing a car with the hose running for 10 minutes (each week of the year)	Washing a car with a bucket and pouring excess water on a lawn or elsewhere on the garden.	15 600 litres
Washing the driveway or paths with a hosepipe for 20 minutes every week of the year.	Sweeping the driveway, path or road gutters	31 200 litres
Leaving the heater on un-nessarily for an hour (20 times during the year).	Switching the heater off when leaving the room or when it is not needed.	Almost 80 litres of water at the power station.
Leaving the geyser on for the 4 days that you are away (on 3 occasions duringthe year).	Switching off the geyser when you go on your 4-day holiday.	About 2 160 litres at the power station.

Over the next 4 months you will receive a monthly information sheet about water saving.

For queries related to this information supplied, contact CCT: 400 3566 (Mon., Wed., & Thurs. between 2 & 4pm). For any other water related queries, contact the Call Centre: 086 0103054.

APPENDIX 9:

Group 2 leaflet: August 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

FACTS AND INFORMATION ON HOUSEHOLD WATER LEAKS AND SAVING WATER: AUGUST 2004

UNNECESSARY WATER WASTAGES:

- Up to 52 bathfulls of water a year can be wasted if a tap is left dripping (www.johannesburgwater.co.za).
- About 18% of all water supplied to the City of Cape Town is unaccounted for. All water supplied is treated and is drinkable water.
- A 1 mm diameter hole in a water pipe loses 41 600 litres of water every month!

$1m^3$=1Kl=1000 litres of water

WATER SAVINGS IN CHANGING FROM ACTON 1 TO ACTION 2

Action ☹	Action ☺	How much water will be saved EVERY YEAR?
Not knowing about and/or not repairing your leaking toilet.	Repairing your leaking toilet	Up to 73 000 litres per toilet!
Not knowing about and/or not repairing your dripping tap.	Repairing your dripping tap (calculated at one drip per second)	Up to 11 000 litres per tap!
Not knowing about and/or not repairing a pipe that has a 0.5 mm hole.	Repairing your water leak	Up to 172 800 litres!

Unless we use water sparingly, Cape Town could run out of fresh water by 2020. There are options of increasing water supplies, such as desalinating sea water, but these are VERY costly.

For more information on repairing a leaking tap, visit the Rand Water's website: www.randwater.co.za - click on Water-wise living in the Home

☺ If we all save a little (water), TOGETHER we can save a LOT! www.capetown.gov.za

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Call Centre 086 0103054

APPENDIX 10:

Group 2 leaflet: September 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

INFORMATION AND TIPS TO REDUCE WATER USE IN THE KITCHEN AND LAUNDRY- SEPTEMBER 2004

Households in Cape Town use 60% of all water used within the city. Of this total amount, about 13% of all water consumed within the home is used for laundry and washing dishes, while only about 3% of all water supplied to households needs to be treated as this is used for drinking and cooking.

- Construction of the Skuifraam dam in Franschoek has just begun. The new dam will increase water supply to Cape Town and surrounding municipalities by 18% when completed in 2007. By 2014 water demand will have outstripped this additional supply (Cape Times, 29 July 2004)

WHAT ARE TAP AERATORS?

Tap aerators add air to water thereby reducing water use by up to 50%.
They are easily attached to <u>most</u> standard taps (www.onthehouse.com/tips).

$1m^3$=1Kl=1000 litres of water

WATER SAVINGS IN CHANGING FROM ACTON 1 TO ACTION 2

Action ☹	Action ☺	How much water will you save PER ACTIVITY EACH YEAR?
Using the dishwasher when it is not full (three times a week).	Washing the dishes in a sink of water.	7800 litres
Using the dishwasher and/ or washing machine for the full cycle (three times a week).	Using the dishwasher and/or washing machine for shorter cycles (cutting the rinse cycle).	15 600 litres
Using the full cycle of the dishwasher including drying.	Switching off the machine after the final rinse and opening the door slightly.	Saves up to 50% of the original electricity amount for dishwasher use!
Using your taps without tap aerators.	Fitting tap aerators onto your taps.	7 300 litres PER PERSON
Washing fruit and/or vegetables under a running tap (daily).	Washing fruit and/or vegetables in a bowl and pouring the water onto your plants.	8 395 litres

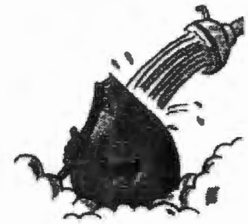
For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For <u>any other water related queries</u>, contact the Water Services Emergency Centre 086 0103054

APPENDIX 11:

Group 2 leaflet: October 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

REDUCING WATER IN THE BATHROOM: OCTOBER 2004



ⓘ WATER USAGE WITHIN THE BATHROOM:

- About 20% of all water used within the home is used for bathing or hygiene purposes.
- An average household in Cape Town (4 people) uses 27 000 litres of water EACH MONTH.
- Almost 30% of all water used in a household is flushed down the toilet alone.
- The average household in Cape Town flushes 97 200 litres of drinkable water down the toilet EACH YEAR.
- Almost HALF of ALL treated, drinkable water used within the home is used for toilet flushing and bathing.

WATER REDUCTIONS IN CHANGING FROM ACTION 1 TO ACTION 2

Action 1 ☹	Action 2 ☺	How much water will you save PER PERSON EACH YEAR?
Having a deep bath (daily).	Taking a 5 minute shower.	36 500 litres (calculated from Johannesburg Water).
Showering for 7 minutes (every day) without a low flow showerhead.	Showering for 7 minutes with a low flow showerhead.	40 880 litres each year PER PERSON.
Leaving the tap running when brushing one's teeth (twice daily).	Turning off the tap when brushing one's teeth.	Up to 14 600 litres (www.capetown.gov.za)
Leaving the tap running when shaving (3 times a week).	Putting water in the basin and turning off the tap when shaving.	Up to 7 020 litres (www.capetown.gov.za)
Flushing the toilet 4 times a day with a normal flushing system.	Installing a dual flushing system.	9 855 litres PER PERSON (calculated from www.randwater.co.za)
Flushing the toilet 4 times a day with no water saving devices.	Putting a 'Hippo' into the cistern	4 380 litres PER PERSON

For more information and tips to reduce water, visit www.thameswateruk.co.uk

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For <u>any other water related queries</u>, contact the Water Services Emergency Centre 086 0103054

APPENDIX 12:

Group 2 leaflet: November 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

GARDENS - THE WATER GUZZLERS!
INFORMATION AND TIPS TO SAVE WATER: NOVEMBER 2004

☹ WATER STATISTICS FOR GARDENS ☹

- Between 30% and 50% of all water consumed by households is used for watering the garden.
- Lawns use up to four times more water than other plants (www.capetown.gov.za).
- Up to 30 litres of water flows from a standard hosepipe each minute (Johannesburg Water, 2004)*
- A water sprinkler uses almost as much water in one hour (600 litres) as a family of four would in a day! (Johannesburg Water, 2004).

WATER SAVINGS IN CHANGING FROM ACTION 1 TO ACTION 2

Action 1 ☹	Action 2 ☺	How much water you will save PER ACTIVITY EACH YEAR?
Leaving the garden sprinker on for an extra 30 minutes as you forgot to switch it off (every second week)	Fitting a timer to your sprinkler and setting it to water for 20 minutes	23 400 litres (calculated from Johannesburg Water, 2004).
Watering the garden for 10 minutes using drinkable water from the tap (once a week)	Watering the garden for 10 minutes using grey water	15 600 litres (calculated from Johannesburg Water*).
Using normal sprinklers to water your garden	Replacing the sprinkler with a more efficient drip irrigation system	Up to 40% less water is used.
Watering the garden during the hottest part of the day in summer	Watering the garden before 10am or after 6pm	Up to 50% is lost therefore plants need half as much water with Action 2.
Having no natural insulation layer on your lawn or vegetation	Putting a layer of mulch on your garden plants	Up to 70% less water is needed (www.randwater.co.za).
Planting lawn and vegetation that requires a lot of water	Growing indigenous (local to your area) vegetation such as fynbos plants	Between 40% and 80% less water is used.

For more information on water-wise gardening, visit:
www.webfoundry.co.za or www.sydneywater.com.au.
For tips to cope with drought, visit:
www.thameswateruk.co.uk

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Water Services Emergency Centre 086 0103054

APPENDIX 13:

Group 3 leaflet: July 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

USEFUL TIPS AND INFORMATION TO SAVE HOUSEHOLD WATER CONSUMPTION: JULY 2004

The rising cost of water in Cape Town:

Domestic water charges are calculated on a sliding scale over a 1 month period. These tariffs (and the basic6 Kl of free water) depend on the number of days in each reading cycle month.

Steps	Tariff
Step 1 (0-6 Kl)	FREE
Step 2 (6-12 Kl)	R2.15
Step 3 (12-20 Kl)	R4.30
Step 4 (20-40 Kl)	R5.48
Step 5 (40-60 Kl)	R6.67
Step 6 (60 Kl or more)	R8.60

These water rates apply to the period 1 July 2004 to June 2005 and exclude VAT.

1Kl = 1000 litres = $1m^3$ of water

The more water you use in a month, the more expensive it is.

How are water charges calculated?

STEP 2: 12 - 6 = 6 Kl @ R2.15 per Kl
STEP 3: 20 - 12 = 8 Kl @ R4.30 per Kl
STEP 4: 40 - 20 = 20 Kl @ R5.48 per Kl
STEP 5: 60 - 40 - 20 Kl @ R6.67 per Kl
STEP 6: more than 60 Kl @ R8.60 per Kl

Why should we pay for water?

- Rainwater stored in dams and rivers is unsafe to drink and needs to be treated and purified. Once treated it is pumped through a network of pipes to individual households.
- The delivery and treatment of water is costly and needs to be paid by consumers to provide new water infrastructure or maintenance of existing water networks.

Saving money through sensible actions

Action ☹	Action ☺	How much you could save EVERY YEAR
Washing a car with the hose running for 10 minutes (each week of the year)	Washing a car with a bucket and pouring excess water on a lawn or elsewhere on the garden.	At Step 5 you could save R200 per year
Washing the driveway or paths with a hosepipe for 20 minutes every week of the year.	Sweeping the driveway, path or road gutters	At Step 5 you could save R400 per year

Over the next 4 months you will receive a monthly information sheet about water saving.

For queries related to this information supplied, contact CCT: 400 3566 (Mon., Wed., & Thurs. between 2 & 4pm). For any other water related queries, contact the Call Centre: 086 0103054.

APPENDIX 14:

Group 3 leaflet: August 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

USEFUL TIPS AND INFORMATION ON HOUSEHOLD WATER LEAKS AND SAVING MONEY: AUGUST 2004

UNNECESSARY WATER WASTAGES

- Up to 52 bathfulls of water a year can be wasted if a tap is left dripping (www.johannesburgwater.co.za).
- About 18% of all water supplied to the City of Cape Town is unaccounted for. All water supplied is treated and is drinkable water.
- A 1 mm diameter hole in a water pipe loses 41 600 litres of water every month!

$1m^3$=1Kl=1000 litres of water

MONETARY SAVINGS IN CHANGING FROM ACTON 1 TO ACTION 2

Action ☹	Action ☺	How much you save in water costs EVERY YEAR?
Not knowing about and/or not repairing your leaking toilet.	Repairing your leaking toilet	R555 incl VAT PER toilet
Not knowing about and/or not repairing your dripping tap.	Repairing your dripping tap (calculated at one drip per second)	R83.64 incl. VAT PER tap
Not knowing about and/or not repairing a pipe that has a 0.5mm hole.	Repairing your water leak	R1313 incl. VAT PER leak

Prices are calculated using consumption in STEP 5 from the City of Cape Town water tariff structure (R6.67 / Kl) excl. VAT

ⓘ Replacing your worn tap washer (that costs less than R1.00 to buy) prevents taps from dripping and could save you hundreds of Rands every year.

For more information on repairing a leaking tap, visit the Rand Water's website: www.randwater.co.za - click on Water-wise living in the Home

☺ If we all save a little (water), TOGETHER we can save a LOT! www.capetown.gov.za

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Call Centre 086 0103054

APPENDIX 15:

Group 3 leaflet: September 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

SAVING MONEY BY REDUCING WATER USE IN THE KITCHEN AND LAUNDRY- SEPTEMBER 2004

ⓘ Households in Cape Town use 60% of all water used within the city. Of this total amount, about 13% of all water consumed within the home is used for laundry and washing dishes, while only about 3% of all water supplied to households needs to be treated as this is used for drinking and cooking.

- Construction of the Skuifraam dam in Franschoek has just begun. The new dam will increase water supply to Cape Town and surrounding municipalities by 18% when completed in 2007. At a cost of R1.2 billion, this amount will be paid entirely by water consumers (Cape Times, 29 July 2004)
- As announced in early August, The City of Cape Town will be introducing water restrictions on 1 October 2004. The level of restrictions will be dependent upon the dam levels at the end of September.

WATER SAVINGS IN CHANGING FROM ACTON 1 TO ACTION 2

Action ☹	Action ☺	How much water will you save PER ACTIVITY EACH YEAR?
Using the dishwasher when it is not full (three times a week)	Washing the dishes in a sink of water	R59.28 incl VAT
Using the dishwasher and/ or washing machine for the full cycle (three times a week)	Using the dishwasher and/or washing machine for shorter cycles (cutting the rinse cycle)	R118.61 incl VAT
Using the full cycle of the dishwasher including drying	Switching off the machine after the final rinse and opening the door slightly	Saves up to 50% of the original electricity - saving you money
Continue using your normal washing machine	When necessary, purchasing a high efficiency washing machine	Uses about 30% less water and 40-50% less energy. This reduces your monthly accounts
Using your taps without tap aerators	Fitting a tap aerator onto your taps	R55.50 incl VAT PER PERSON
Washing fruit and/or vegetables under a running tap (daily)	Washing fruit and/or vegetables in a bowl and pouring the water onto your plants	R63.86 incl VAT

Prices are calculated using consumption in STEP 5 from the City of Cape Town water tariff structure (R6.67 / Kl) excl. VAT

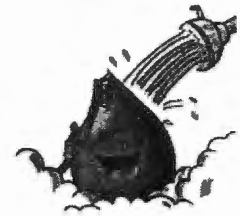
For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Water Services Emergency Centre 086 0103054

APPENDIX 16:

Group 3 leaflet: October 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

REDUCING YOUR MONTHLY WATER COSTS IN THE BATHROOM: OCTOBER 2004



WATER USAGE WITHIN THE BATHROOM:

- About 20% of all water used within the home is used for bathing or hygiene purposes.
- The average household in Cape Town (4 people) uses 27 000 litres of water EACH MONTH.
- Almost 30% of all water used in a household is flushed down the toilet alone.
- The average household in Cape Town flushes 97 200 litres of drinkable water down the toilet EACH YEAR.
- Almost HALF of ALL treated, drinkable water used within the home is used for toilet flushing and bathing.

MONETARY REDUCTIONS IN CHANGING FROM ACTION 1 TO ACTION 2

Action 1 ☹	Action 2 ☺	How much money will you save PER PERSON EACH YEAR?
Having a deep bath (daily).	Taking a 5 minute shower.	R277.53 incl.VAT PER PERSON
Showering for 7 minutes (every day) without a low flow showerhead.	Showering for 7 minutes with a low flow showerhead.	R310.83 incl.VAT PER PERSON
Leaving the tap running when brushing one's teeth (twice daily).	Turning off the tap when brushing one's teeth.	R111.00 incl.VAT PER PERSON
Leaving the tap running when shaving (3 times a week).	Putting water in the basin and turning off the tap when shaving.	R53.37 incl.VAT PER PERSON
Keeping your old toilet cistern (on average 11 litres/flush used 4 times a day).	Installing a toilet cistern with a smaller volume capacity (maximum of 7 litres per flush).	R444.05 incl.VAT PER PERSON
Keeping your current water inefficient flushing system.	Installing a multi-flush toilet.	R45.60 incl.VAT PER PERSON

NOTE: Prices are calculated using consumption in STEP 5 from the City of Cape Town water tariff structure (R6.67 per kilolitre excl. VAT)

For more information and tips to reduce water, visit www.thameswateruk.co.uk

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Water Services Emergency Centre 086 0103054

APPENDIX 17:

Group 3 leaflet: November 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

GARDENS - THE WATER GUZZLERS!
INFORMATION AND TIPS TO SAVE WATER: NOVEMBER 2004

☹ WATER STATISTICS FOR GARDENS ☹

- Between 30% and 50% of all water consumed by households is used for watering the garden.
- Lawns use up to four times more water than other plants (www.capetown.gov.za).
- Up to 30 litres of water flows from a standard hosepipe each minute (Johannesburg Water, 2004)*.
- A water sprinkler uses almost as much water in one hour (600 litres) as a family of four would in a day! (Johannesburg Water, 2004).

MONEY SAVED IN CHANGING FROM ACTION 1 TO ACTION 2

Action 1 ☹	Action 2 ☺	How much money you will save PER ACTIVITY EACH YEAR?
Leaving the garden sprinker on for an extra 30 minutes as you forgot to switch it off (every second week)	Fitting a timer to your sprinkler and setting it to water for 20 minutes	R355.85
Watering the garden for 10 minutes using drinkable water from the tap (once a week)	Watering the garden for 10 minutes using grey water	R237.23
Using normal sprinklers to water your garden	Replacing the sprinkler with a more efficient drip irrigation system	Your water bill could be significantly reduced as up to 40% less water is used for watering the garden
Watering the garden during the hottest part of the day in summer	Watering the garden before 10am or after 6pm	Your water bill could be significantly reduced as water for the garden is halved
Having no natural insulation layer on your lawn or vegetation	Putting a layer of mulch on your garden plants	Your water bill could be reduced as up to 70% less water is needed (www.randwater.co.za)
Planting lawn and vegetation that requires a lot of water	Growing indigenous (local to your area) vegetation such as fynbos plants	Your water bill could be significantly reduced as 40% - 80% less water is used

Prices are calculated using consumption in STEP 5 of the CCT's water tariff structure (R13.34 per kilolitre excluding VAT).

For more information on water-wise gardening, visit:

www.webfoundry.co.za/wdm2/html/ or www.sydneywater.com.au

For tips to cope with drought, visit:

www.thameswateruk.co.uk

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Water Services Emergency Centre 086 0103054

APPENDIX 18:

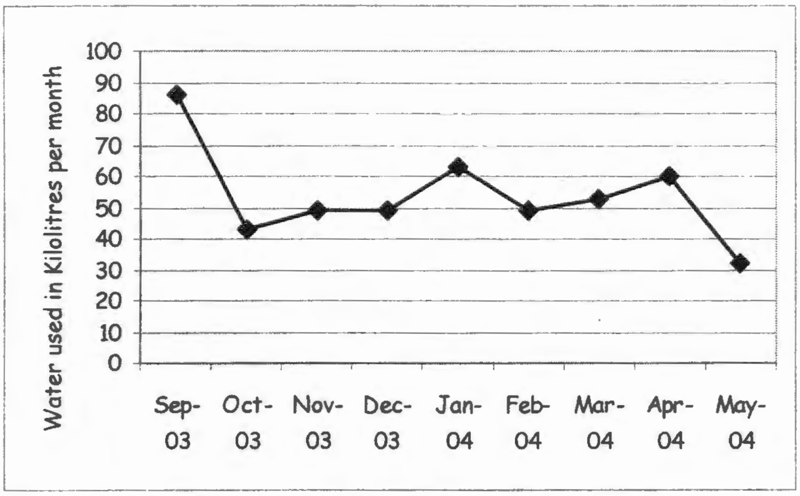
Group 4 leaflet: July 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

TIPS AND INFORMATION TO SAVE HOUSEHOLD WATER CONSUMPTION: JULY 2004

112268855

Your water consumption from September 2003 to May 2004:



Average water consumption for households in Cape Town is 27 Kl per month

Your monthly average for the period is: 55 Kl

1 Kl = 1000 litres = 1 m^3 of water

The rising cost of water in Cape Town:

Domestic water charges are calculated on a sliding scale over a 1 month period.

Steps	Tariff
Step 1 (0-6 Kl)	FREE
Step 2 (6 - 12 Kl)	R2.15
Step 3 (12 - 20 Kl)	R4.30
Step 4 (20 - 40 Kl)	R5.48
Step 5 (40 - 60 Kl)	R6.67
Step 6 (60 Kl or more)	R8.60

These rates apply for the period 1 July 2004 to June 2005 and exclude VAT

How are charges calculated?
Step 2: 12 - 6 = 6Kl@R2.15/Kl
Step 3: 20 - 12 = 8Kl@R4.30/Kl
Step 4: 40 - 20 = 20Kl@R5.48/Kl
Step 5: 60 - 40 = 20Kl@R6.67/Kl
Step 6: more than 60Kl@R8.60/Kl

Saving money through sensible actions:

Action ☹	Action ☺	How much you could save EVERY YEAR
Washing a car with the hose running for 10 minutes (each week of the year)	Washing a car with a bucket and pouring excess water on a lawn or elsewhere on the garden	This could save 15 600 litres of water (R118 incl. VAT)
Washing the driveway or paths with a hosepipe for 20 minutes every week of the year	Sweeping the driveway, path or road gutters	This could save 31 200 litres of water (R261.80 incl. VAT)

During the next 4 months you will receive feedback on your household water consumption.	For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm) For any other water related queries, contact Call Centre 086 0103054

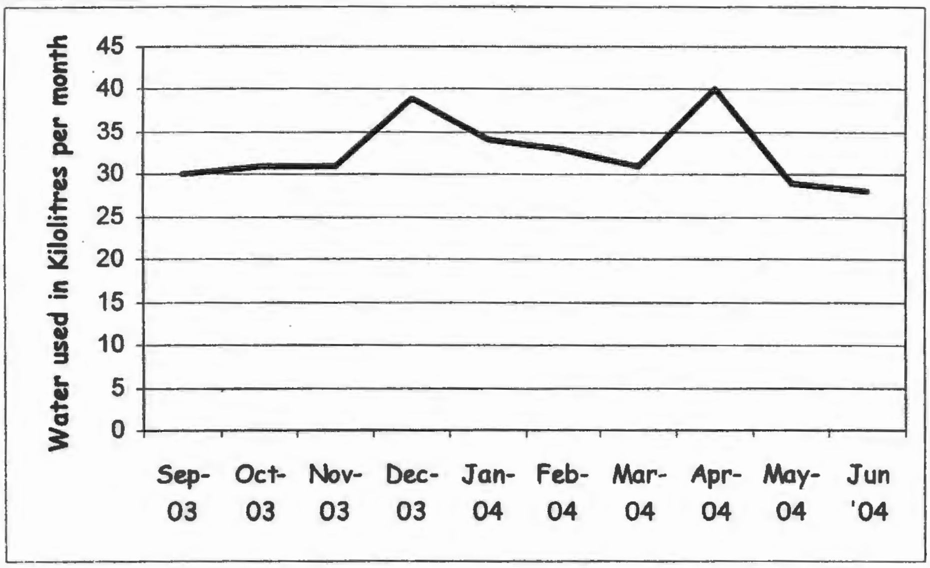
APPENDIX 19:

Group 4 leaflet: August 2004

CITY OF CAPE TOWN
ISIZEKO SASEKAPA
STAD KAAPSTAD

USEFUL TIPS AND INFORMATION ON HOUSEHOLD WATER LEAKS: AUGUST 2004

121450763



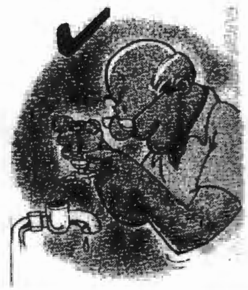
Average water consumption for a household (4 people) in Cape Town is 27 Kl per month.

Your monthly average for the period is 33 Kl.

WHERE TO LOOK FOR LEAKS:

1. Dripping taps
2. Irrigation systems and taps
3. Unnatural greens spots in the garden
4. Washing machines
5. Swimming pool
6. Toilet
7. Showerhead and indoor taps
8. Hot water geysers.

1Kl = 1000 litres = 1m³ of water



☹	☺	How much you could save EVERY YEAR
Not knowing about and/ or the leaking toilet.	Repair a leaking toilet.	This could save 73 000 litres of water and R555 (incl. VAT) PER TOILET!
Not knowing about and/ or the dripping tap.	Repair a dripping tap (1 drop per second).	This could save up to 11 000 litres of water and R83.64 (incl. VAT) PER TAP!
Not knowing about and/ or repairing a 0.5mm hole.	Repair your water leak.	This could save up to 172 800 litres of water and R1313 (incl. VAT) PER LEAK!

Prices are calculated using consumption in STEP 5 from the City of Cape Town's water tariff structure (R6.67 / Kl) excl. VAT.

For queries related to this information supplied, contact CCT 400 3566 (Mon, Wed or Thurs – 2 to 4pm
For any other water related queries, contact the Call Centre 086 0103054.

APPENDIX 20:

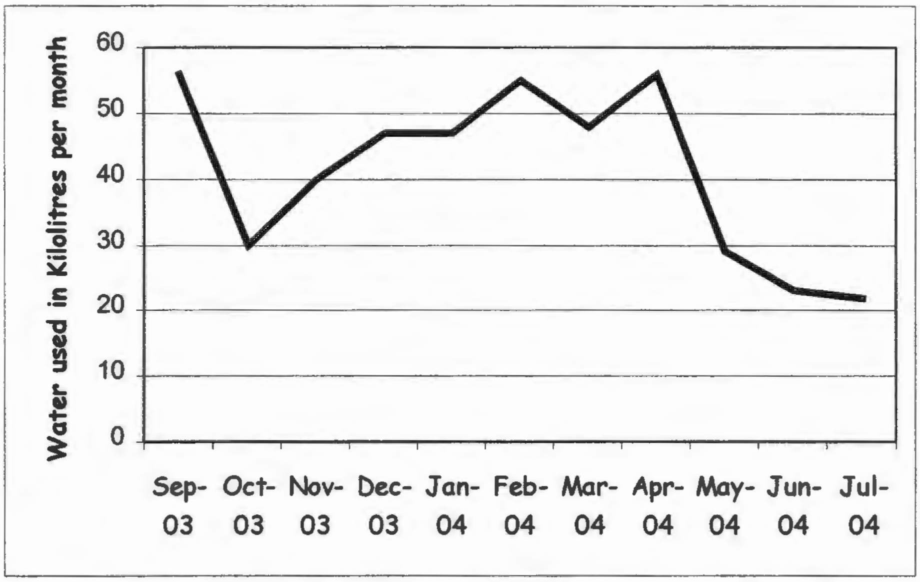
Group 4 leaflet: September 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

TIPS AND INFORMATION TO REDUCE WATER USE IN THE KITCHEN AND LAUNDRY: SEPTEMBER 2004

113511951

<u>Your</u> water consumption from September 2003 to July 2004:



Average water consumption for a household (4 people) in Cape Town is 27 Kl per month

<u>Your</u> monthly average for the period is: 41 Kl

1 Kl = 1000 litres = 1 m^3 of water

- Construction of the Skuifraam dam in Franschoek has just begun. The new dam will increase water supply to Cape Town and surrounding municipalities by 18% when completed in 2007. At a cost of R1.2 billion, this amount will be paid entirely by water consumers (Cape Times, 29 July 2004).

SAVING MONEY AND WATER THROUGH SENSIBLE ACTIONS:

Action ☹	Action ☺	How much you could save per activity EVERY YEAR
Using the dishwasher when it is not full (three times a week).	**Washing the dishes in a sink of water.**	**This could save 7 800 litres of water and R59.28 incl VAT**
Using your taps without tap aerators.	**Fitting a tap aerator onto your taps.**	**This could save 7 300 litres of water and R55.50 incl VAT PER PERSON**
Washing fruit and/or vegetables under a running tap (daily).	**Washing fruit and/or vegetables in a bowl and pouring the water onto your plants.**	**This could save 8 395 litres of water and R63.86 incl VAT**

Prices are calculated using consumption in Step 5 from the City of Cape Town water tariff structure (R6.67 per kilolitre excl VAT).

- When running your dishwasher or washing machine, make sure the load is full to make the best use of water, energy and detergent. A full load uses less water than two half loads.

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For <u>any other water related queries</u>, contact the Water Services Emergency Centre 086 0103054.

APPENDIX 21:

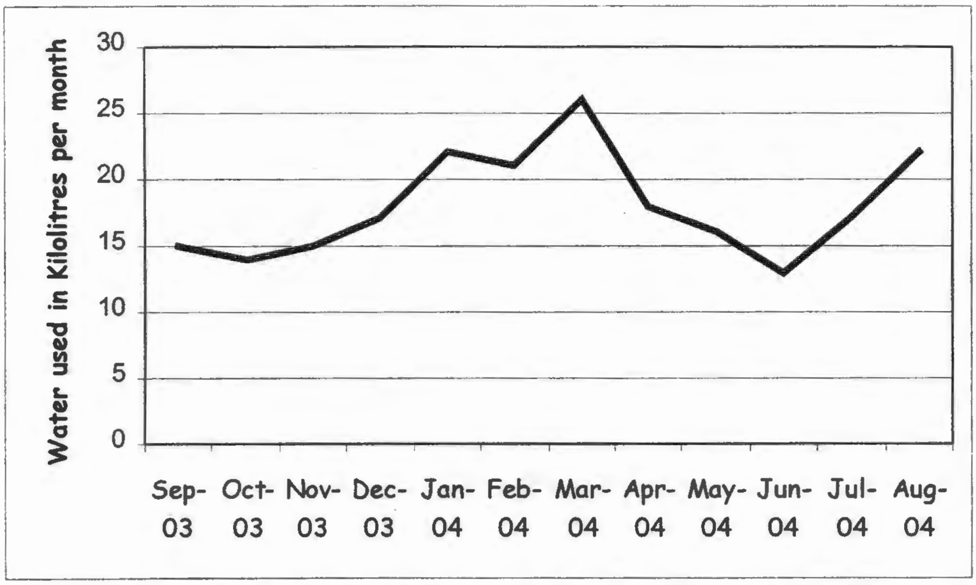
Group 4 leaflet: October 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

SIMPLE TIPS AND INFORMATION TO REDUCE WATER USE IN THE BATHROOM: OCTOBER 2004

111024314

Your water consumption from September 2003 to August 2004



Average water consumption for a household (4 people) in Cape Town is 27 Kl per month

Your monthly average for the period is: 18 Kl

1 Kl = 1000 litres = 1 m^3 of water

Did You Know... Almost HALF of ALL treated, drinkable water used within the home in Cape Town is used for toilet flushing and bathing/ hygiene purposes!

SAVING MONEY AND WATER THROUGH SENSIBLE ACTIONS:

Action ☹	Action ☺	How much you could save PER PERSON EACH YEAR
Having a deep bath (daily).	Taking a 5 minute shower.	36 500 litres of water and R277.53 incl VAT.
Showering for 7 minutes (daily) without a low-flow showerhead.	Taking a 7 minute shower with a low-flow showerhead.	40 880 litres of water and R310.83 incl VAT.
Leaving the tap running when brushing one's teeth (twice daily).	Turning off the tap when brushing one's teeth.	Up to 14 600 litres of water and R111.00 incl VAT
Flushing the toilet using a normal flush-handle (4 times per day).	Installing a dual-flushing system.	On average 9 855 litres of water and R74.93 incl VAT

Prices are calculated using consumption in Step 5 from the City of Cape Town water tariff structure (R6.67 per kilolitre excl VAT).

☺
- ~ Take a short (5 minute) shower rather than having a bath.
- ~ Fit low-flow showerheads onto showers **and** install water-saving devices into the toilet.
- ~ For more information to reduce water, visit www.randwater.co.za OR www.thameswateruk.co.uk.

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Water Services Emergency Centre on 086 0103054.

APPENDIX 22:

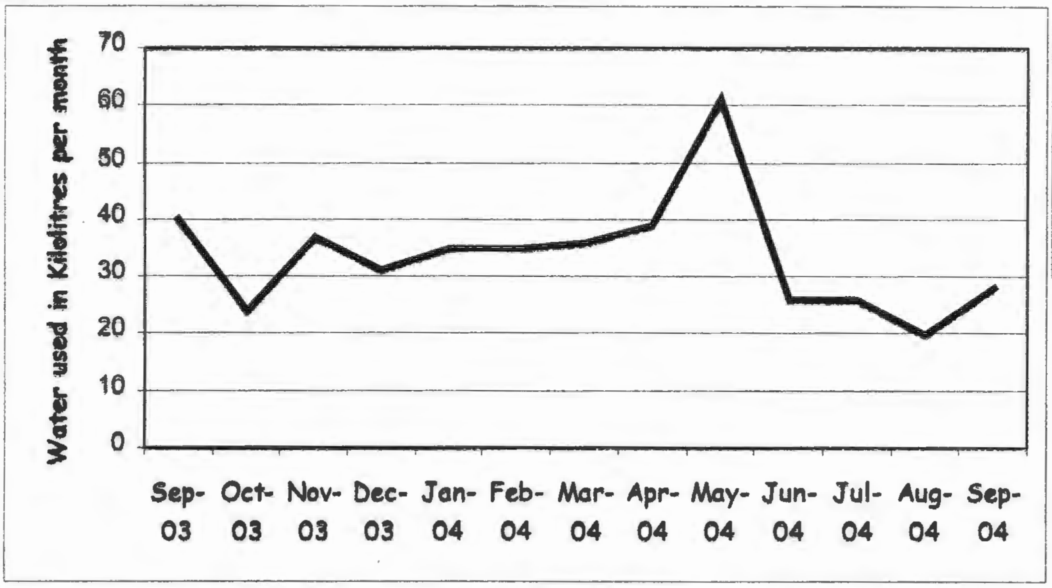
Group 4 leaflet: November 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

INFORMATION AND TIPS TO REDUCE WATER USAGE IN THE GARDEN AND SAVE MONEY: NOVEMBER 2004

113631036

Your water consumption from September 2003 to September 2004



Average water consumption for a household (4 people) in Cape Town is 27 Kl per month.

Your monthly average for the period is: 34 Kl

1 Kl = 1000 litres = 1 m³ of water

WATER FACTS:

- **Between 30% and 50% of all water consumed by households is used for watering the garden.**
- **A water sprinkler uses almost as much water in one hour (600 litres) as a family of four would in a day! (Johannesburg Water, 2004).**

MONEY & WATER SAVED BY CHANGING FROM ACTION 1 TO ACTION 2:

Action 1	Action 2	How much you could save PER ACTIVITY EACH YEAR
Leaving the garden sprinkler on for an extra 30 minutes as you forgot to switch it off (every second week).	Fitting a timer to your sprinkler and setting it to water for 20 minutes.	23 400 litres of water (calculated from Johannesburg Water, 2004) and R355.85 incl. VAT.
Watering the garden for 10 minutes using drinkable water from the tap (once a week).	Watering the garden for 10 minutes using grey water.	15 600 litres of water (calculated from Johannesburg Water, 2004) and R237.23 incl. VAT.
Watering the garden during the hottest part of the day in Summer.	Watering the garden before 10am or after 6pm.	Up to 50% is lost therefore plants need half as much water with Action 2.
Planting lawn and vegetation that requires a lot of water.	Growing indigenous (local to your area) vegetation such as fynbos plants.	Between 40% and 80% less water is used.

Prices are calculated using consumption in Step 5 from the City of Cape Town water tariff structure (R13.34 per kilolitre excl VAT).

~ **For more information on water-wise gardening visit:** www.randwater.co.za OR www.sydneywater.com.au OR www.webfoundry.co.za/wdm2/html.

~ **For tips to cope with drought, visit:** www.thameswateruk.co.uk.

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Water Services Emergency Centre on 086 0103054.

APPENDIX 23:

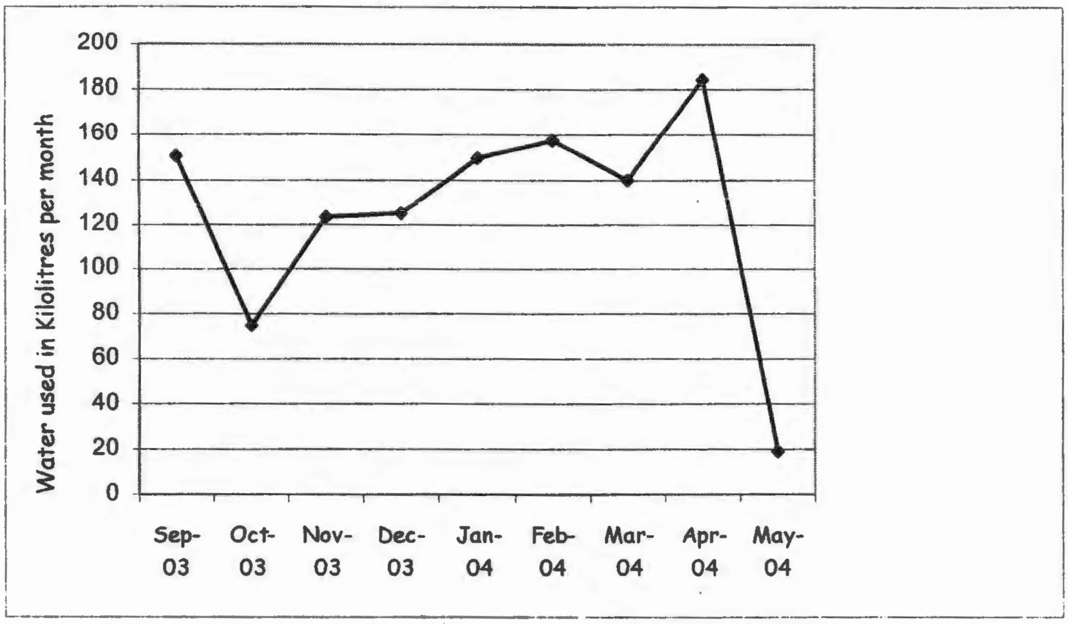
Group 5 leaflet: July 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

Your household water consumption: July 2004

121573847

Your water consumption from September 2003 to May 2004:

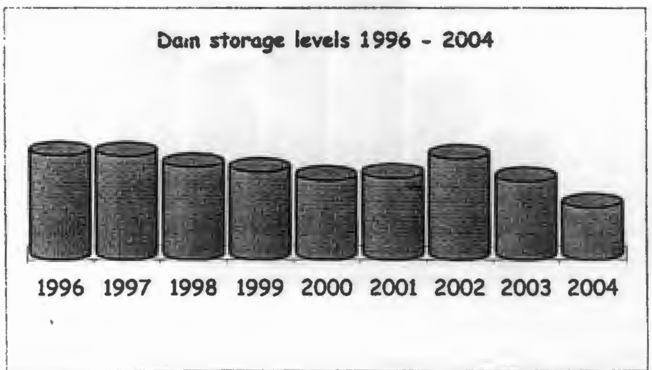


Your monthly average for the period is: 125 Kl of water

1 Kl = 1000 litres = 1 m^3

Average water consumption for households in Cape Town is 27 Kl per month

Monitor your monthly water consumption. Find ways to reduce consumption.



The volume of water stored in dams supplying Cape Town's water has declined steadily since 1996. Every year the demand for more water increases by 4%. Winter rainfall has also been below the long-term average since 1990.

During the next 4 months you will receive feedback on your household water consumption.	For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm) For any other water related queries, contact Call Centre 086 0103054

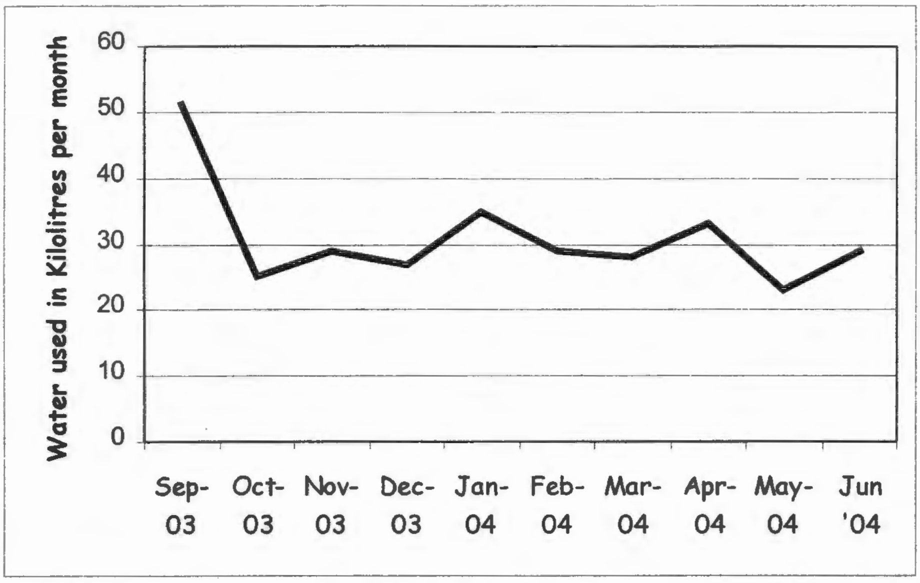
APPENDIX 24:

Group 5 leaflet: August 2004

CITY OF CAPE TOWN
ISIZEKO SASEKAPA
STAD KAAPSTAD

YOUR HOUSEHOLD WATER CONSUMPTION: AUGUST 2004

112900713

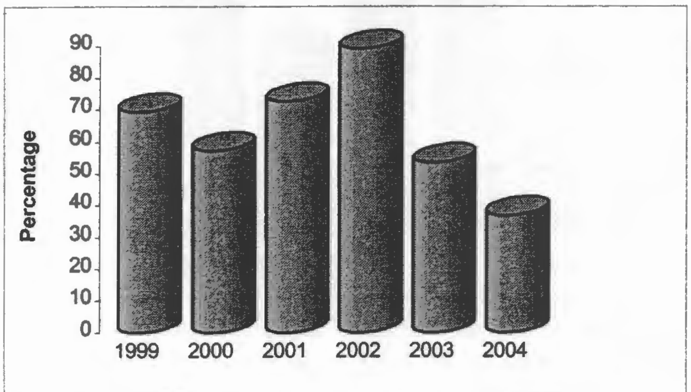


Average water consumption for households (4 people) in Cape Town is 27 Kl per month.

Your monthly average for the period is 31 Kl. [1 Kl = 1000 litres = $1m^3$]

ⓘ Check for leaks in your home and garden. For more information on how to repair a leak, see: www.randwater.co.za.

PERCENTAGE OF WATER STORED IN DAMS SUPPLYING CAPE TOWN:



Available water for Cape Town for the month of July compared to previous years!

Cape Town's water demand is still threatening to outstrip the capacity of water stored in dams.

Countrywide, the average rainfall is less than 500 mm. The global average is 860 mm! 21% of South Africa, (mainly in the arid west) receives less than 200 mm rainfall per year.

For queries related to this information supplied, contact CCT 400 3566 (Mon, Wed or Thurs – 2 to 4pm
For any other water related queries, contact the Call Centre 086 0103054

APPENDIX 25:

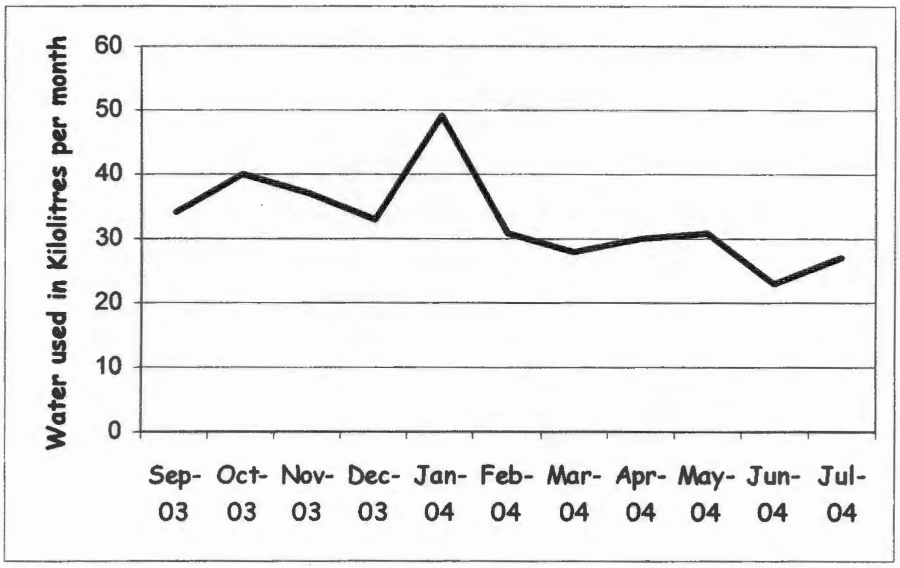
Group 5 leaflet: September 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

YOUR HOUSEHOLD WATER CONSUMPTION: SEPTEMBER 2004

111277095

Your water consumption from September 2003 to July 2004:

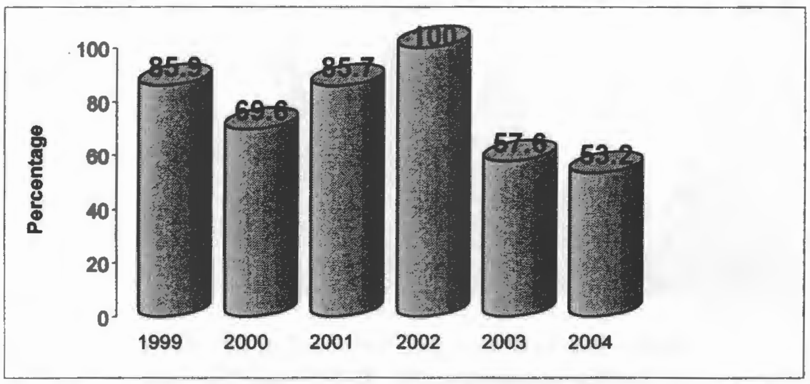


Average water consumption for a household (4 people) in Cape Town is 27 Kl per month

Your monthly average for the period is: 33 Kl

1 Kl = 1000 litres = 1 m^3 of water

PERCENTAGE OF WATER STORED IN DAMS SUPPLYING CAPE TOWN:



Available water for Cape Town for the month of August compared to previous years (CCT, 16 August 2004).

HOW MUCH RAINFALL HAS CAPE TOWN RECEIVED?

Cape Town usually has its heaviest rainfall in June and July. Cape Town received 91mm in June (the monthly average is 93mm), while only 65mm fell this July (the long term average is 82mm). During May, Cape Town received a mere 10mm (compared to the average of 69mm), (Cape Times, 11 August 2004).

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Water Services Emergency Centre 086 0103054.

APPENDIX 26:

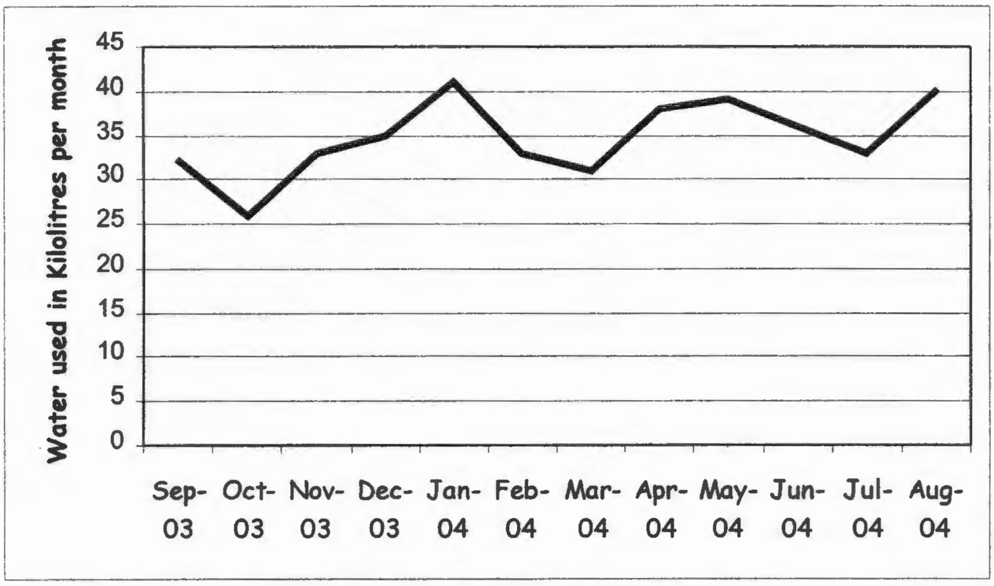
Group 5 leaflet: October 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

YOUR HOUSEHOLD'S WATER CONSUMPTION: OCTOBER 2004

111350000

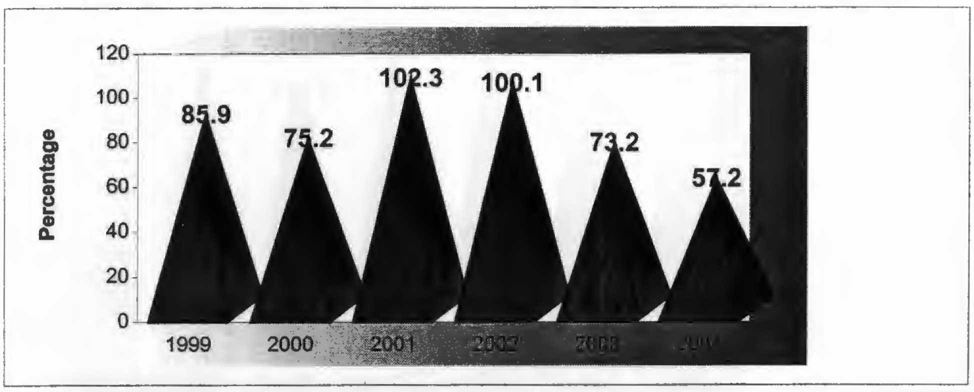
Your water consumption from September 2003 to August 2004:



Average water consumption for a household (4 people) in Cape Town is 27 Kl per month.

Your monthly average for the period is: 35 Kl 1 Kl = 1 000 litres = 1 m^3 of water

PERCENTAGE OF WATER STORED IN DAMS SUPPLYING CAPE TOWN:



Available water for Cape Town for the month of September compared to previous years (CCT, 6th September 2004).

Did You Know... Voelvlei dam is a major drinking-water supplier and the second largest source of water supply to Cape Town. Currently this dam is only 55% full. This time last year, the dam was 69.2% full, while in 2002 the dam was reaching it's full storage capacity at 98% (CCT, 6th September 2004).

ⓘ For tips and information on reducing water use within the home, visit www.thameswateruk.co.uk.

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Water Services Emergency Centre on 086 0103054.

APPENDIX 27:

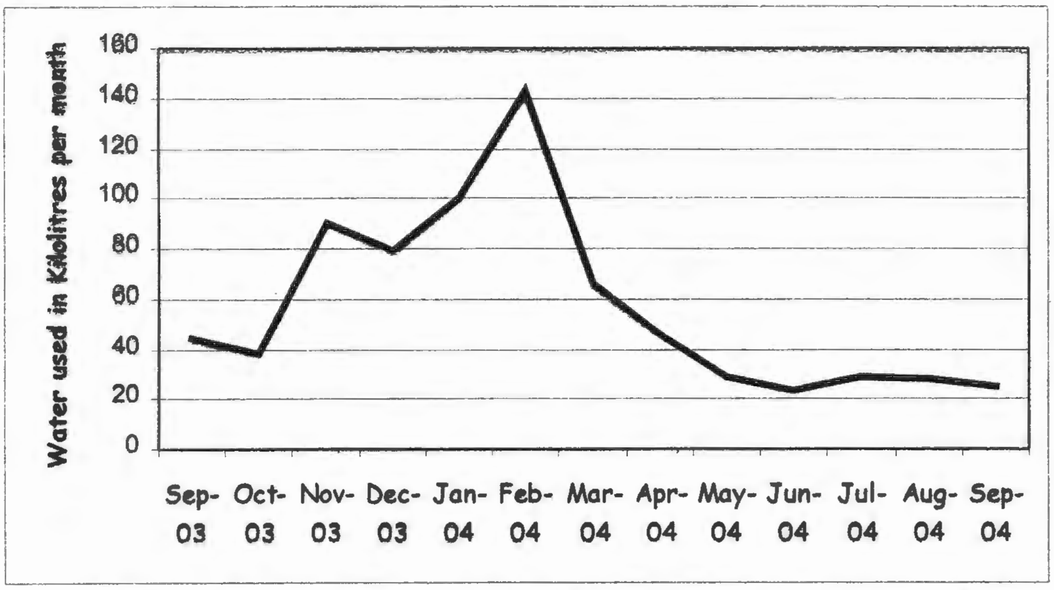
Group 5 leaflet: November 2004

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

YOUR HOUSEHOLD WATER CONSUMPTION: NOVEMBER 2004

111622161

Your water consumption from September 2003 to September 2004:

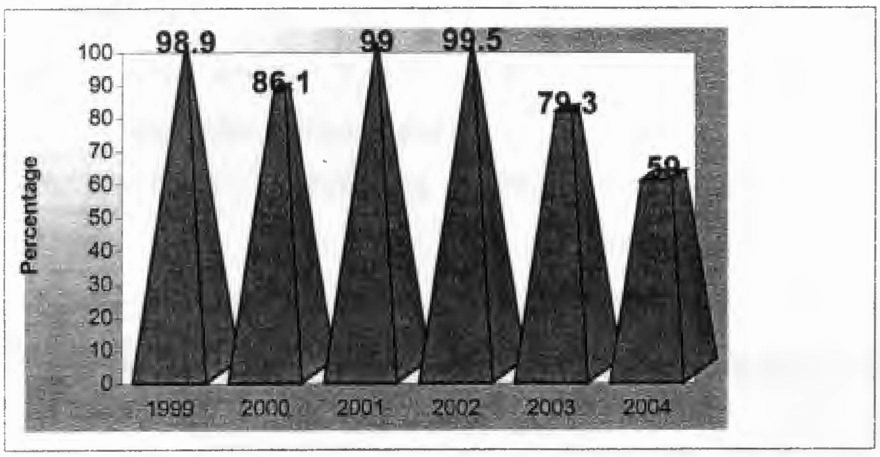


The average water consumption for a household (4 people) in Cape Town is **27 Kl per month.** Compare this figure to your monthly average.

Your monthly average for the period is: **57 Kl**

1 Kl = 1 000 litres = 1 m^3 of water

PERCENTAGE OF WATER STORED IN DAMS SUPPLYING CAPE TOWN:



Available water for Cape Town for October compared to previous years! (CCT, 18th October 2004).

DID YOU KNOW: Theewaterskloof dam is the primary source of Cape Town's water supply and can potentially store 62.5% of all water for the city. On October 18th **2004** this dam was only 56.3% full. Compared to previous years (2003: 79%; 2002: 100.6%; 2001: 100.6%) this is very low (CCT, 2004).

For tips and information on reducing water and monitoring your use within the home and garden, visit **www.webfoundry.co.za/wdm2/html** OR **www.sydneywater.com.au**.

For queries related to this information supplied contact CCT 400 3566 (Mon, Wed or Thurs - 2 to 4pm)
For any other water related queries, contact the Water Services Emergency Centre 086 0103054.

APPENDIX 28:

Telephone survey

Tel. No. ....

REDUCTIONS (GROUP 4-combination)

Survey Number: [ ]

1. From July to November this year your household's water consumption figures have decreased or become less. What is the main reason for this decrease?

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PROMPTS:

- decrease in the number of people living in your house
- had a high water account
- found a water leak because of the information in the leaflet
- put in a borehole/ wellpoint put in
- retrofitted house: tap aerators, low-flow showerheads, multi-/dual flush toilets)

  other- please specify

  ....

- visited websites on water issues because of an increased interest or concern
- became more water aware/conscious
- did not water garden because there was enough rain (during the Winter months)
- Water restrictions on October 1^{st}
- media- newspaper and television
- went on holiday for a fairly long time (3+ weeks)
- because of the leaflet ALONE
- don't know

2a. Did you read the leaflet?

Yes No

b. If NO, why not?

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3a. Was the information sent to you *useful*? (please circle)

Yes No Unsure

b. If NO, what information wasn't *useful* and WHY?

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c. If YES, what specific information in the leaflet was *useful* to you in reducing your water use and WHY?

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4. Should the leaflets be continued to be sent out monthly to households? (please circle)

Yes No Don't know

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5. What do you think is the main reason why *households* do not save water?

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Thank you very much for your time taken to answer this questionnaire.

APPENDIX 29:

Telephone survey

Tel. No. ....

REDUCTIONS (GROUP 5- feedback) Survey Number: [ ]

1. From July to November this year your household's water consumption figures have decreased or become less. What was the *main* reason for this decrease?

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PROMPTS:

- decrease in the number of people living in your house
- had a high water account
- found a water leak because of the information in the leaflet
- put in a borehole/ wellpoint put in
- retrofitted house: tap aerators, low-flow showerheads, multi-/dual flush toilets)
  other- please specify
  ....
- visited websites on water issues because of an increased interest or concern
- became more water aware/conscious
- did not water garden because there was enough rain (during the Winter months)
- Water restrictions on October 1st
- media- newspaper and television
- went on holiday for a fairly long time (3+ weeks)
- because of the leaflet ALONE
- don't know

2a. Did you read the leaflet?

Yes No

b. If NO, why not?

....

....

....

....

....

3a. Was the information provided *useful* to you? (please circle)

Yes No Unsure

b. If NO, what information wasn't *useful* and WHY?

....

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....

....

c. If YES, what specific information in the leaflet was *useful* for your household in reducing your water use and WHY?

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....

4. Should the leaflets be continued to be sent out monthly to households? (please circle)

Yes No Don't know

....

....

....

....

....

5. What do you think is the main reason why *households* do not save water?

....

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Thank you very much for your time taken to answer this questionnaire.

APPENDIX 30:

Telephone survey

Tel. No. ....

INCREASES (GROUP 3- monetary savings) Survey Number: [ ]

1. From July to November this year your household's water consumption figures have increased or become more despite receiving the monthly leaflet. What do you think is the *main* reason for this increase?

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PROMPTS:

- *increase* in the number of people living in your house
- water leak/ burst pipe (between July and October)
- used an abnormal amount of water for the swimming pool
- recently landscaped your garden (between July and October)
- watered the garden more than normal because there was not enough rain
- the leaflet caused an actual increase
- had builders on your property

Other: please specify

- don't know

2a. Did you read the leaflet?

Yes No

b. If NO, why not?

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3a. Was the information provided in the informative bill *useful* to you and your household? (please circle)

Yes No Unsure

b. If NO, what information wasn't *useful* and WHY?

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....

c. If YES, what specific information in the leaflet was *useful* for your household in reducing water use and WHY?

....

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....

4. Should the leaflets be continued to be sent out monthly to households? (please circle)

Yes No Don't know Neutral

....

....

....

....

5. What do you think is the main reason why *households* do not save water?

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Thank you very much for your time taken to answer this questionnaire.

TELEPHONE SURVEY CALL SHEET: Please record ALL calls made- please refer to the coding.

Survey No.	**SAP No.**	**Telephone No.**	**Date**	**Time**	**REASON: outcome of each call: CODE**	**CALL BACK Date:**	**Time:**		**CODING**
									1= call-back (**time and date**)
									2= refusal
									3= no answer- just ringing
									4= busy- not a good time (**time and date**)
									5= out of order
									6= incorrect number
									7= completed
									8 = non-working number/ number disconnected
									9 = answered by non-resident
									10= partial interview
									11 = answering machine message **(BRIEF MESSAGE)****
									12 = language barrier (can not speak English)
									13 = line engaged **(redial again immediately)**
									14 = refusal to continue
									15 = hang up
									16 = at work/ not at home
									17 = did not receive insert
									18 = renting the house
									19 = do not live there anymore
									20 = other (please specify)

APPENDIX 31: A sheet to record the outcome of each telephone call made

APPENDIX 32:

Telephone survey: testing the effect of the information leaflet on water consumption in the CCT

** Brief answering machine message:

Hello I am calling on behalf of the Water Services Department from the City of Cape Town. We are conducting a survey that will take 3-5 minutes and aims to improve your monthly water account. I will try again later to see whether the relevant individual is available. Thank you.

Introductory Blurb

Hello I am calling on behalf of the Water Services Department from the City of Cape Town. My name is _________. We are conducting a short survey that aims to improve your monthly water account. I need to speak with the person who pays the water account in your household AND who has seen the monthly water information leaflet that has been sent to your household. Is he/she available for less than 5 minutes?

NB: Firstly, I would like to confirm that you have received and seen the page sent to your household on water information?

...If NO: Unfortunately we can not continue the survey as it is vital that you received the leaflet for the survey to be successfully completed. Thank you very much for your time.

...If YES: Could I ask you five questions relating to the information leaflet? It should not take more than 5 minutes of your time.

Optional: As your household was chosen through a *random-selection* process and although your participation is completely *voluntary*, I would really appreciate it if you would answer the survey as it is vital that respondents be *representative* of all households in Cape Town. The questions I need to ask you will take *less than 5 minutes*. It would be much appreciated if you could answer as *honestly* as possible. Answers are strictly *confidential* and will be *anonymous* but will be used to improve the current monthly water account that is sent to all households. If you have any queries, I'd be happy to answer them. Could I ask you these *five* questions now?

APPENDIX 33:

Interviewer fall-back sheet: when the respondent is reluctant to participate

- Explanation of survey: The survey will take *less than* 5 minutes.

All of the questions relate to the informative bill that you have received. Your answers will be kept strictly confidential and your co-operation is voluntary but will be greatly appreciated.

- Use of survey: All answers will be grouped together and no responses will be identified with any specific individual or household.

- How your household was chosen: your household was randomly selected to ensure a representative sample of water consumers for generalisability of results to households serviced by the CCT.

- Check-up: If you have any questions about this particular survey, you can call the City of Cape Town on (021) 400 3566 during 2pm- 4pm on Mon., Wed. and Thurs.

- Water-related questions or queries: For any other water-related queries, please call the Water Services Emergency Centre on 086 0103054.

If STILL unwilling:

THANK YOU FOR YOUR TIME, SORRY TO HAVE BOTHERED YOU.

Questions that may be Asked by Respondents

Can one still water the garden? Yes with a hose for one hour twice a week. Depending on the number of your house.

Can one wash the car? Yes but with a bucket of water only and NOT the hose.

What can I do if I see my neighbour watering outside the specified times?

1. Check whether he/her has a borehole sign visibly displayed outside the property. The sign allows them to water anytime.
2. If not, even if they have a borehole, a sign must be visible to the public indicating that underground water is being used.
3. You can then report them to the Water Services Emergency Centre on 086 0103054 where a Water Inspector will investigate the complaint.

If I report my neighbour, will my name be made public? Not unless your neighbour goes to court.

Relating to the survey, if the relevant person is not at home, and a cell number is offered... Unfortunately the City of Cape Town does not allow us to call cell numbers.

THERE IS NO RIGHT OR WRONG ANSWER!

For any other water-related queries, please call the Water Services Emergency Centre on 086 0103054.

THANK YOU!

APPENDIX 34:

Questionnaire piloting the telephone survey

1. Any questions that made the respondent uncomfortable?
....
....

2. Any questions that had to be repeated (understandability)?
....
....
....

3. Any questions that had to be explained?
....
....
....

4. Any questions that appeared to be misinterpreted?
....
....
....

5. Any questions difficult to read?
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....
....

6. Any questions that the interviewer disliked?
....
....
....
....

7. Were any questions too long?
....
....
....

8. Any questions where the respondent wanted to say more but no space/ no options included?
....
....
....
....

9. How long did the interview take?

APPENDIX 35:

Information for the telephone survey

Three telephone surveys will be conducted amongst 150 households (almost 10% of the total sample population). The survey aims to establish how and why people respond to different types of information. The survey will also test the respondents' ability to understand and interact with the information provided in leaflet. Having similar aims, two different surveys will be conducted amongst the households.

Survey 1- Increases or no reductions in water consumption

The sample group displaying increases or no reductions in water consumption (comparative to the other four groups) was identified. Households that did reduce their water consumption were deleted from this group. Fifty households were randomly selected from the remaining number of households. The survey aimed to establish why consumers did not respond to the particular information and why (Appendix 30). The majority of households from group 3 (leaflet on potential monetary reductions) increased their water consumption compared to the same time from the previous year.

Survey 2- Greatest reduction in water consumption

Group(s) that achieved the highest reduction in water (comparative to the other groups) were identified. Households in the group(s) that increased their water consumption were deleted from the group. Fifty households were randomly selected from the remaining number of households. This survey aimed to find out why the particular information leaflet was effective in changing household water consumption (evident in the reductions in water consumption) (Appendices 28 and 29). Group 4 (combination leaflet) and group 5 (feedback leaflet) displayed the greatest reductions in water consumption. The survey also aimed to establish what specific type of information in group 4 was most effective in changing household water consumption and why.

Reasons for Selecting the Telephone Survey

Telephone surveys are quick to complete and results are available in a shorter period of time with substitutions being available instantly (Groves & Kahn, 1979; Oppenheim, 1992). The length of time required to obtain relevant information is shorter and more economical. Due to the limited time-frame (of only 1 week), the telephone survey was the most efficient method to obtain information. The telephone is the most efficient way of initiating contact and also allows for the inclusion of a broad geographical spread of households (evident in the sampling frame) (Czaja & Blair, 1996). There is no clustering of households ensuring that the sampling frame is representative of all households serviced by the CCT.

Another important advantage of telephone surveys is ensuring the safety of the interviewers- a reality that needs to be considered due to the geographical spread of households within the sample.

Response rates from telephone surveys are high. As much as 70% of respondents agree to participate (Groves & Kahn, 1979: 76; Oppenheim, 1992; de Leeuw & Collins, 1997 as cited in De Vaus, 2002: 127). A contributing factor that will increase the response rate in the study is the fact that not only was the survey topic of particular relevance to the respondent (due to the water restrictions), but they would have already received the information leaflet over 5 months thus increasing their motivation to participate. Furthermore, as the subject matter of the survey (relates to the informative bill) it is not of a sensitive or personal nature for the respondent, agreement of participation should be higher.

The disadvantages of conducting telephone surveys outweigh the benefits. These limitations include unanswered calls, potential bias resulting from households that do not have access to telephones (this is generally characteristic of lower income households), unlisted numbers, and the reality that cellphones sometimes replace landline numbers. There is a chance that some categories or groups of people could therefore be under-represented.

The potential for language barriers is minimised as pre-April 2004, the utility account was provided in English or Afrikaans with the latter constituting only 0.6 percent of this study's sampling frame.

As research has shown that between 50- 70% of telephone interviews are successfully completed; another 150 households (50 from each group) were randomly selected to ensure that a total of 150 surveys are completed for the study.

Piloting the survey

To ensure the reliability and validity of the telephone survey questions, a pilot of the survey was conducted. The pilot survey aimed to evaluate the questionnaire by identifying potential problems and shortfalls and allow for necessary adjustments to be made to the questions.

The pilot study aimed to test the effectiveness of each question according to validity (measures what it intends to) and reliability (consistency and repeatability in obtaining the same answers and results if the study was replicated).

The pilot survey was tested amongst 15 households (5 surveys per group). Additional options or categories for coding questions were also identified so that answers were objective to ensure replicability of answers, reliability, validity and comparability of results.

Open-ended questions were used in the survey while the categories acted as potential prompts for the interviewer. Open-ended questions provide for much insight and potentially vital information about the respondent and his/her awareness about the topic at hand (Oppenheim, 1992).

APPENDIX 36:

Respondent answers to: "were the information leaflets useful?"

Group 3	Group 4	Group 5
"definitely"	Does not always read the points, but the "graph is great"	"Excellent, very informative"
I have "become more alert [to my water usage] since receiving the information leaflet"	"The page invites people to join in… a civilized approach and design" carrot rather than the stick approach	"Definitely alerted her to her usage"
"very useful"	"absolutely excellent, brilliant"	"Extremely effective in increasing awareness"
	Graph- see changes easily and useful in picture form- idea of trends	"Great incentive to cut down water"
	"certainly made a difference"	"I am watching [my consumption] every month"
	The information leaflets "show that [households] are part of a system that acknowledges people in it- GREAT"	
	"Constant reminder"	

APPENDIX 37:

Respondent answers to: "should the information leaflet be continued?"

Group 3	Group 4	Group 5
Shows the CCT is serious about saving water and the page acts as a warning for people (Westgate).	"Showing households that they are part of the system and acknowledging people in it- GREAT"	"Absolutely stunning… please continue"
	Graph- Asks the question how/why did I use so much	"Please continue"
	"makes a big difference"	"definitely"
	"We must help ourselves" and be empowered	"Of course!"
	"Should've been done years ago"	"I really hope that the page will be included in the water account in the future"
	"showing the Council cares"	"looks forward to the graph" each month
	"only appreciate something when don't have it"	"good reminder"
	"Interested in the next 6 months consumption"	"the importance of saving needs to be reinforced"
	"Definitely- can only get people on your side when the are being informed as to what's going on"	