REPORT

Promoting Behavioural Change in Household Water Consumption: Literature Review

Prepared for

Smart Water

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Section 1 Introduction

Savings in residential water consumption have played a major part in campaigns encouraging consumers to take an active role in conservation of natural resources and support environmental sustainability. This has been particularly important in the management of water shortages during the recent drought conditions in Australia. The Victorian Government (2004a) developed the White Paper which sets out a series of actions designed to maintain reduced levels of water consumption, once the drought ends. The actions are based on established methods of reducing residential water consumption and include: pricing, permanent water saving measures (restrictions), education and awareness, water efficiency labelling for appliances and rebate schemes.

The use of established methods of reducing residential water consumption has the potential to achieve significant water savings. The most effective measures include

- The use of water efficient appliances, such as dual flush toilets, water efficient washing machines and low volume shower roses.
- Behavioural change such as reducing shower times and changing gardening practices (Victorian Government, 2004a).

Both the use of water efficient appliances and the adoption of water efficient behaviours depend on encouraging consumers to make voluntary choices within a broader facilitating environment of appropriate policy and pricing signals; infrastructure; information and awareness raising.

A Department of Sustainability and Environment report (2005) found that consumers' behaviour and attitudes towards water conservation depends on their perception of water and its use. The report cited Victorian Water Industry Association research which provided some valuable insights into the community's perception of water. One study found that the majority of people surveyed (65 %) either valued water highly as important to all aspects of their life or for its ecological function and indicated a concern for how much water is used and how much is being taken from the environment. However, a significant proportion of the group (25%) regard water as purely a consumer item or service which should be available at all times with no limitations to its use. Furthermore, a third group (12%) do not see water as being significant in any way to their lives.

In Victoria, the agricultural industry is the largest consumer of water, accounting for more than 50% of the State's total water consumption. Household use of water makes up just under 7% (Department of Sustainability and Environment, 2005). In metropolitan Melbourne, residential water use makes up 59% of water used. Of that amount, 80% is used indoors (Victorian government, 2004c). The bathroom is the second largest water use area in the home, with high-flow fittings, such as older showerheads, vanity taps and single-flush toilets utilising large volumes of water during operation (Department of Sustainability and Environment, 2005). The majority of water users underestimate their water consumption (Department of Environment, Sports and Territories, 1996), which suggests that greater water savings can be achieved in residential situations.

Efforts to reduce residential water consumption are generally based around information campaigns designed to encourage voluntary water conservation either by the alteration of behaviour or the adoption of alternative appliances with greater water-using efficiency (Syme *et al*., 2000). This means that there is a need to understand the nature of consumer responses to low-water use appliances and the effect on use. Achieving environmental goals through behaviour change presents a difficult communication challenge, as the goals are often based on complex or uncertain science and require long term collective action. The balance between individual and collective benefits is also complicated. Conservation efforts may not benefit the individual directly, for example, except by the generation of a general feel-good factor. The environment is a collective good. People recognise this and may be reluctant to change their behaviour unless they think that others will do the same. (Collins *et al.*, 2003).

1.1 Structure of review

This literature review summarises the principal theories relating to behavioural change relevant to water conservation in residential situations. It considers the application of the theories to actual behaviour change relating to conservation patterns, and discusses examples from studies relating to the

Section 1 Introduction

environmental sector. The policies and targets set by the government provide a base on which to examine techniques and tools available to encourage residential water users to conserve water and change their behavioural patterns. Specific studies on water saving in residential situations in Australia and elsewhere help to determine effective means of influencing conservation of water in Victoria.

Section 2 Models of Behavioural Change

2.1 Theories of environmental behaviour

Attempts to promote conservation in the environmental sector have traditionally been loosely based around two broad 'models' or patterns of human behaviour (MacKenzie-Mohr *et al*. 1995; Rolls 2001).

- The rational-economic model (also known as the rational choice model). This states that, to influence conservation based decisions, a consumer requires only information relating to financial and performance advantages of alternative choices to enable then to act accordingly.
- The attitude-behaviour model, which is based around the idea that an individual's behaviour is determined by their attitude towards a particular issue, such as conservation, and that their behaviours can be changed by influencing their attitudes.

Jackson (2005) also identifies two sets of approaches to understanding human environmental behaviours. Firstly, approaches which model behaviour as a function of processes and characteristics which are conceived as being *internal* to the individual – attitudes, values, habits and personal norms. Second, approaches which study behaviour as a function of processes and characteristics *external* to the individual, such as fiscal and regulatory incentives, institutional constraints and social practices. This is not a 'water-tight' distinction as the internal formation of attitudes or ascription of norms is influenced by the external social milieu. However, both of these dual categorisations point to the breadth of sometimes competing explanations of conservation behaviours. Often the most powerful, and more complex, models of human environmental behaviour are integrative theories which take a multidimensional view incorporating both internal and external elements.

2.1.1 Rational choice model

The rational choice model is a familiar model and one commonly used as a guide for policy-makers (Jackson 2005). The model argues that consumers make decisions by calculating the individual costs and benefits of difference courses of actions and choosing the options that maximize their expected net benefits. This is based on the assumptions that:

- Individual self-interest provides the foundations for human behaviour.
- Rational behaviour is the result of cognitive deliberation.

Within the rational choice model, if consumers are to make pro-environmental choices, they must have access to sufficient information to make informed choices about available options. Jackson also recognises that private decisions do not always take account of social costs or wider environmental interests, and therefore information on the broader social and environmental costs and benefits must be also be provided to consumers.

The rational choice model fails to recognise the limitations on an individual's ability to take deliberative actions, and the way in which individuals respond to affective, or emotional influences. Individuals use a variety of mental 'short-cuts' - habits, routines, cues, heuristics - which reduce the amount of cognitive processing needed to act and often bypass cognitive deliberation entirely. A degree of routine enters our behaviour, making it much more difficult to change and undermining a key assumption of the rational choice model (Jackson, 2005). Consumers also build affective relationships with products and respond at an emotional level to decisions about what to buy and how to behave. Some neuro-physiology studies suggest that emotion precedes cognition in decision contexts, which contradicts or limits the operation of the rational choice model.

2.1.2 Theory of reasoned action

Ajzen and Fishbein's (1980) theory of reasoned action is probably the best-known attitude-behaviour model. The theory of reasoned action builds on expectancy value theory to incorporate normative social influences on behavioural intention. It conceptualises the linkages between beliefs, attitudes, perceived social norms and behaviours (see Figure 1). Kantola *et al.* (1982) and Kantola *et al.* (1983) used the

Section 2 Models of Behavioural Change

Fishbein and Ajzen (1975) predecessor of the theory of reasoned action as a predictive model of human behaviour related to the environment. Kantola *et al.* (1982) found the Fishbein and Ajzen model useful for explaining intentions to conserve water; they found that most influence on intentions to conserve water was explained by subjective normative feelings (perceived peer pressure) and the exogenous variable age. The ability of evaluative beliefs to predict evaluative attitudes was low. Expressed attitudes did not contribute significantly to the regression equation predicting intention to consume water when subjective norms were included in the model.

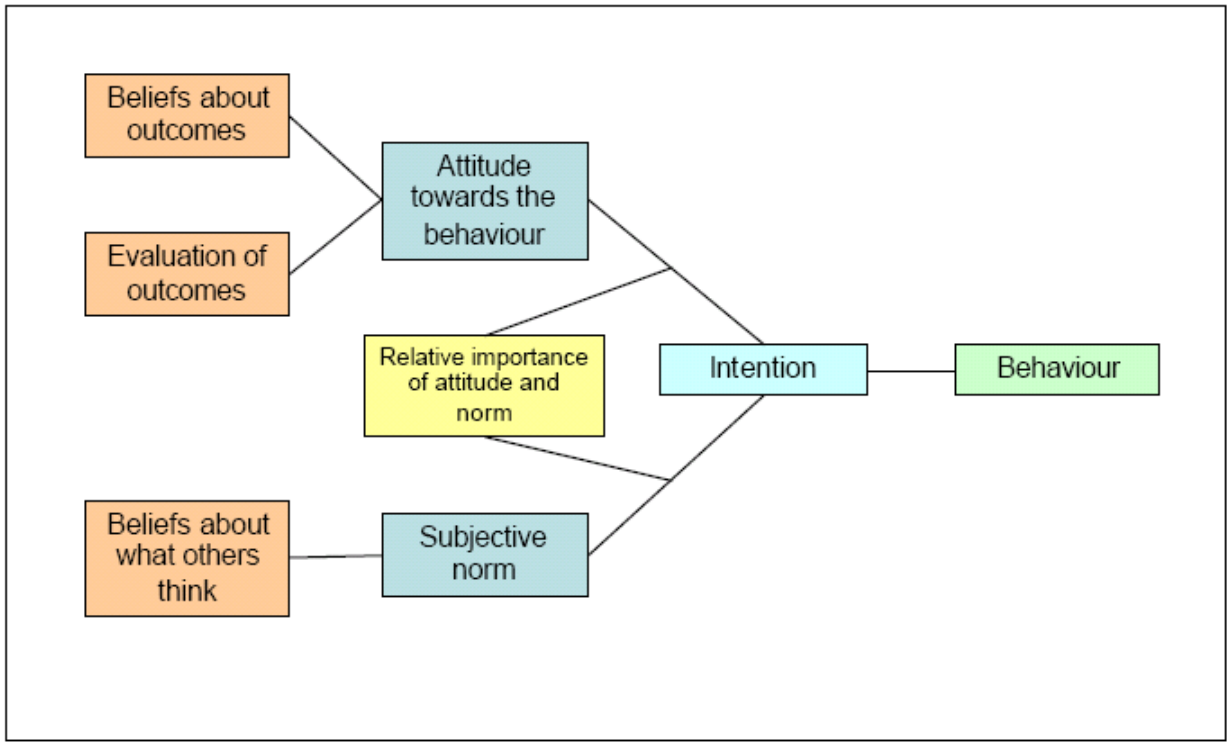

Figure 1: Theory of reasoned action (Source: Jackson (2005) p. 46).

A later study on the ability of persuasive communications with differing levels of intensity (severity) to influence water conservation did not support the dominant mediation role for subjective norms and evaluative attitude for predicting behavioural intention to conserve water (Kantola *et al.*, 1983). Syme and Nancarrow (1992) tested aspects of the ability of Ajzen and Fishbein's model to explain the extent to which intention predicted behaviour in a longitudinal study of participation in urban water planning. More recently, CSIRO's Australian Research Centre for Water in Society has improved the predictive ability of modified Ajzen and Fishbein type models specifically refined for predicting consumer responses to water supply systems and to aquifer recharge using recycled water (Porter *et al.*, 2005; Po *et* al., 2005; Leviston *et al*. 2006). These models have been particularly useful for predicting behaviour when taking account of risks and other social elements associated with delivery of potable water.

2.1.3 The theory of interpersonal behaviour

The theory of interpersonal behaviour is an integrative theory which takes a multidimensional view incorporating both internal and external elements in determining behaviour. The theory of interpersonal behaviour was first outlined by Triandis (1977), who identified the key role played both by social factors and by emotions in forming intentions. The theory of interpersonal behaviour attempts to explain how behaviour patterns result from a combination of what is intended, habitual responses, and situational constraints and conditions under which a person operates (*i.e.* facilitating conditions or external

Section 2 Models of Behavioural Change

elements). In the theory of interpersonal behaviour, intentions (as in the theory of reasoned action) are immediate antecedents of behaviour (Jackson 2005). Intentions are influenced by social, normative and affective factors as well as rational deliberations. Triandis (1977) highlighted the importance of past behaviour, or habit, in mediating present behaviour.

In Triandis' theory intentions have three distinct antecedents (see Figure 2):

- Attitudes or the perceived value of expected consequences.
- Social factors, including norms, roles and self-concept.
- Affective factors, or emotional responses.

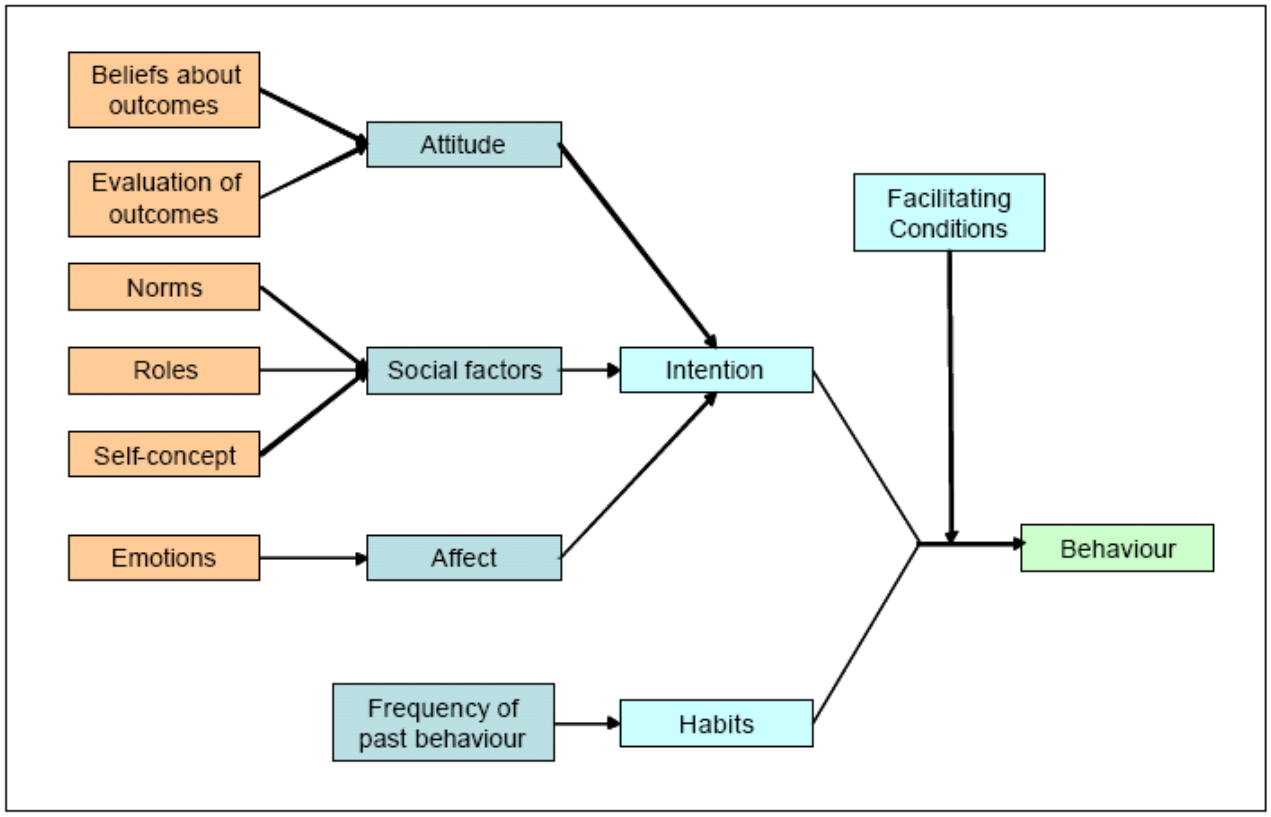

Figure 2: Triandis' theory of interpersonal behaviour (Source: Jackson (2005) p. 94).

Jackson (2005) explains that social factors include:

- Norms: social 'rules' about what should and should not be done.
- Roles: sets of behaviour that are considered appropriate for a particular person in a particular situation.
- Self concept: the self assessment of one's self and what activities one should pursue and engage in.

In framing an intention, an individual's emotional response to a decision may depend on rational-instrumental evaluations of consequences, and may include both positive and negative emotional responses of varying strengths.

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According to Jackson (2005), the theory of interpersonal behaviour captures many of the criticisms levelled at the rational choice theory. It can also be used as a framework for empirical analysis of the strengths and weaknesses of the component factors in different kinds of situations, and would be suitable for application to pro-environmental behaviour. It is often overlooked due to its greater complexity or lack of regard for the attitude-behaviour model. According to the theory, behaviours are neither fully deliberative, nor fully automatic; and neither autonomous nor social. They are influenced by moral beliefs, but the impact of these is moderated by emotional drives and cognitive limitations.

2.1.4 The transtheoretical model

The transtheoretical model of change (TTM) is a theoretical model of behaviour change that has been the basis for developing effective interventions to promote health behaviour change, particularly where strongly formed habits are involved (Prochaska & DiClemente, 1983; Prochaska, DiClemente, & Norcross, 1992; Prochaska & Velicer, 1997). It explains or predicts a person's success or failure in achieving a proposed behaviour change, such as developing different habits. TTM is an integrative model of behaviour change: i.e. it integrates a number of key concepts from other theories. Within the transtheoretical model, behavioural change is related to a person's readiness to change, which depends on interventions introduced at the appropriate stage of readiness to change. The model describes how people modify problem behaviour or acquire positive behaviour. The central organizing concept of the model is the *stages of change*. The model also includes a series of independent variables, the *processes of change*: ten cognitive and behaviour activities that facilitate change.

This is a model of intentional change that focuses on the decision making of the individual. Other approaches to health promotion have focused primarily on social influences on behaviour or on biological influences on behaviour. For smoking, an example of social influences would be peer influence or government policy changes. Within the context of the Transtheoretical Model, these are viewed as external influences, impacting through the individual. The model involves emotions, cognitions, and behaviour, and a reliance on self-regulation through self-reporting. Accurate measurement requires a series of unambiguous items that the individual can respond to accurately with little opportunity for distortion. Measurement issues are very important and one of the critical steps for the application of the model.

2.1.5 Social cognitive theory

Social cognitive theory identifies human behaviour as a dynamic interaction of personal factors, behaviour, and the environment (Bandura 1986). Social cognitive theory accords a central role to cognitive, self-regulatory, and self-reflective processes in human adaptation and change. People are viewed as self-organizing, proactive, self-reflecting and self-regulating rather than as reactive organisms shaped by external forces (Pajares, 2002). As a consequence Social cognitive theory suggests that behaviour change is affected by environmental influences, personal factors and attributes of the behaviour itself (Grizzell, 2005).

The reciprocal interaction between individual behaviour, personal factors and environmental factors in social cognitive theory makes it possible for intervention efforts to be directed at personal, environmental, or behavioral factors. A person must believe in their ability to perform the behaviour and perceive an incentive to do so. The environmental influences identify that behavioural change can occur on multiple levels upon which changes can be initiated and reinforced. The levels are: individual; organisational; and governmental. By inducing behaviour change on these levels, a person is influenced at school, work, and institutions, in communities and at home.

2.1.6 Social identity theory and social norms

Social identity theory (Tajfel and Turner 1986) was originally developed to understand the psychological basis of intergroup discrimination. In social identity theory, a person has not one, 'personal self', but rather several selves that correspond to widening circles of group membership. The concepts of social identity theory are relevant to explaining the operation and impact of social norms, by explaining social relationships between communities and groups and associated behaviour. Social identity theory focuses

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on how individual behaviour is influenced by groups (Terry *et al*. 1999). The groups we identify with serve to bolster our sense of identity and social identification. Social identity theory is concerned with when and why individuals identify with social groups and adopt shared attitudes to outsiders. This process helps explain how social norms are formed and transmitted within peer groups or groups of significant others.

A social norm is a rule or way of behaving that is socially enforced or socially sanctioned. We have seen that social norms are usually important in models of behaviour which have been considered above. Behaviour is more likely to occur if a person believes that significant others (peers, family, and society) support the behaviour, if they have no negative attitude toward the behaviour, and if they perceive the relevant actions to be within their control. People are influenced by the norms of behaviour of groups and role models they identify with, sometimes in contradiction to their individual attitudes (Collins *et al.*, 2003).

2.1.7 Other models

Grizzell outlines a number of other theories which have been applied and are commonly used in the health related behavioural change. As they are aimed at influencing the general public, the theories may also be applicable to conservation related behavioural change. These theories are centred around:

- Learned behaviour: small incremental modifications contributing to an overall behaviour change.
- Rewarded behaviour: reinforcements to describe the consequences that motivate individuals to continue or discontinue behaviours.
- The relapse prevention model, which focuses on anticipating factors which relate to relapse from efforts to change, for example negative states, social pressure or low motivation (Grizzell, 2005)

Many of the theoretical models highlight the role of the perceived outcomes of the behaviours including; perceived benefits, barriers and outcome expectations. Other theories feature the role of social influences such as observational learning, perceived norm, social support and interpersonal behaviours. However, most recognise that the key factors relating to behaviour change are attitude, social norm, and self-efficacy.

Section 3 Linking Attitude and Behavioural Change

3.1 Attitude and behaviour

The most problematic area in the promotion of behavioural change related to water conservation, and more general environmental behaviours, is whether pro-environmental attitudes result in pro-environmental behaviours. It has been noted already that there is a weak link between householders' attitudes towards resource use and the actions that they take to change their behaviour patterns. This is an area of long-standing study. Herberlein and Black (1981) found that pro-environmental behaviours seemed to follow from pro-environmental attitudes, while Sharma, Kivlin and Fliegal (1975) questioned whether public concern about environmental pollution was sufficient to lead to action to stop it. An early review by O'Riordan (1976) summarised the link between environmental attitudes and behaviour as being weak. Stern and Oskamp (1987) in a review of then current research concluded there was evidence of positive relationships between environmental attitudes and environmentally protective behaviours; however, they observed that such findings do not establish the existence of causal relationships. Much of the variation in the correspondence between attitudes and behaviours can be explained by, first, the large numbers of variables determining the observed behaviour, second, different levels of specificity in describing relevant attitudes and relevant behaviours and, third, the influence of diverse external contexts (facilitating conditions) in different situations.

The influence of conflicting external contexts and their interaction with attitudes (which may be strongly pro-environmental) is demonstrated in Stern's (2000) attitude-behaviour-context model (Figure 3). The effect of positive attitudes will be enhanced or constrained by incentives or disincentives (positive or negative external conditions).

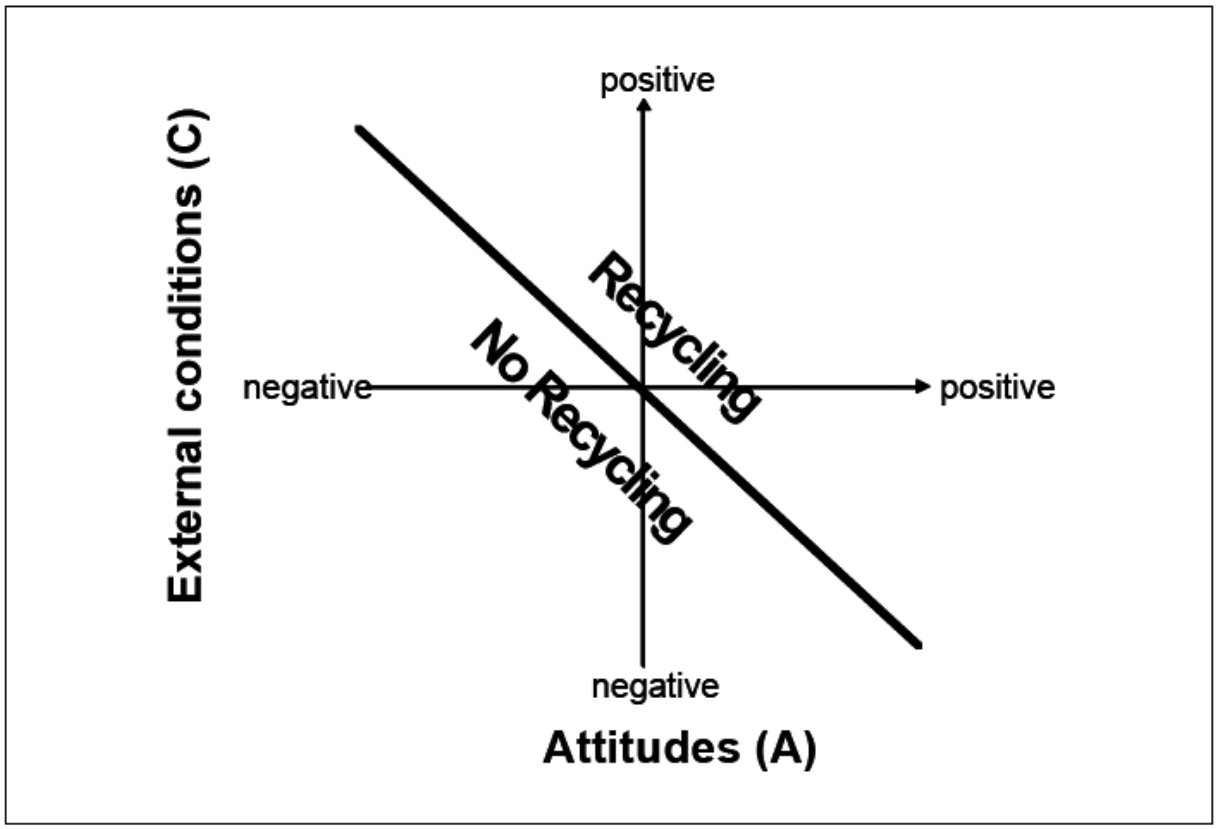

Figure 3: Stern's (2000) attitude-behaviour-context model applied to recycling (Source: Jackson (2005) p. 92).

In the case of recycling (Figure 3), when access to recycling facilities is either very hard or very easy, it scarcely matters whether or not people hold pro-recycling attitudes. In the first case, virtually no-one

recycles; and in the second case most people recycle. In a situation, however, in which it is possible but not necessarily easy to recycle, the correlation between pro-environmental attitude and recycling behaviour is strongest (Jackson 2005).

Syme *et al.* (2000) highlighted the obvious problem found by most studies into conservation behaviours was the reliance of behavioural change on attitude towards change. An evaluation by Syme *et al.* (2000) of the results of a survey on conservation efforts in Melbourne, found that although most community members were confident that their households could succeed in saving water voluntarily, the general view was that voluntary responses were not effective.

Knowledge about an environmental problem often leads to concern. However, concern does not necessarily translate into corresponding action. Studies of conservation behaviour using the theory of reasoned action have confirmed individual performance of a given behaviour is primarily determined by a person's intention to perform that behaviour. The intention is determined by: a person's attitude towards the behaviour; and the influence of a person's social environment or subjective norm. An early study by Syme *et al*. (1983) considered water use in Perth in the early 1980s. Households were required to fill out a questionnaire and keep a diary. The results were varied, with water consumption being related to household size and family income in some instances, and in other instances attitudinal factors were strongly related to water usage.

A summary (Unknown author, undated) on the relationship between changing attitudes and changing norms found that the most frequently used strategies were: providing general information; providing information about consequences; and providing opportunities to compare oneself with others. The most effective strategies for changing attitudes were: to prompt practice; set specific goals, generate self-talk, agree on a behavioural contract, and prompt review of behavioural goals. However, no single strategy was found to result in wide-spread attitude change towards conservation behaviours.

3.1.1 Cognitive dissonance

Another area of attitude-behaviour research relevant to environmental behaviour has been cognitive consistency and cognitive dissonance theory. Cognitive dissonance describes the mental 'tension' that comes from having two conflicting beliefs or thoughts at the same time, or from engaging in behaviour that conflicts with one's beliefs. Most people prefer to be in a state of cognitive consistency – where they perceive compatibility between their beliefs and their behaviours.

Heberlein and Black's (1981) study of cognitive consistency and environmental behaviour showed environmental attitudes and beliefs were organised to produce cognitive consistency. It has been noted by several sources that there is a weak link between householders' attitudes towards resource use and the actions that they take to change behaviour patterns (Department of Sustainability and Environment, 2005). In a study of high consumers of electricity in Perth, Western Australia, those placed in a cognitively dissonant situation – by being confronted by the discrepancy between their attitude to electricity conservation and their electricity consumption – produced an initial, but diminishing, effect on consumption but not on attitudes (Kantola, Syme and Campbell 1984). This study suggests that if consumers are made aware of a discrepancy between their attitudes and their behaviour then more consistency might be a consequence.

3.1.2 Lessons from other sectors

Energy

A lot of the research into consumption behaviours in the energy industry found similar results to studies into consumption behaviour in the water industry. Black, Stern, and Elworth (1985) found that personal norms had more effect on energy-saving activities when the activities were relatively inexpensive, practicable for the particular household, and were easy to perform. Syme *et al*. (1990/91) found that specific beliefs about the use of energy were important correlates of energy consumption.

To trial effective methods of behavioural change, Seligman and Darley (1977) studied the effectiveness of daily feedback reporting on energy conservation in residential housing. The feedback group used 10.5%

Section 3 Linking Attitude and Behavioural Change

less electricity than the control group, and it was found that feedback was helpful in guiding people to effective behaviour, and convincing them that their conservation techniques were effective. However, it was also noted that other aspects, such as changes in outdoor temperature, may have contributed to the energy reduction. Furthermore, it is unknown how long the effects of feedback persist after feedback has ceased, or whether displaying feedback in dollars and cents would be more effective than other modes of presentation.

Rolls (2001) summarised a number of programs relating to the promotion of energy related behaviour change. Examples of programs included incentives, information, materials and feedback to participants on their progress. Another program achieved a similar result through information provided in a home visit and public commitment to reduce energy usage. In general, if several different strategies were employed, the effectiveness of the program increased. However, gain from using additional strategies may not be great in relation to gain from using the most effective strategy. Where multiple strategies are used, identified sub-groups should be exposed to different combinations of strategies in order to define which ones have to most effect. There are few studies that assess the long-term persistence of the desired behaviour changes. Only one study found behaviour change lasted longer than 12 months, and that study only required a minor change in behaviour.

The city of Newcastle has also trialled feedback initiatives with some success (Department of Sustainability and Environment, 2005). They introduced an internet based feedback system, in conjunction with its sustainability programs, called “Climatecam” that tracks community driven impacts such as motor vehicle purchase, waste disposal and energy consumption. The community are able to access the program to view how the various sustainability programs are performing.

Waste

In the waste industry, various studies have been conducted in public attitudes towards recycling, composting and waste reduction. Collins *et al*. (2003) summarised a plastic bag campaign which illustrated that Australians responded well to recycling when there were facilities to do so. Alternatives such as calico bags were provided, some using graphic imagery such as aquatic life on the sides, and promoted in supermarkets and by councils. Websites provided information and exchange programs were set up. These initiatives were effective in the short term. The study showed that majority of the public, although aware of the effects of plastic bags on the environment, were unlikely to reuse or recycle plastic bags, or use an alternative. It was found that introducing a levy on plastic bags was the most effective method of changing attitudes in this area.

In other case studies, environmental awareness campaigns without linkages to policy were found to fail as there was a lack of infrastructure and action initiatives to support the information being offered. Collins *et al*. (2003) found that to change behaviour there is a need to connect with the heart and not the head. In commercial marketing campaigns brand promotion is generally about ideas, feelings and aspirations, and campaigns to induce behaviour change need to be directed accordingly. An example is the *Don’t mess with Texas* campaign discussed by Collins *et al*. (2003) which showed that the main litter culprits (young males) were unlikely to respond to messages about not spoiling the environment. Instead they based the message on a state of pride. Within 12 months, the number of incidents dropped by 29%.

In general, most applications of individual theories or models produce varied results, leading to the suggestion that there is no single way to influence attitudes driving behaviour change. Following the GreenHome workshops run in New South Wales in 2005, interviewees suggested that the incentive to ‘do the right thing’ stems in part from life experiences and exposure to environmental messages through the media and friends (Hobson, 2006). A combination of several, mutually reinforcing strategies seems to generate more positive behaviour change.

Section 4 Influencing Water Consumption

In a report on the Impact of Sustainable Development on Public Behaviour, DEFRA (Darnton, 2004) recommended that campaigns for sustainable behaviour change should employ a wide range of tools including: policy instruments; infrastructure provision; and information provision. In general, each tool should use a credible source to engage the community and present a specific, targeted message. It is also evident that a combination of television and media campaigns, supported by written material is an effective way of presenting and reinforcing a message. There is also a strong link between personal contact in water-saving situations and successful conservation efforts.

In the process of encouraging behaviour change, consumers are often asked to trust the outcome of a behaviour change which sometimes causes some inconvenience to them (Syme, 1986). In other words, campaigns to induce behaviour change are often forms of social marketing, and the different tools available often employ marketing techniques. The Department of Environment, Sports and Territories (1996) published a report on Initiatives to Promote Sustainable Promotion, with the suggested tools falling under the following broad categories: information and education; communication and promotion; incentives; obligation and coercion; new or modified products; and infrastructure. Three of these approaches are now considered.

4.1 Education and information

It has been shown that people learn best when actively engaged in their subject matter (Watermark Australia Project, Melbourne, 2005). In this way information and education can be used to inform consumers about the need to change behaviours relating to conserving water, and give them suggestions on how to do so. It has been recognized that a significant barrier to sustainable consumption of water exists in the general lack of understanding of natural environmental cycles and the effect that urban systems have on these cycles, and the infrastructure used to supply and remove water from households (Department of Sustainability and Environment, 2005).

Watermark (2005) argued in their submission to the Sustainable Water Strategy Central Region of Victoria that the level of shared “water literacy” amongst Victorians must be raised substantially, measured and reported regularly throughout the population. Water literacy here refers to a more profound education dynamic than that implied thus far in conventional water education or water conservation campaigns. The most commonly overlooked factor in water conservation programs is education theory: How do people actually learn? What is the best way to support people’s learning? In a world of information overload, the public response to information on the environment is that more information campaigns or leaflets are not needed (Collins *et al*., 2003). Television and other mass media are quite poor at encouraging people to adopt specific water conserving habits as people may conserve water but not necessarily in the ways depicted in the media based campaigns (Syme, 1986). A Sydney Water study in 1995 also seems to support the findings that, if media based campaigns are introduced, consistency and a long-term approach are necessary to achieve change (Syme *et al*. 2000).

Even if change is not brought about, education and information can help consumers to identify the areas of consumption that have the biggest impacts to the environment and to understand the implications of environmental damage. Department of Environment, Sports and Territories (1996) suggest the use of:

- Life cycle assessments to lessen the consumer driven impact as consumers acquire products that lessen the effect of environmental impact.
- Eco-branding or labelling to allow consumers to be informed and make choices relating to the environmental impact of the product they are purchasing.
- Benchmarking or standard setting to educate companies and households about “model behaviours”.

New creative models for consumer engagement are needed, and government will need to back these with resources and political commitment (Watermark Australia Project, Melbourne, 2005). Previous work by Syme (1986) has indicated that adults are prepared to learn about the water supply, as shown by a positive community response to a program which included quite complicated information relating to the hydrologic properties of their water supply and how their domestic use related to the available supply.

Section 4 Influencing Water Consumption

4.2 Incentives

The environment remains, however, a difficult area in which to promote change through campaigns as it is difficult to show personal effect of actions taken. Small financial incentives may not be enough on their own, but coupled with promotional activities may be more effective (Department of Environment, Sports and Territories, 1996). It is important to convey information in an instantly recognisable form with which consumers can identify. One of the key themes to emerge from a Department of Sustainability inquiry (2005) was the need for consumers to have a tangible way of understanding their impact on the environment. The Our Water Our Future campaign measures savings in terms of glasses of drinking water, the SaveWater campaign uses “average-sized” domestic swimming pools.

Incentives may be economic, in the form of threats, credibility gain or increased amenity (Department of Environment, Sports and Territories, 1996).

- Economic incentives give consumers a financial reason to choose a particular product or making a particular change. These are only effective if people have the ability to choose between alternative courses of action and if they perceive the incentive or penalty to be sufficient inducement to take environmental action.
- Threats, such as fines or environmental influence can motivate people to take environmentally beneficial actions if they fear the consequences of not taking the action.
- Credibility gain can appeal on a community level or to companies where the desire to be widely acceptable can motivate compliance to accreditation codes or standards.
- Perhaps one of the strongest influences for consumers is the possibility of actual or perceived benefits. With a strong influence on increases in comfort, luxury or convenience, people may be encouraged to change consumptive behaviours.

Grizzell (2003) found that behavioural change was more likely to occur if incentives were offered, with his study illustrating that more actions were taken on use of free products (compost bins, energy saving light bulbs) compared to personal initiatives such as turning off the tap while brushing teeth or filling the kettle only with the amount of water needed. Collins *et al*. (2003) also recognised the increased incentive of money saving opportunities linked to conservation behaviour, with consumers more willing to save energy when they saw a poster that illustrated the cost savings achieved by turning a television off, rather than leaving it on standby.

In contrast to trying to engage consumers to initiate behaviour change, absolute requirements are often effective methods of changing behaviours. The Department on Environment, Sports and Territories (1996) suggest the use of:

- Mandatory codes and standards, such as product guidelines.
- Regulations designed to control consumptive actions, for example water saving regulations.
- Preferential procurement, whereby government organisations or large companies in the private sector purchase water saving products as an incentive for industries to produce competitive products.

Changes in water pricing and billing methods have also been used. An increase in the price of water can indicate to the general public the value of water as a resource. However, price increases and pricing structures need to be introduced carefully. People want to ensure that interventions, or price increases, are fair and not open to abuse by free-riders or manipulation by people with higher incomes. Interventions are perceived to be fair when the user pays in proportion to their impact, or the amount of water they use, the interests of lower-income groups are safeguarded and no-one is let off the hook (I Will if You Will, 2006). Syme (1986) found that people responded to price increases in one of two ways. If prices are perceived as being too high, people with react as though their freedom or equity has been threatened. People who already attitudinally favour water conservation feel as though raised prices are over-justifying

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what they would do anyway. A choice becomes forced action, and behaviours can change suddenly unless prices are kept high.

The introduction of new or modified products and services can achieve water savings through their use alone. Examples are innovative product design and water recycling which can lessen the amount of water released to the environment (Department on Environment, Sports and Territories, 1996). Products available to achieve water savings relating to showering include: low-flow shower heads; flow cut-off valves; shower timers; and flow restrictors. Most of the products are relatively low cost and do not interfere with the process of showering. However, the amount of water saved is based on their use to achieve savings (Smart Water Fund, 2006). For example, low-flow shower heads and flow restrictors lessen the volume of water but do not influence the shower duration. Flow cut-off valves and shower timers can be reset, so users can simply ignore the signal to turn off the water.

In general, actions which change consumption habits are often dependent on the existence of organisations and institutions to facilitate their occurrence (Department of Environment, Sports and Territories, 1996). The tools used to achieve water savings are mostly effective where there is a support base from which consumers can learn. Watermark (2005) argues that the government needs to use regulation that enhances the effectiveness of education measures. Measures suggested include:

- Requiring water retailers to conform to a standardized billing format which is informative to the water user.
- Regular measurement and reporting of community water literacy, possibly through use of the national census.
- Requiring water issues and practices to be included in primary and middle school curricula.
- Prescribing a wider range of mandatory, water-saving technologies in building and planning regulations.

Some of these measures have already been introduced in Melbourne, but many of the tools offered by the Victorian government require community-based initiative to achieve water savings.

4.3 Community based social marketing

Community Based Social Marketing (CBSM) describes intervention programs that attempt to apply a structured approach and the insights of social psychology when influencing community behaviour (Rolls, 2001). Social marketing is a modification of conventional product marketing employing components of marketing and consumer research, advertising and promotion, including positioning, segmentation, creative strategy, message design and testing, media strategy, and effective tracking. Social marketing takes account of the fact that social 'products' and behaviours often have different characteristics to commercial products and services.

The approach begins with understanding the barriers that people perceive when trying to behave a desired way, and concentrates on psychological insights into the importance of social norms and community engagement in changing behaviours (Jackson, 2005).

Jackson (2005) outlines the four steps to a successful CBSM design. The first step involves recognising the behaviours relevant to a particular environmental goal, for example, installing a low-flow showerhead. Rather than attempting to promote the behaviour, CBSM then aims to identify the barriers which prevent the action from being taken, and selecting a specific barrier to promote based on its potential impact on the behaviour campaign, the relevance to the behavioural change and the resources available to overcome the barrier. The chosen barrier will vary depending on whether the desired behaviour change is a one off action, or involves changing a particular habit or routine, for example, purchasing a low-flow showerhead, or shortening shower duration to 4 minutes each time a person showers. Jackson (2005) recognises that habitual or routine change is much more difficult to influence compared to changing a one-off behaviour. The second step is to design a programme to overcome the selected barrier to achieve the behavioural change. The important aspect of the design stage is to target interventions very specifically towards the identified barriers, drawing on social-psychological devices such as commitments,

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prompts, or signals, to promote the desired behaviours. The third and final steps in the CBSM approach are piloting and testing the programme and evaluating its effectiveness before it is applied on a wider scale.

The CBSM approach has been found to be effective in changing routine behaviour, for example home composting (Jackson, 2005). Also, by influencing a small part of the community, wider public behaviour can be influenced through the display of social norms. People are more likely to participate in an activity if those around are participating in the activity (Mackezie-Mohr and Smith, 1999). One study showed that water conservation at University of California Santa Cruz, could be influenced by the presence of people modelling the promoted water saving action of turning off the shower while soaping. Mackenzie-Mohr and Smith reported that before the study 6% of shower users carried out the action while 93% were aware of the sign suggesting the action. Following the presence of one model 49% carried out the action. The presence of two models resulted in 67% participation. The desired behaviour change was achieved by overcoming the barrier of the prevailing social norm. It is not known, however, if the behaviour was continued in the long term, or if the behaviour would have occurred if presence of the model had not been there.

Section 5 Policy Environment

Government's role in influencing public behaviour is necessary to provide the infrastructure for changes and the supporting framework on which to base programmes. However, an influencing role is difficult as it relies on people's motivations and behaviours. Achieving goals often takes a combination of legislation, economic instruments, provision of information and marketing and influencing strategies (Collins *et al*., 2003). More specifically, governments can influence the decisions made by householders and communities through policy and regulatory frameworks; by influencing markets to support more environmentally sustainable technologies and services; and the provision and distribution of information (Department of Sustainability and Environment, 2005). Darnton (2004) pointed out that policies need to reflect the complexities of behaviours and target groups to achieve long-term normative changes.

The Australian Constitution gives responsibility for oversight or water matters to state and territory governments. However, a number of recent initiatives outlined by the federal government will have a large impact on management in the states and territories. The National Water Initiative (NWI) was established in 2004 as a comprehensive national strategy addressing a broad range of water management issues including better and more efficient management of water in urban environments, for example through the increased use of recycled water and stormwater. Under the initiative a number of broad strategies have been introduced, such as incentives to encourage water recycling, and a voluntary water efficiency labelling schemes (Department of Sustainability and Environment, 2005).

The Victorian government released the 'White Paper' *Securing Our Water Future Together* in 2004. It sets out a policy framework for sustainable urban and regional water management, based on established methods of reducing residential water consumption. The framework includes pricing reform, permanent water saving measures, education and awareness campaigns, water efficiency labelling for appliances, rebate schemes, and the development of appropriate planning and regulatory supports (Victorian government, 2004a). Under the framework, it is recognised that local government has a crucial role in promoting residential water conservation through management of stormwater, and acting as role models and community educators.

The Victorian government has committed to a reduction of water consumption by 15% by 2010. The White Paper recognises that reduction of demand for water for non-drinking purposes is the key to achieving the targets. The Victorian public has demonstrated positive responses to the introduced conservation measures with significant water savings reached after the implementation of Stage 1 and 2 water restrictions by 2002 (Victorian government, 2004a). It was projected that further savings would be reached by 2004, with the campaign focus shifting to maintaining the reduced levels of water consumption, by changing public behaviours.

By June 2004 the direct policy measures introduced by the Minister for Water (Victorian Government, 2004b) included: mandatory water efficient shower heads and tap, and rainwater or solar hot water systems on all new houses (from July 2005); permanent water saving measures; extension and expansion of the water rebate scheme; support for urban recycling schemes; community information and education programs; restructuring of pricing to encourage water savings; and the introduction of Smart Water bills to make consumers better informed of usage.

Some of the constraints of the Victorian government's policies were: limited resources in rural areas; limited funding to develop and implement programs; the lack of state and federal support for a coordinated education program (Department of Sustainability and Environment, 2005). It was also recognised that although councils are well placed to engage the local community, they do not often have the resources or technical skills to provide advice.

In general a government has the responsibility of setting regulatory framework and policy, price setting and influencing the market to encourage environmentally sustainable practices through economic influence, and to introduce social instruments, such as CBSM campaigns to reinforce regulatory and economic influences (Department of Sustainability and Environment, 2005). Given the complexity and dynamic nature of environmental issues, government policy can play an instrumental role in providing consistent messages and support over a long timescale (Collins *et al*., 2003).

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Water Services Association of Australia found that the majority of people underestimate their water consumption (Piccinin, 2004). Various efforts have been made to change behaviours related to water usage in the home, with various success. A report from the CRC for Water Quality and Treatment (undated) found for social reform, undertaken by water industry managers, to be effective it must be based on understanding of community attitudes to water shortages and conservation.

The CRC conducted a phone survey of 3,500 residents in Sydney, Adelaide, Darwin, Melbourne and Perth, with 56 of the residents selected at random for face to face interviews. The main message that emerged was, with prolonged drought conditions in Australia, consumers are beginning to view water as a scarce resource that should be conserved at all times. However, it was found that on the whole community concern about water shortages is not strong enough to galvanise greater action than is already occurring. People accept that wasting water, just like wasting any resource, is wrong, but cannot envisage a situation in which they might have to live with less water.

Information and education campaigns have often been used in conjunction with other tools to bring about behaviour change. During the late 1970s, Perth experienced a drought with a subsequent publicity campaign (launched by the Metropolitan Water Authority and the media) and the introductions of restrictions and pay-for-use pricing. Water savings were made, which may have primarily been caused by the restrictions and price changes rather that the publicity campaign (Syme *et al*., 2000). Although there have been a number of studies using a variety of methodologies estimating the effectiveness of information campaigns, Syme *et al*. (2000) noted that as yet there has been no water-specific literature pertaining to appropriate models of evaluation. There are many studies on consumer awareness about water, but very little has been published in recent years that systematically evaluates the role of information in reducing water use. Most of the studies that do exist measure the short term effectiveness of campaigns during drought situations rather than the long term effects of ongoing campaigns. A study in Halton (Canada) found that the delivery of information pamphlets on water saving, followed up with a phone call or home visit, achieved greater water savings than just the delivery of the pamphlet alone (Bach, 2004).

A study of community behaviours in Perth during drought periods found that the major influence on intentions to conserve water for the population studied was directed through subjective normative feelings, particularly for older subjects (Kantola *et al*., 1982). Friends were the most important referent group amongst those considered in this study. Evaluative attitudes seemed to exert a strong influence on intentions to conserve water for the younger population.

In the mid 1990s, a behavioural change approach, known as individualised marketing, was trialled in Perth (WaterSmart) and in Melbourne (WaterSaver) to encourage targeted households to save water. The program relied on direct contact between householders and the water authority or agency staff that provided information and regular feedback to households on their progress. In most cases households required considerable assistance to find ways to save water (Department of Environment, Sports and Territories, 1996). Due to the reliance on direct contact, the cost of the program was high, but water savings were achieved and it was recognised that the community responded well to the suggested behaviour changes.

A number of studies have found that incentives to save water have been key features of behaviour change. Kantola *et al*. (1982) found that a person's belief about the importance of saving money on his water bill is the most powerful correlate of evaluative attitudes, but no particular belief is highly related with behavioural intentions. Per Capita Solutions (2006) found that performance, or flow rate, and price were the top ranked factors influencing shower choice. As water saving devices have low flow rates, it does not appear that the presence of the devices alone is sufficient to facilitate conservation behaviour change. Barr *et al*. (2006) found that price and convenience incentives were a factor in consumers' willingness to commit to environmentally sustainable practices, and were better received than environmental surcharges.

The use of eco-efficient objects and products in the home has been found to facilitate forms of ethical environmental practice relating to water use in the home (Hobson, 2006). In a study conducted in Sydney, it appeared that when new objects were introduced to habitual practices, for example shower timers, it

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reminded the user about the actual action of saving water. Users also identified that the personal commitment to using the timer was a powerful tool when discussing environmentally sustainable practices outside the home, with colleagues, friends and neighbours.

The Lismore City Council introduced a campaign in 1993, using financial incentives to encourage water savings. The council offered cash rebates to consumers covering half the purchase price of dual flush toilets and water saving showerheads, with a maximum rebate if both products were purchased. Advertising campaigns were centred on a "water is money" concept and followed a price increase in water billing (Department of Environment, Sports and Territories, 1996). Community response to the campaign was positive. Rebates were exhausted in one month; however, sale of both products remained high after the rebate offer had expired. The most influential component was extensive local promotion (Department of Environment, Sports and Territories, 1996).

The evaluation of water conservation campaigns in Melbourne gives some indication of the influence campaigns can have. In the past, Melbourne campaigns have tended to emphasise conservative watering practices (drip irrigation, watering at certain times of the day, how often to water, fixing leaky taps and various indoor saving methods). They have been run in various forms since 1982. The 1982 to 1983 campaign had a television component added in 1984. In an evaluation of the campaigns, Syme *et* al. (2000) noted there was generally a good proportion of the public sampled who had engaged the types of activities depicted, after the media campaign. A follow up study that measured knowledge, attitudes and reported behaviour suggested that earlier changes associated with the television campaign were not as evident after three years. The lack of effect on consumption may simply indicate that during the short duration of the studies (<3 months) the householders did not have the time to learn to save water or obtain feedback on exactly what the effects of their conservation were. The suggestions and information provided during the campaign were adopted by consumers through the study, but not applied habitually to result in behaviour change for the longer term.

In Melbourne Project Smart1, which involved the development and trial of the Smart Shower Meter, demonstrated that, with real-time feedback, shower users could make water savings averaging 15% over a 6 month period (Smart Water Fund, 2006). The device provided users with flow rate and accumulates shower volume, with visual and audio prompts to assist in the awareness of water use in the shower. The meters were taken up voluntarily by households, meaning that only those who used the meter were consumers who were interested in conserving water, so results may not be representative of the larger community. The results showed that significant savings could be made with real time feedback. It was also reported that use of the meter created a competitive dynamic between shower users which appeared to reinforce consistent water efficient behaviour.

Yarra Valley Water implemented a Water Smart Pilot program in selected suburbs in April 2004. It was modelled on an individualised marketing program which was trialled successfully in Perth in 2003 (Socialdata, 2005). The main objectives of the project were to deliver a voluntary sustainable behaviour package to households with the aim of reducing water consumption across the target population without restricting personal activity, or causing adverse community or political reaction. The program utilised the individual marketing approach, with basic principles:

- Motivation and empowerment.
- Partnership and dialogue.
- Personalised and customised approaches.
- Focus on possible and small changes (Socialdata, 2005).

The Pilot program encouraged households to set their own targets and goals for water saving, and offered tips and feedback to assist them in making behaviour changes. The results were positive, with the study group achieving average water savings of 12%.

In March 2005, Watermark Australia (2005) commissioned Irving Saulwick and Associates to conduct a survey of household water literacy based upon 1000 telephone interviews across Victoria. The survey showed that in Victoria there was a discrepancy between the knowledge consumers had in relation to

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domestic water use, and the behaviours that were exhibited by consumers. It also revealed a difference between attitudes towards water usage in farming situations compared to regional or metropolitan population centres. This research highlight the need to target campaigns to suit different consumer groups over longer periods of time to ensure knowledge and awareness translate into behaviour changes.

In general, a combination of efforts is needed to promote environmentally sustainable behaviour among water users. Conservation behaviours need to be encouraged and reinforced, even if low-water using appliances are installed, if maximum benefits are to be attained. This plays a significant role for persuasive water conservation campaigns. There is, however, a lack on knowledge on the long-term effects of water conservation campaigns. A better knowledge of the long-term trends in consumer behaviour – especially in terms of lack of motivation and discontinuance of behaviours – would be invaluable to the development of future campaigns and studies.

Section 7 Conclusion

It is clear from this review that behavioural models describing voluntary behavioural change are, by their nature, complicated. This is because human behaviour is usually complicated and the consequence of the multiple factors influencing it, with many factors not easily controlled. It should also be clear that the multiple models contesting to be explicators of human behaviour reflect differential focus on different factors influencing conservation behaviour and reflect the fact that any one model is rarely a satisfactory, universal predictor of human behaviour. No single method works to facilitate behaviour change to reduce water consumption in all contexts internal and external to the individual.

As a consequence, simplified approaches and simplifying assumptions are usually taken in seeking behavioural change to reduce water consumption. We focus on relevant or key aspects of influence that can be used to influence behavioural change in household water consumption. Often, we focus on refining the elements of good communication strategies rather than attempting to respond to the more complex, deeper behavioural factors and influences that might be relevant to water use behaviour.

7.1 Useful models for the water industry

This review has emphasised the centrality of changing attitudes and changing, often habitual, behaviour in relation to household water consumption.[1] It is important to recognise that there are internal and external factors influencing household water consumption. Behaviours do not happen in isolation. They are also affected by influences such as a person's beliefs, expected benefits and other people's expectations. The social context in which water conservation behaviour occurs includes social norms and expectations about domestic water use, cultural mores about water shortage, levels of civic responsibility and social cohesion, and social attitudes and beliefs.

The most important elements influencing behaviour observed in the models presented in this review, most of which are included in Triandis' theory of interpersonal behaviour (see Figure 2), are:

- facilitating conditions (the water delivery environment)
- an individual's behavioural intention
- an individual's capacity to respond
- anticipated outcomes of change in behaviour
- attitude to water conservation
- norms for water conservation
- strength of, and social support for, existing habits
- a positive emotional reaction within individuals

These variables provide key elements upon which to focus when seeking to change behaviour in household water consumption.

1 It should be recognised that water conservation behaviour can change without attitude change as a consequence of external factors such as incentives for water saving, regulation, or water restrictions.

Section 7 Conclusion

Change in water consumption behaviour is most likely to occur when as many as possible of these elements are present:

- External factors, such as appropriate water pricing and policy consistency, encourage appropriate behaviour.
- Individuals have formed a strong positive attitude towards saving water.
- Individuals have the capacity to reduce consumption – technology (eg low flow shower heads) or water substitutes are available and are not constrained by inability to purchase or install.
- Individuals believe that the advantages or positive outcomes outweigh the disadvantages or negative outcomes of saving water.
- Individuals perceive more social (normative) pressure to conserve water than to not to conserve water.
- Individuals' emotional reaction to performing the behaviour is more positive than negative; and individuals perceive that water conservation is more consistent with their self image and social identification than inconsistent with it.

7.2 Behaviour change models and the study of the showering habits of Melbourne families

For the research project investigating interventions to encourage water conservation in showering behaviour in domestic households, aspects of two behaviour change models will be tested.

1. Influence of feedback and identified cognitive dissonance in determining shower duration.

   An individual's attitudes to water conservation, and their beliefs about their personal water use, when confronted with discrepancies in actual use, will normally be reorganised to produce cognitive consistency (i.e. a reduction in dissonance) – with a change in behaviour (or a change in attitude).

2. Influence of intra-family norms regarding shower duration.

   Social norms are important elements in most models of conservation behaviour.

In each case, significant elements of models rather than complete models of conservation behaviour will be explored.

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Section 9 Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Smart Water and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the proposal dated 23 August 2006.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

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