10 Waterworks

Developing behaviourally effective policies to manage household water use

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Introduction

Water scarcity is becoming a significant problem in many countries and is linked to a complex mix of demographic, environmental, economic, and social issues. Vörösmarty, Green, Salisbury, and Lammers (2000) identified human population growth and economic development as the primary drivers of scarcity. However, recent modelling suggests that climate change will exacerbate the problem in many vulnerable regions, with a projected 40 per cent increase in the number of people worldwide who will face 'absolute water scarcity' – less than 500 cubic metres per year (Schiemeier, 2014). In this chapter, we argue that the effective water management will require policy responses that are informed by theory and methods from the behavioural sciences. Examples are drawn primarily from Australia and other Western countries, but the general principles of behaviour change introduced in the chapter generalize to other contexts, including developing nations.

Australia is the driest inhabited continent. Rainfall patterns are highly variable, and extended droughts are common. With global climate change, Australian weather events are projected to become even more extreme (Whetton, 2015). Each year, Australians use approximately 20,000GL of water (Australian Bureau of Statistics, 2014). Of this, close to 9 per cent is used by households, considerably less than the agricultural sector (65%), but more than the mining and manufacturing industries combined, which account for about 3 per cent each (Australian Bureau of Statistics, 2014).

From 2002, state and local governments regularly have introduced mandatory water restrictions on households in drought-affected parts of the country (Australian Bureau of Statistics, 2013). There also have been numerous education and behaviour change programs aimed at reducing domestic water use (Lehane, 2014; Syme, Nancarrow, & Seligman, 2000). For example, a national water efficiency labelling scheme was introduced in 2006, providing consumers with information about the expected water consumption of a range of products such as shower heads, dishwashers, and clothes washing machines. The scheme also banned the sale of unregistered products (Chong, Kazagalis, & Giurco, 2008). Incentive campaigns have been popular with local councils, which offer

cash rebates to consumers to cover a proportion of the purchase price of water-saving products (Department of Environment, 1996). In Queensland, the Urban Water Security Research Alliance recently ran a program comparing the impact on water consumption of general education information, feedback where water was being used within a household, and normative feedback about other households' water use (Fielding et al., 2012).

These policies and programs have helped drive changes in water conservation practices, with substantial increases in the installation of water tanks, grey water systems, dual-flush toilets, and low-flow shower heads (Australian Bureau of Statistics, 2010). Many Australians also report taking steps to reduce household water use by using washing machines only when fully loaded, taking shorter showers, turning off taps when cleaning teeth and shaving, and using the half flush button on dual-flush toilets. Outside the home, many Australians report water-saving activities such as using mulch to retain moisture in gardens, only watering when necessary using a trigger hose, and car washing less often or not at all (Australian Bureau of Statistics, 2013). Despite these encouraging trends, Australia continues to have one of the highest rates of per capita water usage in the world (Lehane, 2014). Furthermore, with the easing of drought conditions and the removal of restrictions, water use is once again increasing in many parts of the country (Australian Bureau of Statistics, 2014).

This troubling lack of progress has prompted growing awareness that the successful delivery of water policy requires a more sophisticated understanding of the drivers of human behaviour, and how behaviour change is best accomplished (Halpern, Bates, Beales, & Heathfield, 2004). In a recent review of the literature, Michie and her colleagues (Michie, West, Campbell, Brown, & Gainforth, 2014) identified 83 theories relevant to behaviour change. In this section, we review five of these theories that are particularly relevant for household water conservation. We then introduce the Behaviour Change Wheel (Michie, Atkins, & West, 2014; Michie, van Stralen, & West, 2011), a tool for integrating these theories into a single, practical framework in order to: (1) identify and understand the causal factors that lead individuals to engage and fail to engage in water conservation practices in the home; (2) link these causal factors to specific behaviour change interventions and policies to reduce water consumption.

Behavioural theories

Behavioural theories describe factors that exert a causal influence on behaviour, as well as the nature of this influence. These models are useful for identifying the main motivational drivers of behaviour, and the internal and external barriers that sometimes prevent behaviour change. Many behavioural theories are based on the assumption that behaviour arises from a deliberate decision making process involving a systematic evaluation of potential costs and benefits associated with a range of behavioural options. These consequentialist models view conscious expectancies about future outcomes as the key driver of decision making.

The theory of planned behaviour

The theory of planned behaviour (TPB; Ajzen, 1991) is perhaps the most broadly applied consequentialist theory of human behaviour. According to TPB, the primary determinant of specific water conservation behaviours is an individual's conscious decision – or reasoned intention – to engage in one or more of these behaviours. In turn, TPB proposes that intentions are determined by three main psychological factors: (1) attitudes (the extent to which we feel positive or negative towards the behaviour), (2) subjective norms (the extent to which important others in our lives think that engaging in the behaviour is a good idea), and (3) perceived behavioural control (the extent to which we believe we can successfully engage in the behaviour). Thus, according to the theory, if people have positive feelings about water conservation, expect they will receive social approval for conserving water, and believe they have knowledge, skills, and resources to complete relevant behaviours, then they will be more likely to develop intentions to conserve water, and initiate action.

Importantly, TPB suggests that unless a person has adequate levels of perceived behavioural control, positive attitudes and normative pressure may not be enough to change behaviours. This helps to explain why attitudes and norms are inconsistent predictors of intentions and behaviour. It also highlights the need to identify internal (e.g., lack of knowledge about how to conserve water) and external (e.g., unavailability of water-saving technology) barriers to intentions and behaviours. A range of studies has shown one or more TPB variables to be important predictors of intentions and/or behaviours related to using less water and installing water-saving devices (Corral-Verdugo, Bechtel, & Fraijo-Sing, 2003; Kantola, Syme, & Campbell, 1982; Lam, 1999, 2006; Syme, Shao, Po, & Campbell, 2004; Trumbo & O'Keefe, 2005).

Focus theory of normative conduct

Social norms are the accepted standards of behaviour within social groups. Psychological research has shown that these norms can be a powerful force to either increase or decrease the probability of a broad range of behaviours relevant to environmental sustainability. Focus Theory of Normative Conduct (Cialdini, Reno, & Kallgren, 1990) differentiates between two kinds of social norms: (1) injunctive norms – behaviours that are perceived to be approved by other people – that is, beliefs about what ought to be done, and (2) descriptive norms – perceptions of how other people are actually behaving – that is, what is actually being done. Injunctive social norms reflect the moral rules and guidelines of the social group, and tend to motivate or constrain behaviours by promising social rewards or threatening sanctions. Descriptive social norms play an adaptive role in human behaviour, functioning as a kind of mental shortcut for guiding behaviour when individuals are unsure of how to act in social situations (Jackson, 2005).

The practical implications of Cialdini's theory, with respect to water conservation, become apparent when campaigns try to persuade an audience to behave in

a desired manner. In a study investigating hotel towel reuse, Goldstein, Cialdini, and Griskevicius (2008) found that persuasive messages containing descriptive norms were more effective in eliciting this water conservation behaviour in guests than the standard environmental protection message. In addition, they discovered that normative appeals were most effective when they described the behaviour of similar others (i.e., other hotel guests who had stayed in the same room).

Another study by Aronson and O'Leary (1982–1983), conducted in public showers, demonstrated the strong influence of peer behaviour. They employed a confederate to model water conservation by turning off taps while soaping, a behaviour requested by prominent, nearby signage. The presence of the water-conserving confederate elicited 49 per cent compliance for the desired behaviour, compared to only 6 per cent compliance in the control condition for which a sign was present requesting that shower users conserve water. Adding a second confederate increased compliance to 67 per cent. For better or worse, humans are very similar to herd animals. As the number of people engaging in a behaviour increases, the probability that others will follow also increases.

Another important finding from the social norms literature is that to maximize effectiveness, descriptive and injunctive normative messages must be aligned, thus prompting behaviour in the same direction (Cialdini et al., 2006). For example, interventions can fail if an injunctive normative message ('people should take shorter showers to conserve water') is undercut by a descriptive normative message indicating that most people are doing the opposite ('most people are enjoying longer showers').

Affect heuristic

Many behavioural models assume that behaviour is the result of conscious reflection, often involving the evaluation of costs and benefits. In practice, however, many human behaviours stem from a combination of controlled cognitive processes and automatic responses driven by emotion and/or habit. Research has shown that affect can play an important role in guiding judgments and decisions (Bhullar et al., 2014; Finucane, Alhakami, Slovic, & Johnson, 2000; Loewenstein, Weber, Hsee, & Welch, 2001; Mellers & Schwartz, 1997; Peters & Slovic, 2000; Shiv & Fedorikhin, 1999). People are not only influenced by what they think about a situation, but also by how they feel about it.

The affect heuristic is based on the premise that human decision processes are guided by two distinct information processing systems: (1) an analytic system that is intentional, effortful, and logic-based, and (2) an experiential system that is passive, effortless, rapid, and closely tied to intuition and affect. The analytic system is under the conscious control of the individuals, whereas the experiential system operates automatically with conscious input from the decision maker. According to Finucane et al. (2000), thoughts and images stored in memory are tagged with affective markers that vary in terms of valance and strength. Stimuli in the decision context activate relevant thoughts and images, which in turn spread activation to their associated affective markers. The activated

markers combine to generate an 'affect pool' – in this context, a general feeling of goodness or badness about a water conservation policy or activity. In turn, this feeling guides subsequent judgments and decisions. The model predicts that positive affective responses will lead people to perceive more benefits and fewer costs associated with water conservation, whereas negative affective responses will lead them to perceive fewer benefits and more costs.

An important implication of this model is that when affect is the primary driver of cost-benefit judgments, perceptions of costs and benefits will be inversely correlated with each other. That is, individuals who have strong negative affective associations with water conservation will perceive conservation as more costly and less beneficial. Conversely, individuals who have strong positive affective associations with water conservation will view conservation behaviours as more beneficial and less costly. This indicates that so-called 'rational cost-benefit assessments' are often predetermined by our initial emotional responses. The model also highlights potential opportunities for using emotion-based appeals to encourage household water conservation. Persuasive messages need not always appeal to reason to be effective.

Theory of interpersonal behaviour

Similar to the affect heuristic model, Triandis's theory of interpersonal behaviour (TIB) asserts that behaviour is determined by both automatic and controlled cognitive processes (Triandis, 1977). Like TPB, TIB proposes that we often consciously deliberate and develop intentions to engage or not engage in specific behaviours, and that these intentions are influenced by attitudes, norms, and other facilitating conditions – factors in the external environment that make it easier or harder to engage in water conservation practices. However, TIB also recognizes that not all behaviours are driven by conscious consequentialist decision making. It notes that some behaviours are driven primarily by habit, established patterns of past behaviours. This is particularly relevant to highly repetitive behaviours, like showering, which are generally done in essentially the same manner day after day, month after month. Research suggests that habits act as an important boundary condition. When habit is strong the attitude-intention-behaviour relation is weak, because an individual's 'habitual mind-set' makes them less attentive to new information and courses of action. Strong habits undermine people's best intentions to change by reinforcing short-term rewards rather than long-term benefits. But when habit is weak (low frequency of repetition, not well learned, unstable context, some awareness and/or control) conscious decision making becomes more prominent, and attitudes and intentions stronger predictors of behaviour (Aarts, Verplanken, & van Knippenberg, 1998; Verplanken & Aarts, 1999; Verplanken, Aarts, van Knippenberg, & Moonen, 1998). This highlights the importance of understanding the nature of the behaviour that one wants to change. Habitual behaviours like showering will require very different types of interventions than non-habitual behaviours such as purchasing a water-efficient washing machine.

The behaviour change wheel

Many behaviour interventions are based on the ISLAGIATT principle – 'it seemed like a good idea at the time' (Michie, Atkins, & West, 2014). In a similar vein, Martin and Verbeek (2006, p. 5) note that many policy frameworks to support sustainability are 'irrational, poorly designed, and inefficiently administered', particularly when compared to similar frameworks that have been implemented to support wealth generation. Strategies and policies related to public goods are often developed without first systematically assessing what behaviours to target, the main drivers and barriers for these behaviours, and the specific behaviour change techniques and policies that maximize the chances of success.

To address this general *ad hoc* approach, social scientists have developed a range of frameworks that provide practitioners with step-by-step guides for developing, delivering, and evaluating behaviour change interventions. In their recent review of the literature, Michie et al. (2011) identified nineteen such frameworks. However, they noted that most failed to make explicit connections between the underlying causes of behaviour, behaviour change intervention tools, and public policy, often leaving practitioners unclear about which intervention and policy tools are most appropriate for specific contexts and populations.

In response to this problem, Michie et al. (2011; Michie, Atkins, & West, 2014) developed the *Behaviour Change Wheel* (BCW) that links the behavioural factors to interventions and policy (see Figure 10.1). The BCW enables policy makers to understand the mechanisms underlying problematic behaviours, such

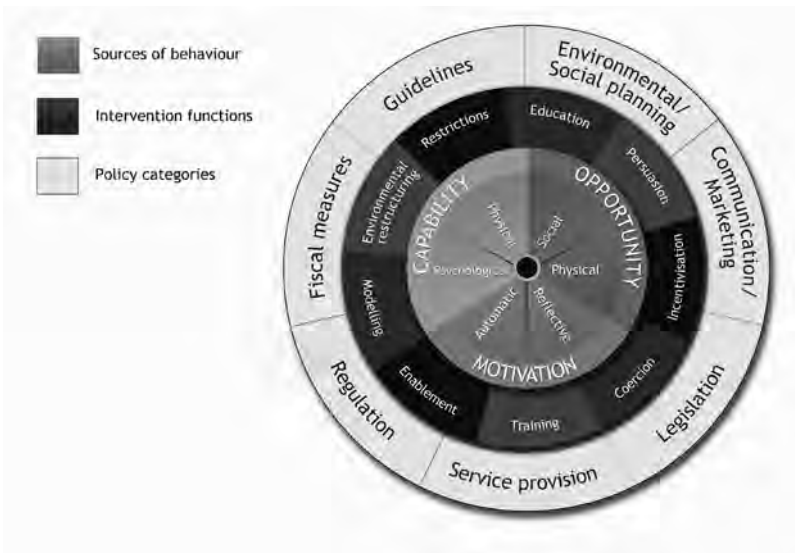

Figure 10.1 The Behaviour Change Wheel, an integrated framework for guiding behavior change interventions.

Reproduced from Michie et al. (2011), by permission of BioMed Central.

as excessive water consumption, and select appropriate interventions and policies to invoke behaviour change. In this section of the chapter, we describe the main elements of behaviour change projects, and how the BCW can help improve the quality of interventions and policies related to domestic water use.

Selecting the 'right behaviours' to target

Many attempts to increase environmentally sustainable behaviours disappoint because they target the wrong behaviours. In an influential paper, Gardner and Stern (2008) produced a short-list that ranked technology upgrades and behavioural changes based on their effectiveness in reducing household energy use. The short list provided households with a practical guide for prioritising behaviours to maximize energy savings.

Following this tradition, Inskeep and Attari (2014) extended the short-list concept to household water conservation. Using US data, they demonstrated that installing a water efficient toilet saved substantially more water (reducing indoor water use by 18.6%) than flushing 25 per cent less frequently (7.3% reduction). Reducing showers from 8.2 minutes to 5 minutes was much more effective in reducing water use (8.2% reduction) than installing a low-flow showerhead (1.9% reduction). In terms of outdoor water use, lawn and plant watering using water collected from a rain harvesting system (i.e., a water tank that catches run-off from the roof) was much more water efficient (up to 100% reduction in outdoor water use) than watering lawns with a hose (33% reduction) or using a programmable irrigation system (30% reduction).

Taking impact into account when choosing which behaviours to target is obviously important. But impact is not the only criterion worth considering. In his book on Community Based Social Marketing, McKenzie-Mohr (2011) proposes a simple framework for prioritising behaviour based on: (1) the impact of the behaviour on tangible ecological and economic outcomes, similar to the short-list approach outlined above, (2) the probability that the behaviour will actually be adopted, and (3) the proportion of the target population already engaged in the behaviour (penetration). In most instances, interventions should aim to influence a small number of high-impact behaviours that have a high probability of being adopted, and currently have low penetration rates within the target community. In this context, practitioners and policy makers should avoid spending time, energy, and money promoting activities that will have little impact on overall water use. Nor should they allocate resources to encouraging behaviours that are unlikely to be adopted or that most people are already performing.

COM-B system for understanding behaviour

The COM-B (Capability, Opportunity, Motivation – Behaviour) system is an overarching, integrative model of behaviour that lies at the hub of the BCW (Michie et al., 2011; Michie, Atkins, & West, 2014). COM-B can help water policy makers and behaviour change practitioners understand behaviour in

context by identifying the main causes of problematic behaviours, such as the failure to adopt water-saving practices. COM-B also helps identify what exactly needs to change to increase the probability that desirable behaviours will occur. According to COM-B, behaviour is determined by three main factors:

(1) Capability – an individual's capacity to engage in the behaviour of interest. COM-B distinguishes between two types of capability. *Physical capability* refers to the extent to which an individual can engage in the behaviour. For example, does the householder have the financial resources, equipment, and/or physical ability to install a low-flow showerhead or rainwater tank? *Psychological capability* refers to the capacity to engage in the necessary mental activities (risk assessments, mental simulation of possible outcomes, decision making etc.) to select appropriate options and actions. Installing a water tank may seem like a straightforward exercise requiring few cognitive demands. However, there are many different types to choose from (e.g., polyethylene, concrete, steel, bladder, above ground, below ground, etc.), all with various strengths and limitations. In addition, most states and municipalities have guidelines about how and where tanks must be installed, which can further complicate the process. Depending on the accessibility and complexity of relevant information, psychological capability can be easily stretched, even for tasks that initially appear to be quite easy. Of course, health and mental health issues such as dementia and depression can also have negative impacts on psychological capacity to successfully engage in behaviour change across a range of domains.
(2) Opportunity – factors external to the individual that prompt or enable the behaviour to occur. COM-B distinguishes between two types of opportunity. *Physical opportunity* refers to situational factors such as having relevant water-saving products and/or installation equipment readily available. It is difficult to install a water tank if the type best suited to climate and personal circumstances cannot be purchased locally. *Social opportunity* refers to cultural or community values and norms that may make engaging in recommended best practices more or less likely. For example, if most households within a community are complying with water restrictions, this creates a descriptive social norm that increases the likelihood that others in the region will also engage in this practice.
(3) Motivation – factors internal to the individual that energise or direct behaviour. There are two main types of motivating factors: reflective and automatic. *Reflective motivation* consists of conscious deliberation and reasoning, and often involves evaluating threats, planning, goal setting, and mentally simulating possible outcomes associated with various types of actions. For example, prior to purchasing a water-efficient appliance, an individual may make a list of the costs and benefits of purchasing or not purchasing the appliance, and select the option that he or she believes is most likely to produce the most positive outcome. *Automatic motivation* refers to mental processes that operate largely outside conscious control

of the individual, including habits, impulses, and emotionally driven behaviour. For example, an individual may initially take long, hot showers because of the pleasure and emotional satisfaction this behaviour affords. However, over time this behaviour may become automatised, and become driven primarily by habit.

According to the COM-B model, capability, opportunity, and motivation both influence and are influenced by behaviour. For example, individuals who perceive many benefits and few costs associated with installing a water-saving appliance or backyard water storage tank (high motivation), have the relevant knowledge and skills to conduct the installation (high capability), and live in communities where these tanks and appliances are readily available and commonly used (high opportunity), are more likely to purchase and install them. In turn, engaging in water-saving behaviours can have a reciprocal reinforcing effect, increasing capability, opportunity, and motivation. Successfully installing a water-efficient showerhead can build competence and self-efficacy, increasing the likelihood that other water-saving projects will be attempted. Purchasing water-saving appliances can help build local markets for these products, increasing purchasing opportunities for future like-minded customers. And, of course, using less water produces a financial benefit in the form of reduced water bills, an important motivator that can encourage further savings.

Although money is an important driver of behaviour change, it is not the only driver; other potent motivators are unrelated to financial outcomes. For example, a recent study by Taufik, Boderdijk, and Steg (2015) found that simply engaging in environmentally friendly behaviours can be psychologically rewarding – eliciting positive feelings and a literal 'warm glow' in the form of reliable increases in perceived temperature. And in the context of developing effective sustainability strategies, Martin and Verbeek (2006) highlight the potential benefits of other non-financial incentives such as public recognition, social rewards, and opportunity.

It is also worth noting that the pattern of drivers and barriers influencing a given behaviour may vary somewhat across individuals within a target community. Not everyone views water conservation in the same way. Distinct segments of the community may have very different driver barrier profiles, reflecting their values, beliefs, and current behaviours. Thus, a policy maker or behaviour change practitioner may not be dealing with a single target community, but rather several. The number and nature of these communities should be understood prior to designing and implementing relevant policies and interventions (Hine et al., 2013; Hine et al., 2014; Slater, 1996).

Linking behavioural theories to COM-B

Importantly, all of the individual components of the behavioural theories reviewed in the first part of this chapter can be classified into the COM-B system (see Table 10.1). From an applied perspective, we consider this to be an extremely important advance.

Michie, West, et al. (2014) compiled a compendium of 83 theories of behaviour and behaviour change, a number substantial enough to overwhelm even the most competent of policy makers. The COM-B system provides a straightforward approach for integrating a highly disparate behavioural science literature into a single manageable framework that will enable practitioners to identify behavioural drivers and barriers that are most relevant for the water usage problem they wish to solve. The COM-B system, as part of the behaviour change wheel, also enables practitioners to explicitly link drivers and barriers to specific behaviour change strategies, our next topic.

Table 10.1 Translating behavioural theories into COM-B system

COM-B Categories	*Definition*	*Model Factors*
CAPABILITY – Physical	Capacity to physically engage in the behaviour.	TPB - Perceived behavioural control TIB – Self-efficacy
CAPABILITY – Psychological	Capacity to engage in the thought processes (comprehension, reasoning, etc.) that underlie the behaviour.	TPB – Perceived behavioural control TIB – Self-efficacy
OPPORTUNITY – Physical	Features of the physical environment prompting or making possible a behaviour.	TIB – Facilitating conditions
OPPORTUNITY – Social	Features of the socio-cultural environment prompting or making possible a behaviour.	TIB – Facilitating condition
MOTIVATION – Reflective	Conscious brain processes that energise and guide the behaviour (e.g., evaluations and plans).	TPB – Attitudes; Normative beliefs; Subjective Norms; Outcome beliefs; Outcome evaluations; Motivation to comply; Intention FTNC – Injunctive Norms; Descriptive Norms TIB – Behavioural intention; Social normative beliefs; Personal normative beliefs; Perceived consequences; Role beliefs; Normative beliefs; Personal norms; Professional norms
MOTIVATION – Automatic	Automatic brain processes that energise and guide behaviour (e.g., emotions, impulses, etc.).	TPB – Subjective Norms; Normative beliefs FTNC – Injunctive Norms; Descriptive Norms TIB – Affect; Habit; Affective attitudinal beliefs AH – Affect heuristic

Note: TPB (Theory of Planned Behaviour), FTNC (Focus theory of Normative Conduct), TIB (Theory of Interpersonal Behaviour), AH (Affect Heuristic)

Linking drivers and barriers to interventions

The middle ring of the BCW consists of nine intervention functions for changing behaviour: education, persuasion, training, incentivisation, restriction, environmental restructuring, modelling, and enablement. Definitions and examples related to domestic water use are provided in Table 10.2. An important strength

Table 10.2 Definitions and examples of interventions

Intervention Functions	*Definitions*	*Domestic Water Use Examples*
Education	Increasing knowledge and understanding	Providing written factsheets, technical manuals and videos, or practical courses to disseminate information and demonstrate household water conservation practices.
Persuasion	Using communication to induce positive or negative feelings or stimulate action	Providing information about descriptive norms (what people are doing) and injunctive norms (what people should be doing) to encourage people to engage in water conservation behaviours.
Incentivisation	Creating expectation of reward	Providing rebates for purchasing water storage tanks and water efficient appliances.
Coercion	Creating expectation of punishment or cost	Introducing legislation makes water conservation practices (e.g., restrictions on watering lawns and gardens) mandatory, with fines for non-compliance.
Training	Imparting skills	Running courses to train homeowners to install water-efficient shower heads, and create and maintain drought resistant gardens.
Restriction	Using rules to influence the engagement in the target behaviour	Introducing rules about days and times when outside watering can occur.
Environmental restructuring	Changing the physical or social context to encourage desired behaviours	Passing legislation that bans the sale of plumbing products and white goods if they do not meet the standards of the water efficiency labelling scheme.
Modelling	Providing an example for people to aspire to or imitate	Setting up a 'demonstration site' on a local property to display best-practice water conservation methods.
Enablement	Increasing means/ reducing barriers to increase capability or opportunity	Developing new technologies such as more water-efficient appliances. Providing householders with smart meters that provide users with online feedback of current and daily water use, with comparisons to neighbourhood or town/city norms.

Source: Based on Michie et al. (2011)

of the BCW is that it links identified causes of behaviour (from COM-B analysis) to specific intervention types (in the middle ring).

To succeed, practitioners must be aware of the wide range of behaviour change interventions available to them, and understand that different interventions may be required depending on the specific drivers and barriers in a given context. For example, in a large study of Australian households, Dolnicar and Hurlimann (2010) found a number of important barriers to adopting water-conserving appliances such as front-loading washing machines and low-flow showerheads: high purchase costs (which undermine physical capability), the perceived impracticality (the perceived added burden associated with using these appliances), and lack of knowledge about how much water the appliance would actually save (two factors that undermine reflective motivation). Given this set of barriers the BCW suggests an optimal intervention could include enablement (e.g., providing rebates on water-saving appliances to enhance physical capability), and education and persuasion (e.g., providing information that emphasizes the appliances in question are effective and easy to use).

The BCW does not provide specific guidance about how to design behaviour change interventions, but it is a systematic, empirically grounded approach for identifying the general types of interventions that should be most effective for specific behaviours in specific contexts. By understanding the mechanisms that drive and prevent target behaviours, practitioners will be in a much stronger position to develop appropriate strategies. Table 10.3 summarises how the components of the COM-B model link to the nine intervention functions.

Linking interventions to policy

Australia's water resources are managed through a co-operative water reform framework implementing reforms through a variety of instruments, often with perverse results (Martin & Williams, 2014), further reinforcing the need for a greater focus on behaviourally effective strategies.

The outermost ring of the BCW focuses on policies – plans of action and strategies to help governments and organisations to achieve their goals. The BCW distinguishes between seven policy types: communication/marketing, guidelines, legislation, regulation, fiscal, environmental/social planning, and service provision.

Just as the BCW links behavioural causes to intervention types, it also bridges the gap between interventions and policy tools in this outermost ring. The BCW provides a common framework for practitioners and policy makers to jointly identify which policy tools are most likely to benefit behaviour change initiatives. For example, interventions aimed at persuading households about the benefits of installing water tanks or other conservation technologies would be best supported by a policy mix involving one or more of the following: communication/marketing, guidelines, regulation, legislation, and service provision. On the other hand, interventions aimed at increasing household water conservation behaviours through modelling would be best supported by policies related to

Table 10.3 Links between COM-B components and intervention functions

COM-B	*Education*	*Persuasion*	*Incentives*	*Coercion*	*Training*	*Restriction*	*Environmental Restructuring*	*Modelling*	*Enablement*
Capability									
Physical					☑				☑
Psychological	☑				☑				☑
Opportunity									
Physical						☑	☑		☑
Social						☑	☑		☑
Motivation									
Reflective	☑	☑	☑	☑					
Automatic		☑	☑	☑			☑	☑	☑

Source: Based on Michie et al. (2011)

Table 10.4 Links between intervention functions and policy tools

Intervention Function									
Policy Tool	*Education*	*Persuasion*	*Incentives*	*Coercion*	*Training*	*Restriction*	*Environmental Restructuring*	*Modelling*	*Enablement*
Communication/ Marketing	☑	☑	☑	☑				☑	
Guidelines	☑	☑	☑	☑	☑	☑	☑		☑
Fiscal			☑	☑	☑		☑		☑
Regulation	☑	☑	☑	☑	☑	☑	☑		☑
Legislation	☑	☑	☑	☑	☑	☑	☑		☑
Environmental/ Social Planning									☑
Service Provision	☑	☑	☑	☑	☑			☑	☑

Source: Based on Michie et al. (2011)

communication/marketing and service provision. The types of policy tools that are best matched to intervention types are summarised in Table 10.4.

Again it is worth highlighting that the BCW was not designed to provide advice about how to construct or what to include in a specific policy or intervention related to behaviour change. Rather, the BCW provides a general framework for understanding the main drivers and barriers for a given behaviour, and then, based on that behavioural analysis, identifying which general types of behaviour change interventions and policy delivery systems are best suited to address the behavioural problem under investigation. For practitioners who are interested in step-by-step guides about how the BCW and related behaviour change frameworks can be applied in field settings, several excellent resources are available (McKenzie-Mohr, 2011; Michie, Atkins, & West, 2014).

Conclusions

Water scarcity is a growing problem in many countries across the world. Pressures associated with global population growth, economic development, and climate change are projected to make matters worse. The social sciences have produced a large number of behavioural theories relevant to managing domestic water use, and important to overall water consumption. These theories can help policy makers and practitioners understand the main causes of problematic water use behaviours, and identify the most appropriate intervention strategies for changing behaviours. Michie et al.'s (2011; Michie, Atkins, & West, 2014) BCW provides an integrated framework for understanding behavioural causes in context, and explicitly linking these causes to interventions and policy tools. The framework provides a common language and mental model for policy makers and practitioners to conceptualise and communicate about behaviour change. It provides a sound foundation for launching a systematic program of analysis and action to address the behaviours that lie at the heart of many water conservation problems.

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