Rainwater Tank Maintenance: Community Perceptions of Policy Options

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The Urban Water Security Research Alliance (UWSRA) is a $50 million partnership over five years between the Queensland Government, CSIRO's Water for a Healthy Country Flagship, Griffith University and The University of Queensland. The Alliance has been formed to address South East Queensland's emerging urban water issues with a focus on water security and recycling. The program will bring new research capacity to South East Queensland tailored to tackling existing and anticipated future issues to inform the implementation of the Water Strategy.

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FOREWORD

Water is fundamental to our quality of life, to economic growth and to the environment. With its booming economy and growing population, Australia's South East Queensland (SEQ) region faces increasing pressure on its water resources. These pressures are compounded by the impact of climate variability and accelerating climate change.

The Urban Water Security Research Alliance, through targeted, multidisciplinary research initiatives, has been formed to address the region's emerging urban water issues.

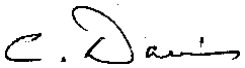
As the largest regionally focused urban water research program in Australia, the Alliance is focused on water security and recycling, but will align research where appropriate with other water research programs such as those of other SEQ water agencies, CSIRO's Water for a Healthy Country National Research Flagship, Water Quality Research Australia, eWater CRC and the Water Services Association of Australia (WSAA).

The Alliance is a partnership between the Queensland Government, CSIRO's Water for a Healthy Country National Research Flagship, The University of Queensland and Griffith University. It brings new research capacity to SEQ, tailored to tackling existing and anticipated future risks, assumptions and uncertainties facing water supply strategy. It is a $50 million partnership over five years.

Alliance research is examining fundamental issues necessary to deliver the region's water needs, including:

- ensuring the reliability and safety of recycled water systems.
- advising on infrastructure and technology for the recycling of wastewater and stormwater.
- building scientific knowledge into the management of health and safety risks in the water supply system.
- increasing community confidence in the future of water supply.

This report is part of a series summarising the output from the Urban Water Security Research Alliance. All reports and additional information about the Alliance can be found at http://www.urbanwateralliance.org.au/about.html.



Chris Davis
Chair, Urban Water Security Research Alliance

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EXECUTIVE SUMMARY

The purpose of this research is to examine community acceptability of policies that are aimed at ensuring ongoing maintenance of domestic rainwater tank systems. The research investigates the influence of four sets of factors on policy acceptance: various policy features; judgements of policy fairness; and effectiveness, individual attitudes and motivations towards tank maintenance, and external context.

This research represents the final part of a larger project which investigated potential policy options to promote water tank maintenance. It has been suggested that a lack of water tank maintenance by householders represents a threat to the ongoing operation of water tank infrastructure, and a number of studies have supported this contention. Research by Moglia *et al.* (2012) integrated the findings of four interconnected studies that addressed rainwater tank management and found that maintenance was an important component of ongoing management. Moglia and colleagues recommended tank maintenance, in conjunction with improved tank design and installation procedures, as necessary strategies for ensuring satisfactory management of rain water tanks into the future.

Previously, we conducted two qualitative studies to understand how industry and government stakeholders thought policy could best address this issue, and to understand how the public thought policy could best address this issue. Drawing on these prior studies, we generated a range of plausible policy options and, in the present research, tested their acceptability using a choice modelling study of a large sample of the public from South East Queensland (SEQ). In the study, we presented people with a range of policy options, and assessed their reactions to these. The policy options varied along three features: type of monitoring of tanks (a tank register or random checking); the presence or absence of enabling features; and the use of an incentive to encourage tank maintenance or a disincentive to discourage a lack of tank maintenance.

In general, there was higher support for policies that included incentives and enabling features. Findings demonstrated that incentives (and, as a corollary, disincentives) are the most important feature for the public's judgements of a policy. Policies which included incentives were viewed as more fair, effective and acceptable. Conversely, policies that included a disincentive (i.e. a penalty for not maintaining a tank) were viewed least favourably on all these measures. Other policy elements (the use of enabling features, and the type of monitoring used) were also demonstrated to influence the public's judgements, although to a lesser extent than incentives and disincentives. Policies that included enabling features were judged as more effective and those policies that left tank holders to their own devices were viewed as less effective. The research also found that people's judgements of fairness and effectiveness were important to policy acceptance. Results demonstrated that judgements of fairness were almost twice as important as effectiveness in most instances.

The research also investigated people's underlying motivation for tank maintenance and the influence this has on policy acceptance. On average, people indicated low levels of awareness of tank maintenance, but high levels of motivation towards undertaking tank maintenance. The level of motivation was underpinned largely by favourable attitudes, feelings of capability, and a self-identity as someone who 'keeps things well maintained'. Favourable attitudes related to views that the benefits of tank maintenance outweighed the costs associated with keeping a tank maintained. Feelings of capability encompassed a person's sense of control and confidence that he or she could undertake tank maintenance activities. A self-identity as someone who likes to keep things maintained was identified as an underlying psychological factor contributing to motivations for maintenance. Results also indicated that there were differences in the levels of these motivational factors depending on tank usage. Tank owners who primarily used their tank water outdoors were less motivated to conduct tank maintenance than those tank owners who used their tank water indoors.

The motivational factors also explained, in part, a person's acceptance of policy. Favourable attitudes towards tank maintenance and feelings of capability and control were important psychological factors for policy acceptance, and judgements of both fairness and effectiveness. Of note was the finding that people who currently saw themselves as capable and in control of tank maintenance were less supportive of the introduction of measures to encourage and monitor tank maintenance behaviour.

Together, these results suggest the importance of increasing owner awareness toward tank maintenance requirements, creating positive attitudes towards the benefits of keeping a tank maintained, and improving people's capabilities to undertake maintenance, in order to foster a wider uptake of tank maintenance amongst owners. These factors are reflected in the more favourable judgements of policies that include enabling features. The research also suggests the use of disincentives and more regulated approaches, such as monitoring of tank maintenance, are likely to be deemed as more unfair and unacceptable to the public.

Finally, the research indicated that, contrary to expectations, there was no clear influence of contextual framing on policy acceptance, judgments of fairness and effectiveness, or on levels of motivation. The "public health" and "drought proofing" framing did not result in more positive judgements of policy options, nor in increased levels of maintenance motivation as we had expected. Despite previous qualitative research suggesting that these two contextual frames would influence policy acceptance, this present research found no such effect.

Overall, this research provides important contributions to the development of policy in this domain. If it is judged necessary for a policy intervention to address issues of water tank maintenance, then the public palatability of that policy will contribute strongly to its eventual success.

1. INTRODUCTION

The purpose of this research is to examine community acceptance, and perceptions of fairness and effectiveness of policies that govern sustainable urban water management. Specifically, this research investigates policies aimed at ensuring ongoing maintenance of domestic rain water tank systems. In addition, this study examines individual attitudes and motivations towards tank maintenance behaviour, and the relationship to acceptability of related policies. In general, there has been a move away from 'command and control' approaches for governing sustainable development initiatives in Australia (Head, 2009). This trend is typical of the international arena, where governments are working to facilitate behavioural change in the sustainability field through the wider use of non-regulatory methods (House of Lords, 2011; Wilson and Chatterton 2011). Government agencies are utilising a varied range of interventions to support sustainable proposals, ranging from non-regulatory approaches, such as information programs and reward-based systems, through to more coercive approaches such as regulations and sanctions (House of Lords, 2011; Osbaldiston and Schott, 2011). This trend has developed from a neo-liberal approach to government, which recognises the role of individual choice, and attempts to minimise the paternalistic approach of heavy-handed regulation to bring about pro-social behaviour (Gardner and Stern, 2002; Head, 2009). Furthermore, governments recognise their inability to manage wide-ranging regulation agendas, with neither the knowledge, nor human or financial resources available to regulate and enforce standards that support diverse sustainability initiatives.

This change in policy landscape presents a challenge to government, and extends to the support and management of sustainable water initiatives. Within this context, the appropriate form of governance required to support decentralised water systems, such as rainwater tanks, remains unclear. This issue can be addressed in part by understanding the factors that affect community acceptance of possible governance options. Although a range of other considerations is relevant to policy development, public acceptance plays a central role in determining successful implementation of any intervention measures. This research examines the acceptability, perceived fairness, and perceived effectiveness of possible policies that could govern decentralised water systems. Specifically, it investigates policies aimed at ensuring ongoing maintenance of residential rainwater tank systems in South East Queensland.

The literature indicates that specific policy characteristics and perceptions of policies, in terms of fairness and effectiveness, are important determinants of policy acceptability (e.g. Eriksson, Garvill, and Nordlund, 2006; 2008; Steg, Dreijerink, and Abrahamse, 2005; 2006). Previous research has also demonstrated the importance of individual attitudes and motivations, and problem awareness, as drivers of acceptance (e.g. Eriksson *et al.*, 2008). The present research investigates these four types of influences on the community's acceptance of policy options. A series of policy characteristics and relevant psychosocial variables, informed by the literature and previous qualitative research, are examined. In addition, the impact of two different policy contexts, a perceived public health risk, and an impending drought, are tested on policy acceptance and on judgements of fairness and effectiveness.

The present research used a quantitative approach incorporating experimental design and choice modelling. A cross-sectional survey with embedded experimental manipulations was conducted on a sample of 533 tank owners in south-east Queensland during April, 2012. Multiple regression and conjoint analyses were used to evaluate four research questions.

1.1. Research Questions

There were four main aims of this research: to examine the influence of policy features on the public's judgements and acceptance of those policies; to examine the influence of policy judgements on acceptance; to examine the influence of individual attitudes and motivations on policy judgements and acceptance; and to examine the influence of context and framing on policy judgements and acceptance. These broad aims were addressed through four main research questions.

RQ1. Which policy features are important for policy acceptance, and judgements of fairness and effectiveness?
RQ2. To what extent do judgements of fairness and effectiveness predict policy acceptance; and which is the important variable?
RQ3. To what extent do individual attitudes and motivations towards tank maintenance predict policy acceptance, and judgements of fairness and effectiveness; and which are the important variables?
RQ4. How does external context affect policy acceptance, and judgements of fairness and effectiveness?

2. LITERATURE REVIEW

The literature describes a range of influences that affect policy acceptability and these are a combination of factors, which can be broadly categorised into four groups: 1) policy features; 2) judgements about policy; 3) individual motivations; and 4) contextual aspects. Policy features encompass the attributes inherent in the policy, such as the type of behaviour mechanism it employs, to achieve the target behaviour, for example, 'soft' or 'hard' approaches. Judgments about the policy are beliefs regarding the outcomes of the policy, and include judgements of fairness and effectiveness. Individual motivations are psychosocial factors that concern attitudes, and a willingness or intention to undertake the behaviour advocated by the policy intervention (the target behaviour). Finally, contextual aspects reflect the public framing of the policy: the rationale provided for the policy's existence. This present research integrates these four aspects into a model for pro-environmental policy acceptance. The model provides the conceptual basis for this present research, and is displayed in Figure 1.

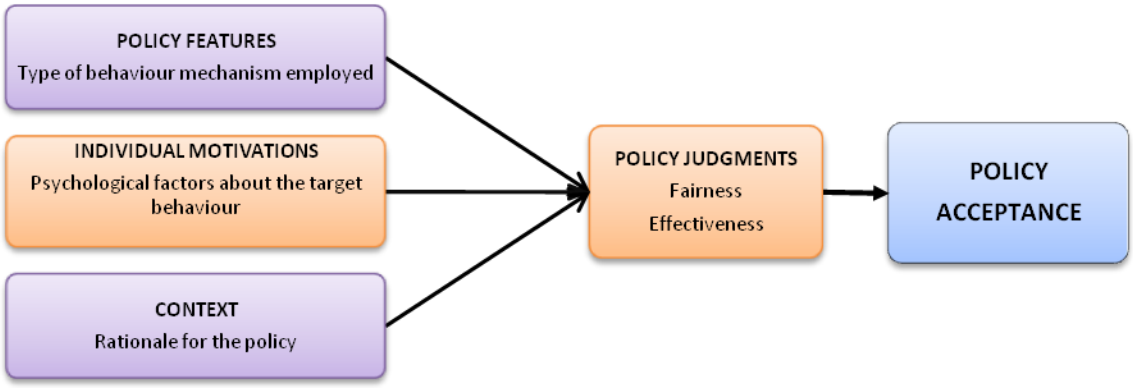

Figure 1. Conceptual model for Pro-environmental Policy Acceptance.

2.1. Policy Features

There are various different ways that policies can encourage and ensure household maintenance of rainwater tank systems. The most common policy feature that has been examined in the literature is the type of behaviour change mechanism that is embodied in the policy. Most typically, behaviour change mechanisms vary in terms of the degree of coerciveness inherent in the policy option; that is, they vary on a continuum from non-coercive to coercive. The literature uses a variety of names to describe these mechanisms (Garling and Schuitema, 2007). At the non-coercive end there are 'soft' and 'pull' approaches. Soft approaches include education and awareness campaigns, and activities to encourage and facilitate voluntary undertaking of the target behaviour. Pull policies are those that provide incentives and rewards as ways to encourage a change towards the target behaviour. In contrast, the more coercive approaches are described as 'hard' and 'push' approaches, and designed to use increasing levels of regulation to bring about change. Hard approaches can include a variety of regulatory mechanisms to enforce behaviour, and push policies use disincentives, such as penalties and increased taxes or pricing, to bring about change.

In general, push mechanisms are perceived to be less acceptable than pull mechanisms. Previous research demonstrates push mechanisms, such as increased pricing and the use of taxes, are associated with reduced levels of acceptance. In addition, acceptability of these types of policies is correlated with perceptions of fairness (Schuitema, Steg, and Kruining, 2011), and effectiveness (Cools *et al.*, 2011; Erikkson *et al.*, 2008). The less fair and less effective the policy seems, the less acceptable it is to the community. Similarly, policies that use pull mechanisms, such as reduced pricing through subsidies or improved choice options, are perceived as more acceptable (and are perceived as more effective and more fair). This type of research has been applied primarily in the travel management

domain, where policies are used to reduce car use. The literature in the water domain seldom reports on policy features and the relationship to policy acceptance. Rather, research has been based on the public acceptance of different types of alternative water sources, such as recycled, desalinated and rainwater options (Dolnicar and Hurlimann, 2010; Dolnicar, Hurlimann, and Grun, 2011; Mankad and Tapsuwan).

2.2. Policy Judgements

Policy related beliefs of fairness and effectiveness have been widely examined in the literature and have been established as integral to policy acceptance. Research has demonstrated both concepts as positively associated to policy acceptance. *Perceived fairness* relates to the degree to which a policy measure is seen as ethically just (Cools *et al*., 2011 p781). Fairness includes the principles of equality and equity (Garling and Schuitema, 2007), and can incorporate perceptions of personal freedom. Policies that are perceived to increase a person's freedom to choose are viewed as fairer (Eriksson *et al*., 2006). *Perceived effectiveness* refers to the extent to which a person believes the policy will achieve the purpose for which it has been developed (Cools *et al*., 2011). This judgement can be made at two levels: perceptions that the policy will be effective for encouraging the individual themselves to change, and that it will be effective for encouraging others to change (Eriksson *et al*., 2006).

2.3. Individual Motivations

Individual motivations towards policy have been investigated in the pro-environmental literature, predominantly in the transport and energy domains. This research has been conducted in relation to policy acceptance of various types of travel and energy demand management interventions. Eriksson *et al*. (2006) developed a conceptual model of the internal motivation factors as a two-staged hierarchical set of beliefs. The first stage of the model incorporates general environmental beliefs and reflects a person's pro-environmental orientation, problem awareness, personal norms, and willingness to act. These in turn are linked to the second stage of the model, which incorporates beliefs specific to the policy, and includes perceptions of effectiveness and fairness. These internal factors are viewed as causally determining policy acceptance. In survey research, Eriksson and colleagues tested and validated their two-part model on three different types of policy measures for reducing car use. Results indicated that general environmental motivations, in combination with policy-specific beliefs, underpinned acceptability of the various policy measures. Eriksson *et al*. (2006) based the psychological elements comprising their general pro-environmental motivations on Stern's Value Belief Norm (VBN) theory (Stern, 2000).

Other researchers have used similar models to explain the psychosocial aspects for policy acceptance, using VBN constructs as representative of the individual motivations (e.g. (Attari *et al*., 2009; Cools *et al*., 2011; Eriksson *et al*., 2006; Steg, *et al*., 2005). Steg *et al*. (2005) tested the ability of the VBN variables to explain policy acceptance, and demonstrated it was capable of explaining acceptance for 16 different types of policy interventions related to energy conservation. Attari *et al*. (2009) also demonstrated that VBN variables were associated positively with acceptance of regulatory policies to support reductions in energy use.

In these models, willingness to act represents the final construct in the causal chain underpinning policy-related beliefs, and indicates a level of motivation towards undertaking the target behaviour. In this way, willingness to act is analogous to the construct of *intention* from the Theory of Planned Behaviour (TPB), which also represents a level of preparedness to undertake the target behaviour (Ajzen, 1991). The TPB models three constructs as underpinning intention: attitudes towards the behaviour, normative or social pressure to undertake the behaviour, and control beliefs. Control beliefs relate to a person's perceptions that they are capable of undertaking the behaviour (Ajzen, 1991). To date, research into policy acceptance has rarely applied the TPB to explain acceptance. This current research adopts constructs from the TPB as representative of the individual's motivations that can influence policy acceptance. An earlier focus group study of 42 people identified these types of variables as important to tank maintenance and policy acceptance (Walton, Gardner, Sharma, Moglia, and Tjandraatmadja, 2012). The previous research found favourable attitudes towards tank

maintenance, in terms of overall benefits outweighing costs, and feelings of self-efficacy important to policy preference. In addition, Walton and colleagues found personal norms (a sense of moral obligation), and self-identity (a self image as 'a person who keeps things well maintained'), were relevant to tank maintenance. These psychological variables were identified as potentially underpinning an individual's motivation towards acceptance of policy directed at tank maintenance. The present research adopts these variables, and integrates them into an expanded-TPB model to represent individual's motivations.

These psychological variables are expected to not only explain individual motivation towards tank maintenance, but also contribute towards predicting policy acceptance. People who are motivated towards tank maintenance could conceivably respond in two different ways to policy instruments designed to encourage the same behaviour. They might react negatively to the policy, because they may see it as unnecessary (since they are already motivated and don't see the need for further encouragement). Alternatively, they might react positively to the policy, seeing it as a way to encourage the behaviour in others that they themselves have decided is important. Figure 2 illustrates the variables of the expanded-TPB model.

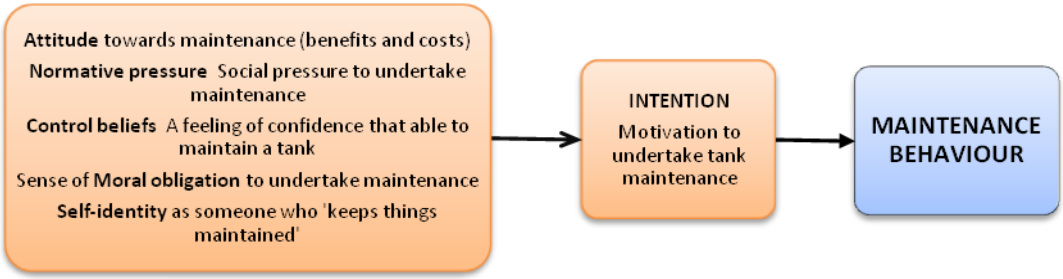

Figure 2. Expanded-TPB model for motivation to undertake tank maintenance.

2.4. Context: Problem Awareness

Problem awareness has been shown to influence policy acceptance. Research indicates that a person's awareness of the problem that underpins the reason for the policy has a positive effect on policy acceptance (Erikkson *et al*., 2008; Steg *et al* 2005). Previous qualitative findings that informed the present research identified two contextual factors that could potentially influence the acceptance of policy for tank maintenance. These included the possibility that an unmaintained tank could contribute to increased risk of mosquito borne illnesses, and the potential for water scarcity due to future droughts. The prior research suggested that individuals would view tank maintenance policy more favourably in these situations, because it would help to mitigate these two problems. As a result, the current research investigates the potential of these two influences to impact on policy acceptance for tank maintenance.

3. METHOD

The research adopted a mixed (within- and between-subjects) experimental design and used an online survey as the instrument for data collection. Three different context framings were manipulated as a between groups factor. Three sub-groups of participants were each presented with one of three policy contexts, which described a different rationale for the policy intervention. Using a choice modelling approach, three policy features, each with two levels, were manipulated. As a result of the manipulations, eight different policies were presented in each survey, and all respondents evaluated each policy in terms of acceptability, fairness and effectiveness. In addition, the survey gathered data on individual motivations for tank maintenance, general tank related behaviour, and demographic information.

3.1. Sample

Participants were recruited through a third party panel listing company, which used a database of 300,000 individuals to randomly select participants based on predetermined selection criteria. These criteria required respondents to be water tank owners, home owners (i.e. not renting), at least 18 years old, and residing in SEQ. This selection was achieved through screening questions embedded within the online survey. The sample of 533 respondents comprised slightly more females than males (56% and 44% respectively), ages ranging from 18 to older than 65 years, with 64% of respondents older than 45 years. There was a range of socioeconomic levels represented, with approximately 18% of respondents reporting household incomes of less than $60,000, 44% with household incomes between $60,000 and $120,000, and 38% with incomes greater than $120,000. There was also a range of household types with approximately 8% having a lone occupant, 39% with couples, 50% having families with children, and 3% in shared accommodation. Approximately 60% had retrofitted their tank and 40% had acquired their tank either as part of building a new home or by purchasing a property with a tank in situ. On average, tanks had been installed for approximately six years (M = 6.26 yrs, SD = 3.28), with tank installation ranging from less than a year ago to greater than 12 years ago. These demographic characteristics were considered to be a satisfactory representation of tank owners in SEQ.

3.2. Procedure

All participants undertook an online survey. There were three versions of the survey and each survey comprised four sections. Section 1 consisted of introductory information, which outlined the necessary background material for undertaking the survey. This section included the information for the three experimental manipulations of context, with each version of the survey containing a specific contextual manipulation: version 1) general information only; version 2) general information plus public health rationale; and version 3) general information plus drought mitigation rationale. Participants were randomly allocated to a specific survey version. Section 2 measured policy acceptance, perceived effectiveness, and perceived fairness for eight different policy options. Section 3 measured individual motivations for tank maintenance, and Section 4 general tank related behaviour and demographics. An overview of the survey format is illustrated in Figure 3.

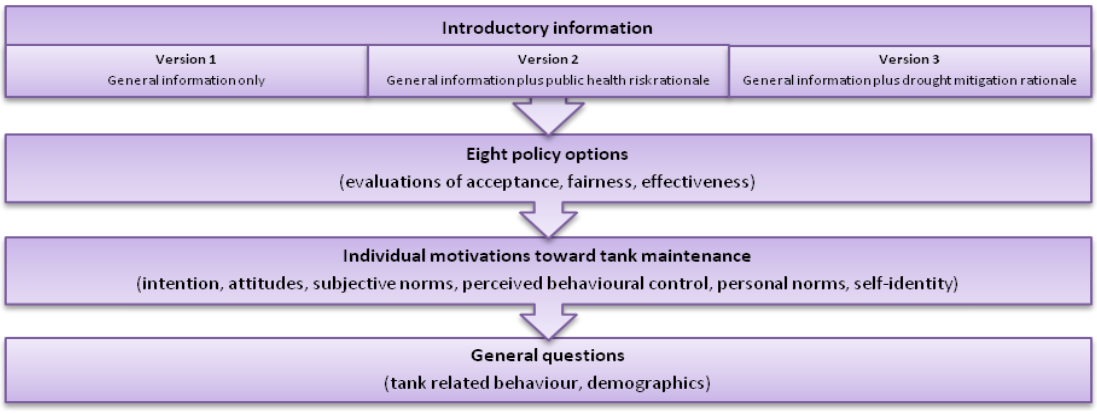

Figure 3. Overview of survey format.

3.3. Survey Instrument

3.3.1. Contextual Factors

The three contextual manipulations were operationalised by creating three different sets of introductory information. The information was brief and written in non-technical language. The *generic* version provided general information on tank prevalence in South East Queensland, the need to maintain a tank in order to ensure optimal tank function, and a typical maintenance schedule. The schedule outlined, in general terms, the maintenance tasks required and frequency to keep a tank in sound functioning order. The *public health risk* version contained the generic version plus a rationale for maintaining a tank based on the minimisation of risk of mosquito borne illness. The *drought mitigation* version contained the generic version plus a rationale based on the effectiveness of rainwater tanks as a way to drought-proof the region against future droughts. Each version of introductory information contained approximately the same number of words and was formatted in a similar manner. A pilot test was used to assess the effectiveness of the manipulations, and adjustments were made accordingly. The three context manipulations are displayed in Appendix A.

3.3.2. Policy Features

A full factorial design was used to evaluate three policy features. The three chosen policy features were based on different behaviour change mechanisms that could be used to encourage tank maintenance behaviour: type of monitoring; enabling; and (dis)incentives. The choice of policy features was informed by previous qualitative research (Walton *et al*., 2012). Each policy feature comprised two levels, which represented two different options for that policy feature. For example, the two levels for type of monitoring were a tank register and random checking of tanks. Table 1 displays a description of each feature and associated levels.

Table 1. Policy Factors and levels.

	Policy Features		
Levels	**Monitoring (tank register / random checking)**	**Enabling (education / nil)**	**(Dis)Incentives (penalty / rebate)**
1	Introduce measures such tank registers *Introduce a tank register*	Introduce measures such as advertising campaigns and information brochures *Provide tank owners with information on how to maintain a tank eg. brochures, list of plumbers and tank cleaners, instructions placed on the tank*	Some sort of penalty for not maintaining the tank *Fine tank owners for not maintaining their tank*
2	Introduce measures such as inspections *Introduce random checking of tanks*	No enabling measures provided *Leave tank owners to their own devices to find information on how to maintain a tank*	Some sort of incentive for maintaining the tank *Offer a rebate to tank owners for maintaining their tank*

In the choice modelling approach, a full factorial design means that a level of each policy feature is combined with a level of each of the other two policy features. This results in a choice set for each policy option comprising a level from each of the three features. Accordingly, there were eight policy option combinations, or choice sets. Table 2 displays the combinations for the eight policy choice sets presented to respondents for evaluation.

Table 2. Descriptions of policy option choice sets.

Choice Set	Set of Features	Monitoring	Enabling	(Dis) Incentives
1	Introduce a tank register Provide tank owners with information on how to maintain a tank eg. brochures, list of plumbers and tank cleaners, instructions placed on the tank Fine tank owners for not maintaining their tank	Register	Enabling	Disincentive
2	Introduce a tank register Provide tank owners with information on how to maintain a tank eg. brochures, list of plumbers and tank cleaners, instructions placed on the tank Offer a rebate to tank owners for maintaining their tank	Register	Enabling	Incentive
3	Introduce a tank register Leave tank owners to their own devices to find information on how to maintain a tank Fine tank owners for not maintaining their tank	Register	No enabling	Disincentive
4	Introduce a tank register Leave tank owners to their own devices to find information on how to maintain a tank Offer a rebate to tank owners for maintaining their tank	Register	No enabling	Incentive
5	Introduce random checking of tanks Leave tank owners to their own devices to find information on how to maintain a tank Fine tank owners for not maintaining their tank	Random check	No enabling	Disincentive
6	Introduce random checking of tanks Leave tank owners to their own devices to find information on how to maintain a tank Offer a rebate to tank owners for maintaining their tank	Random check	No enabling	Incentive
7	Introduce random checking of tanks Provide tank owners with information on how to maintain a tank eg. brochures, list of plumbers and tank cleaners, instructions placed on the tank Fine tank owners for not maintaining their tank	Random check	Enabling	Disincentive
8	Introduce random checking of tanks Provide tank owners with information on how to maintain a tank eg. brochures, list of plumbers and tank cleaners, instructions placed on the tank Offer a rebate to tank owners for maintaining their tank	Random check	Enabling	Incentive

3.3.3. Dependent Measures

Policy Acceptance and Judgments of Fairness and Effectiveness

Policy acceptance, fairness and effectiveness were measured using single item measures to evaluate each of the eight policy options. Respondents were asked the extent to which they agreed with statements using a Likert-type scale (1 = strongly disagree, 7 = strongly agree). The three statements were: '*This policy is acceptable to me'; 'This option is fair';* and *'This option will encourage people to maintain their tanks',* addressing acceptability, fairness, and effectiveness respectively. Single item measures of these variables have been previously reported, especially when multiple policy choice sets are evaluated; all measures used in this research were based on items described in the environmental psychology literature (Cools *et al*., 2011; Eriksson *et al*., 2006; Steg *et al*., 2006).

In addition, two questions were also used to measure general views towards tank maintenance policy: *'I am in favour of the introduction of measures to encourage people to maintain their rainwater tanks'*; and '*I support some form of monitoring to ensure that rainwater tanks are being maintained'*

Individual Motivations

Measures of six psychological variables were used to assess the underlying level of motivation towards tank maintenance behaviour. These measures included: 1) *intention* to undertake tank maintenance (three items); 2) *attitudes* towards tank maintenance (eight items); 3) *subjective norms* (two items); 4) *control beliefs* (three items); 5) *personal norms* (two items); and 6) *self-identity* (two items).

Tank-Related Behaviour

There were three questions related to tank behaviour, addressing: level of awareness for tank maintenance; self-reported tank maintenance activities; and use of tank water.

Demographics

Measures of age, gender, income, household structure, and questions related to tank acquisition were collected. These questions were used to prepare a profile of the survey sample and to investigate group differences.

3.4. Data Preparation

All multi-item measures of variables were tested for internal consistency and demonstrated high levels, with Cronbach's alphas ranging from .88 to .95, except for the three perceived behavioural control items. PBC demonstrated a Cronbach's alpha of .75, which was improved to .87 when the item related to perceived difficulty was removed. As a result, two variables were used in ongoing analysis: perceived control and perceived difficulty. All multi-item measures were collapsed to single measures of variables.

A conjoint analysis was used to examine the influence of policy features on policy acceptance, and judgements of fairness and effectiveness. A conjoint analysis was able to determine the part worth scores that each feature contributed toward the overall evaluation of acceptability, fairness, and effectiveness. In addition, a conjoint analysis determined the relative importance of each feature in explaining aggregate acceptance, fairness, and effectiveness scores (Hair *et al.*, 2010). Multiple regression analyses were used to determine the extent to which variables explained motivations, and ANOVAs were used to evaluate differences between groups.

4. RESULTS

4.1. Policy Features, Policy Acceptance, and Judgements of Fairness and Effectiveness

A series of conjoint analyses was conducted to determine the extent to which the three policy attributes explained respondents' overall evaluation of policy acceptability, and judgements of policy fairness and effectiveness. Table 3 summarises the responses to all eight choice sets across the three measures.

Table 3. Summary of choice set scores for acceptability, fairness, and effectiveness.

Choice Set		Acceptability		Fairness		Effectiveness	
		M	*SD*	*M*	*SD*	*M*	*SD*
1	Tank register, Enablers, Penalty	2.87	1.75	2.56	1.64	3.75	1.90
2	Tank register, Enablers, Rebate	4.72	1.81	5.12	1.64	5.16	1.58
3	Tank register, No enablers, Penalty	2.43	1.59	2.10	1.37	2.83	1.66
4	Tank register, No enablers, Rebate	3.83	1.69	4.28	1.70	3.88	1.62
5	Random checking, No enablers, Rebate	3.48	1.74	3.93	1.78	3.71	1.66
6	Random checking, No enablers, Penalty	2.27	1.52	2.01	1.33	2.68	1.67
7	Random checking, Enablers, Penalty	2.68	1.71	2.42	1.62	3.57	1.92
8	Random checking, Enablers, Rebate	4.23	1.86	4.58	1.78	4.77	1.63

Note. $N = 442$

Conjoint analysis provides results as *part worth scores*, which reflect the contribution of each attribute in explaining the responses given by participants. Part-worth scores were determined for each level of the three policy attributes. A negative part-worth score indicates that policies having this feature are perceived to be less acceptable, less fair, or less effective. Conjoint analysis also provides *average importance scores,* which indicate the relative importance of each feature to the measure of acceptance, fairness or effectiveness. Higher average importance scores indicate more important features (relative to the score for the alternative features).

Conjoint analysis results are reported below, separately for each measure (acceptance, fairness, effectiveness).

4.1.1. Policy Acceptance

Policy acceptability was most strongly affected by the presence of penalties or rebates (average importance = 45.71). Part-worth scores and mean scores indicated that: rebates were more acceptable than penalties; enabling policies were more acceptable than policies that left individuals to their own devices; and a tank register was more acceptable than random checking as a form of monitoring. Paired *t* tests and confidence intervals indicated that all differences between attribute means were significant. Results are displayed in Table 4.

Table 4. Average part-worth scores and average importance of policy features for acceptability.

Policy Feature and Level			*M* (*SD*)	*t* * (441)	Average Part-Worth Scores	Average Importance
1	Monitoring	Create a register	3.46 (1.26)	5.93	0.150	26.19
		Random checking	3.16 (1.33)		-0.150	
2	Enabling	Enablers	3.62 (1.32)	13.26	0.311	27.42
		No enablers	3.00 (1.24)		-0.311	
3	(dis)Incentives	Penalty	2.56 (1.38)	-22.65	-0.753	45.71
		Rebate	4.07 (1.37)		0.753	
		Constant			3.314	

Note. *All *t* values are significant at $p < .001$; Pearson's $r = .99$, $p < .001$

4.1.2. Policy Fairness

Policy fairness was most strongly affected by the presence of penalties or rebates (average importance = 57.53). Part-worth scores and mean scores indicated that: rebates were perceived as fairer than penalties; enabling policies were fairer than policies that left individuals to their own devices; and a tank register was fairer than random checking. Paired *t* tests and confidence intervals indicated that all differences between attribute means were significant. Results are displayed in Table 5.

Table 5. Average part-worth scores and average importance of policy features for fairness.

Policy Feature and Level			*M* (*SD*)	*t** (441)	Average Part-Worth Scores	Average Importance
1	Monitoring	Create a register	3.51 (1.10)	7.29	0.139	18.20
		Random checking	3.23 (1.21)		-0.139	
2	Enabling	Enablers	3.67 (1.23)	12.90	0.296	24.04
		No enablers	3.08 (1.15)		-0.296	
3	(dis)Incentives	Penalty	2.27 (1.28)	-30.70	-1.101	57.53
		Rebate	4.48 (1.36)		1.101	
		Constant			3.376	

Note. *All *t* values are significant at $p < .001$; Pearson's $r = .99$, $p < .001$

4.1.3. Policy Effectiveness

Policy effectiveness was most strongly affected by enabling factors (average importance = 38.85). Part-worth scores and mean scores indicated that: policies that contained enabling measures were perceived to be more effective than policies without; policies with rebates were perceived as more effective than policies with penalties; and a tank register was perceived as more effective than random checking. Paired *t* tests and confidence intervals indicated that all differences between attribute means were significant. Results are displayed in Table 6.

Table 6. Average part-worth scores and average importance of policy features for effectiveness

Policy Feature and Level			*M* (*SD*)	*t** (441)	Average Part-Worth Scores	Average Importance
1	Monitoring	Create a register	3.90 (1.15)	5.496	.111	21.48
		Random checking	3.68 (1.25)		-.111	
2	Enabling	Enablers	4.31 (1.39)	16.225	.516	38.85
		No enablers	3.27 (1.21)		-.516	
3	(dis)Incentives	Penalty	3.20 (1.44)	-18.205	-.586	38.77
		Rebate	4.38 (1.17)		.586	
		Constant			3.794	

Note. *All *t* values are significant at $p < .001$; Pearson's $r = .99$, $p < .001$

4.2. Policy Judgements as Predictors of Policy Acceptance

Multiple regression analyses were performed on each choice set of policies to determine the extent to which judgements of policy fairness and effectiveness predicted policy acceptability. In all eight choice sets, fairness and effectiveness were robust predictors of acceptance, with R^2 values ranging from .55 to .69. In all choice sets, perceived fairness was the most important variable for predicting policy acceptance. In five out of eight choice sets, perceptions of fairness were at least twice as important as effectiveness in predicting acceptability. Results are displayed in Table 7.

Table 7. Multiple regression analyses predicting policy acceptance from perceptions of effectiveness and fairness for eight choice sets.

	Choice Set							
	1	2	3	4	5	6	7	8
R^2	.63***	.62***	.55***	.59***	.64***	.60***	.69***	.60***
Effectiveness β	.28***	.36***	.17***	.32***	.41***	.09*	.27***	.24***
Fairness β	.60***	.45***	.63***	.53***	.47***	.72***	.65***	.56***

Note. *** $p < .001$, ** $p < .01$, * $p < .05$

4.3. Motivations for Tank Maintenance

4.3.1. Predicting Intention to Undertake Tank Maintenance

A hierarchical regression analysis was conducted to assess the extent to which an intention to undertake maintenance behaviour could be predicted with psychological variables (attitudes towards tank maintenance, normative pressure, perceptions of control, perceptions of difficulty, a sense of moral obligation, and a perceived self-identity for 'keeping things well maintained'). Results of the final model demonstrated that in combination, the psychological variables accounted for 82% of the variance in intention to undertake tank maintenance, $R^2 = .82$, adjusted $R^2 = .82$, $F(6, 526) = 404.026$, $p < .001$. All psychological variables were significant predictors of intention, and the most important variables were attitudes towards maintenance, a perceived self-identity as someone who keeps things well maintained, and perceptions of control. Standardised coefficients for each of the psychological variables are reported in Table 8.

Table 8. Hierarchical multiple regression analysis: Final model for predicting intention from psychological variables.

Psychological Variable	β	*t*	*p*
Attitude towards maintenance	**.39**	14.916	< .001
Subjective norm	**.10**	3.901	< .001
Perceived control	**.20**	8.126	< .001
Perceived difficulty	**-.07**	-3.616	< .001
Personal norm	**.09**	3.625	< .001
Self-identity to keep things maintained	**.31**	12.326	< .001

Note. β = standardised regression coefficients

4.3.2. Predicting Tank Maintenance Behaviour

To test the extent to which self-reported tank maintenance behaviour could be predicted with psychological variables, a hierarchical multiple regression analysis was performed. In combination an intention to undertake tank maintenance, the psychological variables accounted for 49% of the variance in self-reported behaviour, $R^2 = .49$, adjusted $R^2 = .49$, $F(7, 525) = 73.265$, $p < .001$. The final model indicated intention, perceived control and perceived difficulty were significant and direct predictors of tank behaviour. Analysis of the results of each step of the hierarchical regression demonstrated that attitude, perceived control, perceived difficulty and self-identity were predictors of behaviour but their influence was mediated by intention. Perceived control and perceived difficulty were not only mediated through intention, but also acted directly on behaviour. This mix of direct and mediated effects is in line with the expected role of perceived control within the TPB. Results of the final model are presented in Table 9.

Table 9. Hierarchical multiple regression analysis: Final model for predicting behaviour from psychological variables.

Psychological Variable	β	*t*	*p*
Intention to undertake maintenance	**.29**	3.924	< .001
Attitude towards maintenance [1]	-.08	-1.584	.114
Subjective norm	.07	1.751	.080
Perceived control	**.31**	6.990	< .001
Perceived difficulty	**-.18**	-5.060	< .001
Personal norm	.05	1.124	.262
Self-identity to keep things maintained	.06	1.317	.188

Note. β = standardised regression coefficients
[1]Inspection of the correlations of Attitude and Behaviour indicate a positive and significant relationship (r = .44), the sign reversal for attitude should therefore be disregarded as likely explained by the high correlation between Attitude and Intention (r = .78)

4.3.3. Predicting Support for the Introduction of Policy

On average, there was support among respondents for introducing measures to encourage tank maintenance behaviour (M = 5.13, SD = 1.66). Support was measured on a 1-7 scale with higher scores indicating a more favourable view. Multiple regression analysis (see Table 10) was used to determine the extent to which psychological variables predicted support for the introduction of policy measures to encourage tank maintenance. In combination, attitudes towards tank maintenance, normative pressure to undertake tank maintenance, perceptions of control and difficulty towards tank maintenance, a sense of moral obligation to maintain a tank, and self-identity as someone who keeps things maintained accounted for 16% in the variance of support for policy measures (adjusted R^2 = .15, $F(6, 526) = 16.819$, $p < .001$). By Cohen's convention, this is a medium effect size where R^2 of .0196 is considered small, R^2 of .13 is considered medium, and R^2 of .26 is considered large (Allen and Bennett, 2010). The significant predictors were attitude, perceived control, personal norms, and self-identity. Attitude and control were the more important variables relating to support for the introduction of policy measures to encourage tank maintenance. People with more positive attitudes to tank maintenance, stronger personal norms about tank maintenance, and a self-image as a person who keeps things maintained were more supportive of monitoring. Of interest, perceived control was a negative predictor of support, indicating that individuals with higher levels of control had lower levels of support for the introduction of policy. Note that this result suggests that people who believe they can carry out this maintenance themselves might not see the need for a policy to exist.

Table 10. Multiple regression analysis: Predicting support for introduction of policy from psychological variables.

Psychological Variable	β	*t*	*p*
Attitude towards maintenance	**.33**	5.822	< .001
Subjective norms	-.04	-.038	.482
Perceived control	**-.19**	-3.526	< .001
Perceived difficulty	.06	1.347	.179
Personal norms	**.12**	2.233	.026
Self-identity to keep things maintained	**.13**	2.294	.022

4.3.4. Predicting Support for Monitoring Tank Maintenance

On average, there was not strong support for monitoring tank maintenance ($M = 3.37$, $SD = 1.91$). Support was measured on a 1-7 scale with higher scores indicating a more favourable view. To determine the extent to which psychological variables predicted support for monitoring tank maintenance, a multiple regression analysis was conducted (see Table 11). In combination, the psychological variables accounted for 20% of the variance in support for monitoring (adjusted $R^2 = .19$, $F(6, 526) = 22.195$, $p < .001$). By convention this is a medium effect size. The significant predictors were attitudes, perceptions of control, and personal norms. People with more positive attitudes to tank maintenance, and people with stronger personal norms about tank maintenance, were more supportive of monitoring. Again, perceptions of control were a negative predictor of support for monitoring, indicating that people with higher perceptions of control were less supportive of monitoring.

Table 11. Multiple regression analysis: Predicting support for monitoring tanks from psychological variables

Psychological Variable	β	*t*	*p*
Attitude towards maintenance	**.30**	5.482	< .001
Subjective norm	.05	1.030	.303
Perceived control	**-.30**	-5.801	< .001
Perceived difficulty	.07	1.607	.109
Personal norm	**.22**	4.130	< .001
Self-identity to keep things maintained	.001	.021	.983

4.3.5. Predicting Policy Acceptance and Policy Judgments from Psychological Variables

Multiple regression analyses (see Table 12) were conducted to determine the extent to which the psychological variables explained policy acceptance, and judgments of fairness and effectiveness for the two most favoured policies (choice set 2 and choice set 8). In combination, the psychological variables accounted for 13%, 20% and 24% in respective variance for acceptance, fairness and effectiveness. The significant predictors for all three measures were attitudes, perceptions of control and perceptions of difficulty, with attitudes towards maintenance behaviour the most important predictor. These results indicate that people's attitudes towards the benefits of undertaking the behaviour, their perceptions of how confident they are to perform maintenance behaviour, and how difficult the behaviour is, contribute to a person's judgment of the policy being fair, effective and acceptable. The more favourable they feel towards tank maintenance, the less control they have and the more difficult they see the task, the more they are supportive of policy that promotes enabling and contains an incentive.

Table 12. Multiple regression analysis: Predicting policy acceptance and policy judgements from psychological variables.

	Policy Acceptance[1]	Perceived Fairness[1]	Perceived Effectiveness[1]
R^2	.13	.20	.24
$F(6,435)$	10.553***	17.859***	22.427***
Psychological Variables	**β**	**β**	**β**
Attitude towards maintenance	**.42*** **	**.50*** **	**.51*** **
Subjective norm	-.03	-.07	-.09
Perceived control	**-.14***	**-.18****	**-.13***
Perceived difficulty	**.11***	**.10***	**.12***
Personal norm	-.07	-.02	.05
Self-identity to keep things maintained	.05	.09	.09

Note. *** $p < .001$, ** $p < .01$, * $p < .05$
[1] Policy measures are from the two most preferred choice sets (Choice set 2 and 8)

4.3.6. Differences in Motivations Based on Type of Tank Ownership

One-way ANOVAs were conducted to determine differences in tank behaviour, intention to undertake tank maintenance, attitudes towards tank maintenance, perceptions of normative pressure, perceptions of control, perceptions of difficulty, a sense of moral obligation, and a perceived self-identity for 'keeping things well maintained', between retrofitted and non-retrofitted tank owners. There were no statistically significant differences in the psychological variables based on type of tank ownership.

4.3.7. Differences in Motivations Based on Usage of Tank Water

A series of one-way ANOVAs was conducted to look for differences between tank owners that use their water mainly outdoors and those that use the water indoors, across measures of tank maintenance behaviour, intention to undertake tank maintenance, and the psychological variables described earlier. Using a Bonferroni adjusted alpha of .006, there were significant differences in all levels of the psychological variables, except for perceived self-identity, with indoor users demonstrating higher levels of the variables. This result indicates that people who use their tank water indoors have greater intentions to undertake tank maintenance, have more favourable attitudes towards maintaining a tank, demonstrate greater control beliefs, perceive maintenance as less difficult, feel a greater sense of moral obligation to keep the tank maintained, perceive more normative pressure to keep the tank maintained, and report higher levels of tank maintenance behaviour, than do people who only use their tank water outdoors. There was no statistical significant difference between indoor and outdoor tank water users in perceptions of themselves as being someone who keeps things well maintained. Table 13 displays these results.

Table 13. Differences in motivations based on use of tank water: outdoor use and indoor use.

Variable		*M*	*SD*	*F*(1,435)	Effect size η^2
Maintenance behaviour	Outdoor	4.80	1.28	27.924***	.060
	Indoor	5.44	1.17		
Intention	Outdoor	5.27	1.16	27.762***	.060
	Indoor	5.85	1.10		
Attitude	Outdoor	4.97	1.16	35.863***	.060
	Indoor	5.55	1.08		
Normative pressure	Outdoor	4.57	1.57	27.786***	.060
	Indoor	5.33	1.35		
Perceived control	Outdoor	4.97	1.39	15.236***	.034
	Indoor	5.49	1.30		
Perceived difficulty	Outdoor	3.81	1.58	19.615***	.043
	Indoor	3.12	1.63		
Moral norm	Outdoor	4.33	1.50	15.735***	.035
	Indoor	4.94	1.65		
Self-identity	Outdoor	5.53	1.12	5.355	.012
	Indoor	5.77	1.05		

Note. *** $p < .001$, ** $p < .01$
Effect size: By Cohen's convention $\eta^2 = .01$ considered small, $\eta^2 = .059$ considered medium, $\eta^2 = .138$ considered large

4.4. Contextual Framing

To determine the influence of contextual framing (generic, public health risk, and drought mitigation) on policy acceptance, and judgements of fairness and effectiveness a series of one-way ANOVAs was conducted. There were no statistically significant differences in mean scores for acceptability, perceived effectiveness, or perceived fairness among the generic, public health, or drought contexts for any of the eight choice sets.

A further series of one-way ANOVAs was conducted to determine the influence of context (generic, public health risk, and drought mitigation) on intention to undertake tank maintenance, attitudes towards tank maintenance, perceptions of normative pressure, perceptions of control, perceptions of difficulty, and a sense of moral obligation. There were no statistically significant differences in the psychological variables among the three different contexts. This result indicates the framing of the policy did not appear to affect people's reactions to policy options or to measured psychological variables. These results were not in line with expectations, where the contexts of public health risk and drought mitigation were expected to affect people's evaluations of policy options.

4.5. General Tank-Related Behaviour

4.5.1. Use of Tank Water

Tank water was mainly used outdoors by approximately 60% of respondents, with the remaining 40% reporting they use tank water either solely indoors or both indoors and outdoors.

4.5.2. Tank Maintenance Awareness

In general, there was low awareness of tank maintenance behaviour. Approximately 63% of respondents either didn't know that a tank had to be maintained or didn't know what needed to be done to maintain a rainwater tank. Only 37% of respondents reported being both aware of the need for tank maintenance and knowing what to do.

4.5.3. Tank Maintenance Behaviours

Self-reports of five different tank maintenance behaviours were measured on a scale of 1 to 7, with a higher score indicating more maintenance behaviour. On average, people most commonly reported undertaking clearing gutters and cleaning insect screens. De-sludging the tank was rarely reported. Table 14 summarises these results.

Table 14. Self-reported tank maintenance.

Maintenance Activities	*M*	*SD*
Keep the gutters clear of leaves and other matter	5.59	1.41
Keep insect screens that cover the inlet and outlet pipes to the tank, in good working condition	5.63	1.43
Check the tank for cracks, holes, or leaks	5.54	1.50
Check the water quality	5.01	1.73
Check and keep the bottom of the tank clean of sludge	3.99	1.90

5. DISCUSSION

In general, the results indicate that low levels of awareness regarding tank maintenance exist, and that there is support for the introduction of measures to encourage tank maintenance. However, the types of measures incorporated in any policy are important to people's acceptance, and concepts of fairness and effectiveness seem to underpin their acceptance.

The results identified incentives and disincentives as the most important feature for policy acceptance, and for judgements of both fairness and effectiveness. Policies that included an incentive were viewed most favourably in terms of acceptability, fairness, and effectiveness; and policies that included a penalty for not maintaining a tank were viewed least favourably. Notably, the (dis)incentive feature was strongly related to fairness, with (dis)incentives demonstrating more than twice the level of importance than the presence, or not, of enablers, or the type of monitoring that was used.

Enabling features were strongly related to judgements of policy effectiveness. Results demonstrated that enabling features were equally as important as (dis)incentives when it came to perceptions of effectiveness, and that those policies that included enablers were judged as the most effective. The policies that left tank holders to their own devices were viewed as the least effective.

The type of monitoring employed in the policy was the least important feature, compared to the presence of (dis)incentives or enablers, in terms of policy acceptance, and judgements of fairness and effectiveness. Although policies that included tank registration were viewed more favourably than those policies that included random checking, there was minimal difference in judgments, and both were viewed quite negatively.

A person's judgements of fairness and effectiveness appear to be important factors in determining acceptability of a policy related to tank maintenance. Fairness emerged as the more important predictor of acceptance, and in the majority of choice sets was at least twice as important as effectiveness.

Overall, the results indicated that both policy features and the consequent policy judgements appear to influence policy acceptance. Policy features engender judgements of fairness and effectiveness, and in turn influence overall policy acceptance. Certain features appear to contribute more to judgments of fairness or effectiveness. In this research context, (dis)incentives are a major contributor to fairness, and enablers to effectiveness. In addition, fairness contributes more to policy acceptance than effectiveness. A simplistic view of the relationship of policy features to policy judgements and policy acceptance is illustrated in Figure 4.

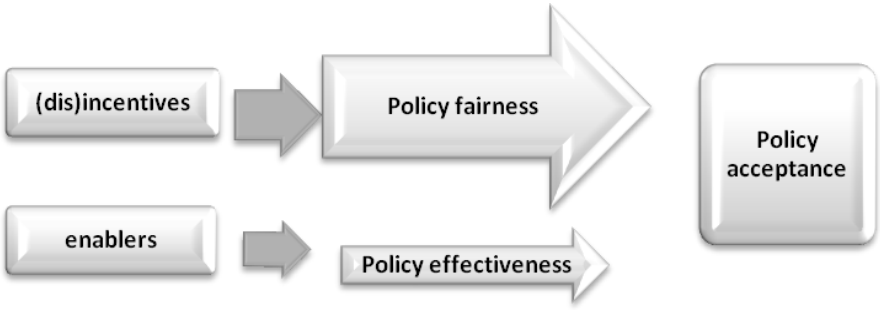

Figure 4. Policy features, policy judgements and policy acceptance.

This type of understanding is helpful when dealing with maintenance of rainwater tanks, and highlights the importance of fairness. Previous focus group research identified a sense of agency or autonomy as a benefit of owning a rainwater tank (Walton *et al.*, 2012). This represented the freedom to use the tank water in a manner that the tank owner wanted, for example in the garden or swimming

pool, beyond water restrictions. This notion of freedom seemed to extend to the maintenance of the tank, with tank maintenance somehow infringing on this personal sense of freedom and autonomy. Furthermore, the focus group research identified a freedom to choose various options for maintaining a tank as important. These views could explain, in part, the importance of fairness to tank maintenance policy.

In the present study, no specific costs of the different policy options were provided to participants. Clearly the cost of different options would be expected to strongly influence public responses, as well as depending on whether the costs were applied directly to householders in the form of fees or fines, or applied indirectly in the form of council rates. However, these policy options are as yet notional, and have not been fully costed, so it was not feasible to present legitimate estimates of specific costs to participants.

Individuals' attitudes and motivations towards tank maintenance behaviour were significant predictors of policy acceptance, and judgements of fairness and effectiveness. This was the same for explaining general support for the introduction of measures to both encourage and monitor tank maintenance. The important motivations were attitudes regarding the benefits of tank maintenance and control perceptions. Of note was that people who felt they were in control of tank maintenance or perceived it as easy were more likely to view policies or the general introduction of measures to encourage and monitor tank maintenance, as unacceptable, unfair or ineffective. This suggests that people who already feel they are adequately maintaining their tank are not supportive of measures to encourage tank maintenance, or the introduction of any sort of monitoring of tank maintenance.

The results also demonstrated that individual motivations to undertake tank maintenance could, in part, be explained by the six psychological variables: attitudes, normative pressure, beliefs of control and difficulty, a sense of moral obligation and self-identity. These variables of the extended-TPB model explained considerable variance in people's intention to undertake tank maintenance. The most important factors were attitudes towards tank maintenance, self-identity for keeping things maintained, and perceptions of control. This result suggests that interventions that promote the benefits of tank maintenance over the costs of not keeping a tank maintained could foster a favourable attitude towards tank maintenance, and could be beneficial. Similarly, solutions that link tank maintenance with other home maintenance activities could be appealing to those who see themselves as someone who keeps things maintained. For example, including tank maintenance as part of a routine swimming pool check or pest control could facilitate tank owners to incorporate tank maintenance into a broader home maintenance schedule. Previous qualitative findings underpin these suggestions. Finally, interventions that support a person's belief in their own capability and provide confidence to undertake tank maintenance could be effective. Education initiatives, awareness campaigns, and information services would be the types of measures that could result in improved control beliefs, and ultimately tank maintenance behaviour. Support for these types of enabling initiatives was confirmed by the findings that enablers were important to a judgement of policy effectiveness and policy acceptance. Importantly, offering a range of enablers would not only contribute to differing needs of tank owners, but also to perceptions of policy fairness.

Individual motivations also seemed to be able to explain self-reported tank maintenance behaviour. Favourable intentions to undertake the behaviour and beliefs in capability explained the extent to which people reported performing the tank maintenance activities. Of relevance to these findings is that capability beliefs act directly on behaviour. This finding indicates that even with a positive intention to undertake tank maintenance, if a person doesn't feel capable or confident of his or her ability to undertake tank maintenance, then tank maintenance is less likely to occur. This finding highlights the importance of providing enablers as a policy intervention to support tank maintenance behaviour.

It is noted that self-reported tank maintenance behaviour was relatively high, with four of the five maintenance behaviours showing average responses well above the scale midpoint. It is likely that some degree of self-reporting bias is in effect: participants may be skewing their own responses to present themselves in a more socially acceptable light. Research using actual measures of maintenance behaviour would address this issue, but is obviously much more complex and resource intensive to conduct.

Results indicated differences in motivations based on how the tank water was used. Individuals who mainly used their tank water outdoors demonstrated lower levels of intention and in all the underlying motivations, except for self-identity, than individuals who used their water indoors. This suggests that the benefit to outdoor water users of having a tank is not seen as great as it is by indoor water users. Alternately, outdoor water users are less concerned with the quality of the tank water than when it is used indoors for toilets and washing machines.

Contextual framing of the problem did not seem to influence policy acceptance, judgements of policy fairness and effectiveness, nor motivations to keep a tank maintained. Results indicated no difference among the different policy rationales. The need for maintenance based on mitigation of a potential public health risk, or as a way for future drought-proofing, showed no difference from the generic context. This result was counter to expectations, in which a public health risk and a drought mitigation context had been expected to increase policy acceptance. Previous findings from focus group research indicated that, in these types of situations, people would be more amenable to policy interventions directed at improving and ensuring tank maintenance. This influence was particularly evident for the public health risk context. A potential explanation for this finding is that the experimental manipulation in this present research was not strong enough to evoke the reaction expected.

6. CONCLUSION

This research has investigated community acceptance of policies aimed at encouraging maintenance of domestic rainwater tanks. It has examined four factors that contribute to policy acceptance: policy features, judgements of fairness and effectiveness, individual motivations, and contextual framing. Results demonstrated the relative importance of the type of monitoring, the presence of enabling factors, and incentives and disincentives in relation to perceptions of acceptance, fairness, and effectiveness. Incentives and enabling factors emerged as the most important features for policy acceptance, and judgements of fairness and effectiveness. Judgements of fairness were identified as more important to policy acceptance than effectiveness, yet both contributed to a person's evaluation of policy acceptability.

The research identified that low levels of awareness and high levels of motivation existed in relation to people's views surrounding tank maintenance. The main drivers of motivation were attitudes, feelings of capability and a self-identity for keeping things maintained. The findings also demonstrated that individual motivations contributed to policy acceptance, and that attitudes and perceptions of control were important psychological variables for acceptance. Some differences existed in the levels of motivation and underlying psychological factors based on tank usage. Contrary to expectations, no increased differences were identified in policy acceptance, based on contextual framing of a public health or a drought proofing situation.

Overall, this research provides authorities with findings useful for practical policy development in the water domain, and contributes to the conceptual understanding of sustainability governance issues.

APPENDIX A: Introductory Information

1. Generic Version

Please read this general information about rain water tanks.

There are over 300,000 household rain water tanks in South East Queensland.

All together, rain water tanks make a significant contribution to water savings in the region.

However, tanks need to be maintained to ensure that the tank is kept in sound functioning order.

By maintaining a tank it prevents things going wrong with the tank and the pump.

2. Public Health Version

Please read this general information about rain water tanks.

There are over 300,000 household rain water tanks in South East Queensland.

All together, rain water tanks make a significant contribution to water savings in the region.

However, tanks need to be maintained to ensure that the tank is kept in sound functioning order.

By maintaining a tank it prevents things going wrong with the tank and the pump.

Maintaining a tank also reduces the likelihood of insects getting into the tank, and helps to make sure that there is minimal risk of mosquito related illnesses becoming a problem.

3. Drought Mitigation Version

Please read this general information about rain water tanks.

There are over 300,000 household rain water tanks in South East Queensland.

All together, rain water tanks make a significant contribution to water savings in the region.

However, tanks need to be maintained to ensure that the tank is kept in sound functioning order.

By maintaining a tank it prevents things going wrong with the tank and the pump.

Maintaining a tank also helps the region to combat the problems of drought, and this is important because we live in a drought- prone area with future droughts likely.

APPENDIX B: Survey Questions

(The survey version was implemented online and cannot be reproduced as it was displayed.

(Screener questions)

Which place best describes the region where you live?

- Gold Coast
- Brisbane
- Sunshine coast
- Moreton Bay
- Redlands
- Logan
- Ipswich
- Toowoomba (TERMINATE)
- Scenic Rim
- Lockyer Valley
- Somerset
- Other (TERMINATE)

What is your age?

- 18-24
- 25-29
- 30-34
- 35-39
- 40-44
- 45-49
- 50-54
- 55-59
- 60-64
- 65+

What is your sex?

Male
Female

What best describes your current living situation

- Home owner occupier
- Home renter (TERMINATE)

Does the dwelling you are living in have a rain water tank

- Yes
- No (TERMINATE)

Information sheet

Purpose of the research
This research is trying to understand the community's response to various policy ideas that the government or councils could introduce, to help encourage and assist people in keeping their rainwater tanks working well. This research will provide valuable information to people involved in planning the region's water security and developing water policy.

Who is conducting the research?
The workshop is being conducted by the CSIRO as a research partner of the Urban Water Security Research Alliance (UWSRA). The UWSRA is a research affiliation between the Queensland Government, the CSIRO, Griffith University and the University of Queensland.

What is involved?
Your participation involves completing an online survey that will first ask you to read some brief background information, and then to answer some questions. The questions are about your views towards water tanks and how best to manage water tanks, and some general questions about you. You are not required to have any special knowledge about rainwater tanks.

The survey will take approximately 15 minutes to complete. It is voluntary and you are free to withdraw at any time. You do not have to answer any questions with which you feel uncomfortable.

What happens with the information?
All information collected during the research will remain confidential. Although results of the study may be published in academic and professional journals, no identifying information will be used. In order to comply with ethical guidelines, there will be full maintenance of confidentiality and anonymity. A copy of the results will be made available to each participant upon request. This can be done by clicking on the button at the end of the survey that asks to receive a summary of the research.

What are the risks to you?
Participation in this study should involve no physical or mental discomfort, and no risks beyond those of everyday living. If, however, you should find any question to be invasive or offensive, you are free to omit answering that question. If you have any concerns about any aspects of the study, please contact us through the details below.

Will you receive any payment for taking part in the study?
You will receive (insert the incentive provided by the panel listing company), which is an arrangement you have with (insert the name of the panel listing company)

Ethical clearance and Contacts

This study has been cleared in accordance with the ethical review processes of CSIRO and falls within the guidelines of the National Statement on Ethical Conduct in Human Research. If you have any questions concerning your participation in the study feel free to contact the researchers involved. If you would like to speak to an officer from the CSIRO not involved in the study, please contact the CSIRO Human Research Ethics officer on (07) 38335693

Thank you for your help with this important research.
Yours sincerely,

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Welcome to the Rain Water Tank Survey

Thank you for agreeing to participate in this survey.

By clicking on the "Next >>" button below and continuing with the survey, you are indicating that you:

Have understood the information provided about this research
Have had all questions answered to your satisfaction
Understand that if you have any additional questions you can contact the research team
Understand that you are free to withdraw at any time, without comment or penalty Understand that your participation in the study is voluntary
Understand you will not be able to be identified from the information collected
Understand that anonymity will be safeguarded in any publication of the results
Understand that you can contact the research team if you have any questions about the project, or the CSIRO Human Research Ethics officer on (07) 38335693
Agree to participate in this project.

Thank you for agreeing to participate in this survey

In this survey we will be asking you about rainwater tanks.

We are interested in your views and opinions about maintaining rain water tanks.

There are no right or wrong answers and you are free to withdraw at any time.

Although some of the questions may seem similar it is important you answer all the questions to the best of your ability. The survey should take about **15** minutes to complete.

Please read the next two pages of background information carefully.

Next >>

Please read carefully

Important Background Information

There are over 300,000 household rain water tanks in South East Queensland.

Together, rain water tanks make a significant contribution to water savings in the region.

However, tanks need to be maintained to ensure that the tank is kept in sound functioning order.

By maintaining a tank it helps to ensure the quality of the water, and prevents things going wrong with the tank and the pump.

Next >>

To maintain a rain water tank, experts recommend the following schedule

Every 6 months

Clear the gutters, first flush box, and roof of leaves and other matter

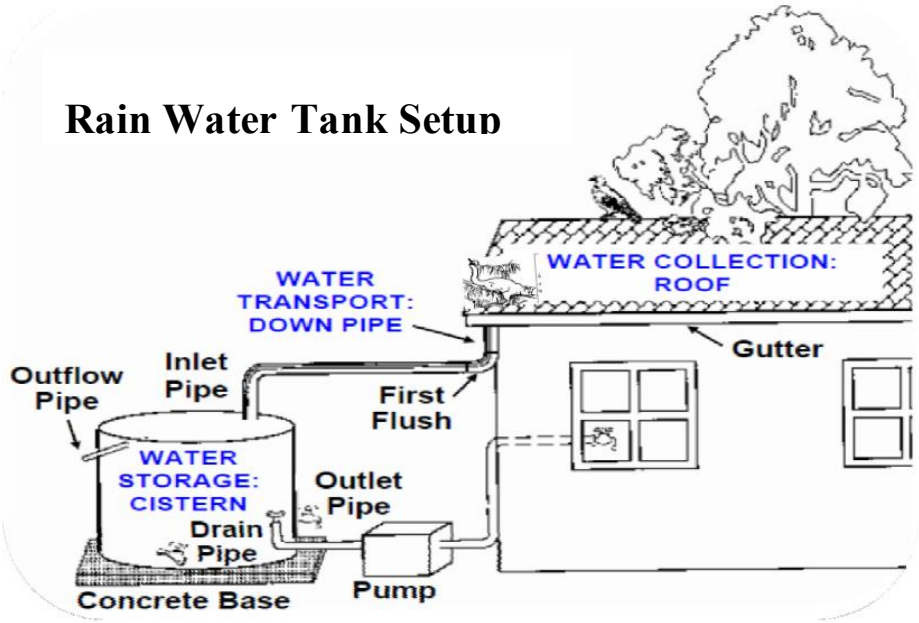
Check that the insect screens, which cover the inlet and outlet pipes to the tank, are in good condition

Check the tank for any cracks, holes, or leaks

Check the water quality by looking at the colour and smell of the water

Every 3-5yrs

Clean any sludge from the bottom of the tank – this involves getting a plumber or tank cleaner



Next >>

Please choose the answer that best describes your level of awareness, *prior to this survey*, about tank maintenance:

- I was unaware that a tank needed to be maintained
- I was aware that a tank needed to be maintained, but wasn't sure what to do
- I was aware that a tank needed to be maintained, and knew what to do

I am in favour of the introduction of measures to encourage people to maintain their rain water tanks						
Strongly disagree						Strongly agree
1	2	3	4	5	6	7

I support some form of monitoring (e.g. by council) to ensure that rain water tanks are being maintained:						
Strongly disagree						Strongly agree
1	2	3	4	5	6	7

We would like your views about different options that governments or councils could use to encourage tank owners to maintain their rain water tanks.

We will present you with **eight different options**. Each option is brief and easy to understand, and is a 'package' of initiatives with three parts.

Please read each option carefully, and then evaluate the options as a total 'package'. Consider the three initiatives in combination when you answer the questions below.

Option 1

- Introduce a tank register
- Provide tank owners with information on how to maintain a tank e.g. brochures, web-site, lists of plumbers and tank cleaners, instructions placed on the tank
- Fine tank owners for not maintaining their tank

Please indicate how much you agree with the following statement:

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
This option is acceptable to me							
This option will encourage people to maintain their tanks							
This option is fair							

Next >>

Option 2

- Introduce a tank register
- Provide tank owners with information on how to maintain a tank e.g. brochures, web-site, lists of plumbers and tank cleaners, instructions placed on the tank
- Offer a rebate to tank owners for maintaining their tank

Please indicate how much you agree with the following statement:

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
This option is acceptable to me							
This option will encourage people to maintain their tanks							
This option is fair							

Next >>

Option 3

- Introduce a tank register
- Leave tank owners to their own devices to find information on how to maintain a tank
- Fine tank owners for not maintaining their tank

Please indicate how much you agree with the following statement:

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
This option is acceptable to me							
This option will encourage people to maintain their tanks							
This option is fair							

Next >>

Option 4

- Introduce a tank register
- Leave tank owners to their own devices to find information on how to maintain a tank
- Offer a rebate to tank owners for maintaining their tank

Please indicate how much you agree with the following statement:

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
This option is acceptable to me							
This option will encourage people to maintain their tanks							
This option is fair							

Next >>

Option 5

- Introduce random checking of tanks
- Leave tank owners to their own devices to find information on how to maintain a tank
- Offer a rebate to tank owners for maintaining their tank

Please indicate how much you agree with the following statement:

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
This option is acceptable to me							
This option will encourage people to maintain their tanks							
This option is fair							

Next >>

Option 6

- Introduce random checking of tanks
- Leave tank owners to their own devices to find information on how to maintain a tank
- Fine tank owners for not maintaining their tank

Please indicate how much you agree with the following statement:

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
This option is acceptable to me							
This option will encourage people to maintain their tanks							
This option is fair							

Next >>

Option 7

- Introduce random checking of tanks
- Provide tank owners with information on how to maintain a tank e.g. brochures, web-site, lists of plumbers and tank cleaners, instructions placed on the tank
- Fine tank owners for not maintaining their tank

Please indicate how much you agree with the following statement:

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
This option is acceptable to me							
This option will encourage people to maintain their tanks							
This option is fair							

Next >>

Option 8

- Introduce random checking of tanks
- Provide tank owners with information on how to maintain a tank e.g. brochures, web-site, lists of plumbers and tank cleaners, instructions placed on the tank
- Offer a rebate to tank owners for maintaining their tank

Please indicate how much you agree with the following statement:

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
This option is acceptable to me							
This option will encourage people to maintain their tanks							
This option is fair							

Next >>

Please respond to each of the following statements

Keeping my rainwater tank maintained would be:						
Of no benefit 1	2	3	4	5	6	Extremely Beneficial 7
Unimportant 1	2	3	4	5	6	Extremely Important 7
Unpleasant 1	2	3	4	5	6	Pleasant 7
Dissatisfying 1	2	3	4	5	6	Satisfying 7

My view towards keeping a rain water tank maintained is:						
Extremely unfavourable 1	2	3	4	5	6	Extremely favourable 7
Extremely negative 1	2	3	4	5	6	Extremely positive 7

I expect I will keep my rain water tank maintained						
Strongly disagree 1	2	3	4	5	6	Strongly agree 7

Please indicate how much you agree with the following statement

	Strongly Disagree 1	**2**	**3**	**4**	**5**	**6**	**Strongly Agree 7**
It would be in my interests to keep my rainwater tank well maintained							
It would be good to keep my tank well maintained							
I would find keeping my tank maintained difficult							
Keeping my tank maintained is something I would have complete control over							
I am confident that I could keep my rain water tank well maintained							
I would feel a sense of moral obligation to keep my tank maintained							
I would feel guilty if I didn't maintain my tank							
I see myself as someone who likes to keep things well maintained							
I intend to maintain my rain water tank							
People who are important to me would think I should maintain the tank							
Most people who are important to me would approve of me keeping the tank maintained							
I want to try to keep my rainwater tank maintained							
I think of myself as someone who likes to keep things in good working order							

How do you use the water from your rain water tank?

- Mainly for outdoor use
- Mainly for indoor use
- Both indoor and outdoor use
- Don't know

Approximately, how many years ago was your rain water tank installed?

(Drop down menu with options <1,1,2,3,4,5,6,7,8,9,10, >10, Don't know)

Please choose the answer that best explains your situation

- We got a rainwater tank automatically when building our new house
- We retrofitted the tank to our house, and got a subsidy
- We retrofitted the tank to our house, but got no subsidy
- The tank was already at the house when we bought it

Please indicate the extent to which you agree with the following about your rain water tank:

	Strongly Disagree 1	2	3	4	5	6	**Strongly Agree** 7
I / we keep the gutters clear of leaves and other matter							
I / we keep the insect screens, which cover the inlet and outlet pipes to the tank, in good condition							
I / we check the tank for cracks, holes, or leaks							
I / we regularly check the quality of the water i.e. the colour and smell of the water							
I / we check and keep the bottom of the tank clean of sludge							

Approximately, what is the household's annual income before tax?

- Less than $30,000
- $30,000 – 59,999
- $60,000 – 89,999
- $90,000 – 119,000
- $120,000 – 149,000
- More than $150,000

What best describes the situation of your household?

- Single person
- Retired couple
- Couple with no kids at home
- Family with small children
- Family with teenagers or adult children
- Share accommodation

How many people regularly live in your house?

Drop down menu – 1,2,3,4,5,6,7,8,9,10,11,12, >12

Well done you have reached the end of the survey

Thank you for taking the time to participate in this important study

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Urban Water Security Research Alliance

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