Exploring Interventions to Encourage Rainwater Tank Maintenance

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February 2012

Urban Water Security Research Alliance
Technical Report No. 59

Queensland Government
National Research FLAGSHIPS Water for a Healthy Country
CSIRO
Griffith UNIVERSITY
The University Of Queensland AUSTRALIA

Urban Water Security Research Alliance Technical Report ISSN 1836-5566 (Online)
Urban Water Security Research Alliance Technical Report ISSN 1836-5558 (Print)

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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Walton, A., Gardner, J., Sharma, A., Moglia, M, and Tjandraamadja, G. (2012). *Exploring Interventions to Encourage Rainwater Tank Maintenance.* Urban Water Security Research Alliance Technical Report No. 59.

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ACKNOWLEDGEMENTS

This research was undertaken as part of the South East Queensland Urban Water Security Research Alliance, a scientific collaboration between the Queensland Government, CSIRO, The University of Queensland and Griffith University. Particular thanks go to workshop and focus group participants for their time and input.

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.

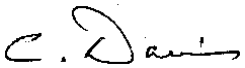
As the largest regionally focused urban water research program in Australia, the Alliance is focused on water security and recycling, but will align research where appropriate with other water research programs such as those of other SEQ water agencies, CSIRO's Water for a Healthy Country National Research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

Rainwater tanks are now present in many homes throughout South East Queensland and make a valuable contribution to the water security of the area. There are estimated to be in excess of 300,000 tanks in the region, with one in three homes owning a tank. However, it is important that rainwater tank systems are maintained to ensure proper functioning and ongoing use. Research to date suggests that few tank owners undertake any maintenance of their tanks. This issue is a concern for government and water planners because of the potential implications for public health, strategic water planning and loss of publicly subsidised assets, if people abandon their tanks due to failure. This study addresses this problem by investigating community acceptance of various policy intervention options that a governing authority could use to encourage tank maintenance at the household level.

The research was conducted as a two-phase sequential qualitative study, collecting data from government and industry stakeholders, and from the community. The study used a workshop and focus groups as the methods for collecting data, and analysed and reported on findings using a qualitative approach. A workshop involving government and industry stakeholders identified a range of possible policy intervention options, ranging from self-management to regulatory approaches. From this range of policies, eleven interventions were presented to three community groups: retrofitted tank owners, mandated tank owners, and non-tank owners in focus group sessions. Community attitudes and views towards these options were sought, in particular with regard to perceived acceptability and effectiveness.

In general, the findings suggested that there was some congruence between policy makers and consumers regarding possible policy interventions to foster tank maintenance behaviour. Both groups supported self-management approaches and improvements to design and installation as effective options for fostering tank maintenance behaviour. More coercive approaches that regulated ongoing maintenance, through use of tank registers and inspections, were the least favoured strategies amongst stakeholder and community groups. However, there was evidence that a potential public health risk, for example mosquito-borne illnesses, could influence these views, and could result in greater acceptance by the community of regulatory approaches for ongoing maintenance.

Self-management approaches were viewed as both easy to implement and an effective solution to tank maintenance. Central to these approaches were: increasing community awareness; communicating the benefits and value of tank maintenance; and providing a web-based resource with various support services, including a maintenance schedule tailored to the individual tank owner. Findings suggested that if tank owners were provided with options for getting their tank maintained, ranging from ‘do it yourself’ information through to buying services, that this would enable many tank owners to maintain their tanks. This approach, combined with an effective communication program, would increase motivation for keeping a tank maintained. Another positively viewed option was regulatory changes for improving design and installation. This approach was considered harder to achieve, but was viewed as equally effective and acceptable as the self-management approaches. It was recognised that improvements in design and installation could prevent future maintenance problems (although only for new tanks); making this approach compelling to both policy stakeholders and the community groups.

For the policy stakeholders, creation of tank registers was considered beneficial as a way of managing tank assets, but there were mixed views as to the effectiveness of this strategy and of the difficulty of implementation. Suggestions for creating a register ranged from compulsory registration through to registration and certification linked to tank installation. However, for the community, creating a register of tanks was the most negatively viewed option. Not only was a register viewed with suspicion (as a potential precursor of inspections, fees and fines), but also as an ineffective option for achieving tank maintenance. The community participants suggested that this type of approach could lead to people abandoning their tanks. A register, and associated fees and inspections, would add to the cost burden of tank maintenance and erode any savings benefit of having a tank (a benefit already considered marginal). Also, it would militate against the tank owner’s sense of autonomy, which was viewed as an important reason for having a tank.

A home-based service modelled on the 'Climate Smart' program was popular with the community, but there was minimal support from policy stakeholders, even though this idea was considered an easy, albeit costly, option to implement. Finally, regulation as a way of achieving ongoing maintenance was seen as the hardest to implement and least preferable option by policy stakeholders; and was also considered unacceptable by the community groups. This approach incorporated routine inspections and associated penalties, and was modelled on current swimming pool regulations. However, there was more support for routine tank inspections if undertaken at the time of tank installation, or integrated into home inspections at the point of sale of a home.

The community's acceptance of the various policy interventions seemed to relate to attitudes and views around seven factors, some of which were fundamental to the decision to get a tank in the first place, and some more directly related to performing tank maintenance. The original drivers of tank purchase, particularly for retrofitted tank owners, were: a positive view towards savings on water costs; the appeal of being autonomous and able to use water freely; and awareness of the environment. These factors were considered benefits of owning a tank, and confirmed as such by mandated tank owners, although to a lesser degree. A sense of self-efficacy in maintaining the tank, a concern for doing the right thing, and self-perceptions of being someone who looks after things, also underpinned tank maintenance behaviour.

Community responses to different potential interventions can be seen as reflecting these different motivations. For example, interventions that promoted efficacy were deemed to be acceptable and effective by the participants. Any interventions that potentially eroded any relative cost advantage were assessed negatively. In particular, policy ideas that interfered with a sense of autonomy were viewed most negatively. Most participants did not see tank maintenance as requiring a regulatory approach from government. Rather, people viewed regulatory approaches were seen as unnecessary and as 'nannying' by the State. As a consequence, these types of approaches were viewed with suspicion, and a perceived risk that any such attempts to regulate tank maintenance could result in owners choosing to abandon their tanks.

In conclusion, this research explored possible policy options for encouraging tank maintenance, and investigated community attitudes and views towards these options. Via a qualitative approach, the research has provided rich descriptive information on the relevant issues surrounding tank maintenance. However, qualitative research cannot make claims about the wider population's attitudes. To more fully understand the applicability of this study's findings, a quantitative approach is required. In this way, it would be possible to measure community attitudes towards these options more broadly, and to provide a more detailed assessment of the relative value placed on each of the various options.

1. INTRODUCTION

1.1. Background

Installation of rainwater tank systems in South East Queensland has become widespread in response to concern for water security in the region. Over the past five years it is estimated that more than 300,000 rainwater tanks have been installed in homes around the Brisbane, Gold Coast and Sunshine Coast areas (Australian Bureau of Statistics, 2010). This activity has been in response to the 2000-2008 Millennium Drought, described as one of the worst in the region's history. Some tank installation has been supported by state government rebate schemes, which resulted in many home owners retrofitting tanks to their existing properties. Since 2007, installation of a tank has become a mandatory requirement of building a new home in the region (Queensland Government, 2008). This increased storage capacity in decentralised systems has provided additional water security to home owners for non-potable purposes, and has also mitigated consumer demand on the mains water supply.

Although the extensive uptake of rainwater tanks has been beneficial to water security, it raises some important questions regarding the ongoing maintenance of such systems. To date, tank owners have generally been left to maintain their own tanks. The extent to which this maintenance is occurring is unclear, although there is some evidence to suggest that home owner maintenance of tank systems is minimal (Moglia, Tjandraatmadja and Sharma, 2011; Tucker, Mankad and Greenhill, 2011). This situation could become problematic in the long term, with increasing risk of tank dysfunction. An unmaintained tank is assumed to contribute to eventual tank failure; possible tank abandonment, due to ineffective tank performance; and the risk of mosquito-related problems. Such a situation suggests there are implications for public health and strategic water planning if rainwater tank systems function sub-optimally. An additional consideration is the potential degradation of a significant public investment if rainwater tanks are not maintained.

In light of these considerations, this research aims to identify and explore a range of policy options that could help foster tank maintenance behaviour within the community. The research first determined possible policy interventions, using stakeholders involved in policy implementation and development to identify ideas. These policy ideas were then explored with householders, with a particular focus on their likely adoption of the policies, examining potential barriers, benefits and perceived effectiveness. This research contributes practically to policy making and water supply planning, and also increases our understanding and knowledge of behaviour change in the sustainability field.

1.2. Research Questions

The research objectives for this study were twofold: to identify a range of possible policy options that could be used to encourage and enable tank owners to maintain their rainwater systems, and to explore community acceptance of these options. To meet these broad objectives, three specific research questions (RQ) were developed.

RQ1. What intervention strategies can help to ensure the ongoing operation and performance of household rainwater tanks?

RQ2. What are the views and attitudes of the community towards the various strategy options?

RQ3. What are community members' preferred options for ensuring the ongoing performance of household rainwater tanks?

1.3. Research Design

The research used a sequential two-phase design, employing qualitative approaches to data collection and analysis in both phases. A qualitative approach was used to gather rich and descriptive data, and to provide a deeper understanding of the issues surrounding the topic. The first phase used a workshop format with stakeholders from government and industry, to identify a range of possible policy interventions that could be used to encourage tank maintenance behaviour. The workshop allowed us to investigate stakeholder preferences for various strategies, and to understand perceptions of the benefits and barriers associated with each. The second phase used focus groups to understand community attitudes and preferences towards policy strategy ideas. In both research phases, quantitative judgements of each strategy were elicited from participants, by incorporating perceptual mapping techniques and voting preferences into the research design.

1.4. Structure of the Report

The report first describes Phase One, including a brief review of relevant literature, a detailed description of method, and presentation of results and discussion of findings. This is followed by Phase Two, which uses a similar format of presentation. A final discussion of the overall findings and implications for policy and future research are presented. The report concludes with a final brief summary and a description of limitations of the research design.

2. PHASE ONE: IDENTIFICATION OF POTENTIAL INTERVENTIONS

2.1. Introduction

Fostering behavioural change is a complex process, with no single theory capable of explaining all the complexities of behaviour. This limitation is particularly evident in the environmental literature, where models of behaviour are recognised to be inadequate at fully explaining the different factors that surround pro-environmental behaviour (Bamberg and Moser, 2007; Jackson, 2005; Stern, 2000; Gardner and Stern, 2002). In response to this complexity, policy approaches for encouraging changes to behaviour are wide ranging, and still evolving.

The traditional approach to achieving behavioural change has been the use of regulations, incentives and other market-based mechanisms for altering behaviour. These approaches have usually been used in tandem with education programs that are typically focused on describing the nature and severity of the problem, and the actions needed to overcome the problem (Gardner and Stern, 2002; Prendergrast, Foley, Menne and Karalis Isaac, 2008; Wilson and Dowlatabadi, 2007). More recently, intervention strategies have extended in scope aiming to address the social and psychological dimensions of behaviour. Social marketing campaigns, which rely on changing social norms rather than providing monetary incentives or penalties, are one example where policy makers have used a broader range of strategies to change attitudes and effect change towards a pro-social behaviour (Andreasen, 2006; Jackson, 2005; McKenzie-Mohr and Smith, 1999; Peattie and Peattie, 2009). The use of diverse interventions, and the incorporation of an interdisciplinary approach to tackling environmental problems, has been advocated by researchers and theorists as best practice for achieving change in the sustainability field (Gardner and Stern, 2002; Jackson, 2005; Uiterkamp and Vlek 2007).

However, it is not clear which of these approaches are most appropriate for different types of behaviour. In the present study, our focus is on maintenance behaviours that are aimed at preventing future problems with rainwater tank systems. In such preventative behaviours, the benefits are frequently not realised until the long term, and often not directly apparent to the individual. In the case of rainwater tanks, the benefits of proper maintenance include long term use of the tank, security of a water source for non-potable purposes, and the reduced risk of mosquito-related diseases. Although modest, there is also a benefit to the water utility provider of further reductions in end-user demand on mains water supply, and a concomitant benefit to the tank owner of lower water consumption costs. To date, the sustainable behaviour literature has little to say about which type of policy approach is suitable for encouraging this sort of preventive behaviour.

One study in this field suggests there is a wide range of possible interventions that could be considered suitable for promoting tank maintenance behaviour. Moglia *et al.* (2011), in survey research, began to identify possible intervention ideas for effecting behavioural change. These surveys of water professionals suggested a number of elements and issues that may need to be considered in promoting water tank maintenance, including regulation, inspection and education. The current research represents an extension and elaboration of these issues.

The research question specific to Phase One is as follows.

RQ1. What intervention strategies can help to ensure the ongoing operation and performance of household rainwater tanks into the future?

Based on this overview, it is expected that the research will identify a wide range of possible intervention strategies for fostering tank maintenance.

2.2. Method

A qualitative workshop approach was adopted for Phase One. Workshops are well suited to understanding and exploring complex issues involving multiple stakeholders. The workshop allowed us to identify a range of possible management options and explore the issues surrounding each option. The interactions and discussions during the workshop encouraged participants to reshape and refine

their ideas and views. Workshops are also a good way to get white collar participants together when access to them as individuals can be problematic (Neuman, 2003).

2.2.1. Recruitment

The workshop was held in November 2011 with 30 participants. A list of 34 potential participants was developed to include stakeholders from across six different sectors: state government; regulatory entities; utility companies; local government; academia; and industry (as identified in earlier research, see Moglia *et al*. 2011). Industry representatives included rainwater tank designers and manufacturers, engineers and plumbers. All stakeholders had involvement in some aspect of the life cycle of rainwater tank systems. Participants were invited to a four-hour workshop, and were provided in advance with a summary overview of the purpose behind the workshop and general background material. An information sheet was also supplied to meet ethical requirements (Appendix B). The participants were not provided with any incentive (monetary or otherwise) to attend. The recruitment procedure resulted in 30 participants attending.

2.2.2. Workshop Protocol and Procedure

A workshop protocol was developed from discussions within the research team and based on the workshop purpose and desired outcomes. The protocol was designed to identify and explore a range of possible strategies for encouraging and ensuring rainwater tanks are maintained. The research team specifically wanted to understand the benefits and barriers associated with each potential strategy. In addition, the research team wanted to assess participants' perceptions of the difficulty in implementation of a particular strategy and the strategy's potential effectiveness.

The workshop began by establishing a shared understanding of the current context and the consequent purpose of the workshop. This was achieved through an initial short presentation. The workshop then moved to a brainstorming task conducted in small groups with the aim of identifying a diverse range of possible strategies for achieving tank maintenance at the household level. A short brainstorming approach was employed to encourage idea formation within the groups. It was then necessary to narrow down the wide range of strategies to a smaller number of strategies which would form the basis for deeper analysis. This was achieved through a process of idea grouping, prioritising and allocation. This process took place at a large group level, directed by the research team facilitators.

The workshop then moved to more in-depth analyses of the strategies. This process involved small group discussions of approximately 45 minutes in length. Each group analysed two strategies (identified from the brainstorming process) particularly focusing on benefits and barriers, implementation issues, and perceptions of difficulty and effectiveness. To facilitate discussion and keep the group on task, a template of six questions was prepared as a guideline for discussion (Appendix A). Each group comprised four to six participants with a researcher acting as a group facilitator. Following this analysis process, the workshop proceeded to a plenary session whereby the small groups reported their views to the large group. This feedback process allowed all participants to hear details related to the various strategies and to add or amend their comments to the small group findings. At the conclusion of a group's feedback they summarised their analysis by positioning their strategies on a conceptual map, which summarised the strategy in terms of its ease of implementation (Easy to Hard) and its judged impact on rainwater tank maintenance (Effective to Ineffective). Positioning maps are an effective tool for visually displaying perceptions of an object (in this case a management strategy) in relation to relevant criteria. The map also visually depicts the perceptions of each strategy in relation to all alternate strategies.

The final part of the workshop involved a voting process, which gave an indication of participants' preferences regarding the strategies. Each participant was asked to indicate three preferences on the strategies, two strategies that they liked the most and one strategy that they liked the least. The most preferred and the least preferred were colour coded with yellow and red stickers accordingly. Each participant placed his or her stickers on the relevant strategies on the public positioning map.

The workshop also included frequent reminders to participants to record their comments on a dedicated 'comments' paper. This process was designed to capture information from participants that they felt was very important, or that they didn't have an opportunity to express.

The workshop activities were moderated by the same facilitator, who was a member of the research team. Other members of the research team acted as facilitators of the small group discussions and took written notes of the initial brainstorming session. The strategies identified in the brainstorming session were recorded on large sticky notes, and displayed and grouped in view of the large group. The small group analyses of strategies were recorded on butcher's paper and displayed during the plenary session. The public positioning map recorded each group's perceptions of the various strategies and individuals' votes for strategy preferences. The 'comments' papers recorded individuals' additional comments. In combination, these materials became the basis of the data collected from the workshop.

2.2.3. Data Analysis

The written material was analysed using thematic content analysis (Creswell, 2009). The various strategies were analysed around differences and similarities and grouped into meaningful categories. The discussion and written data was coded to themes, and related themes were then merged and grouped. The perceptual map was summarised to reflect the various strategy categories, and the 'votes' for strategy preferences were counted and grouped accordingly. The results are presented according to the four workshop activities.

2.3. Results

2.3.1. Brainstorming Session

The initial brainstorming activity identified 35 strategies representing a diverse range of ideas. Some strategy suggestions were broad umbrella terms such as 'education', while others were more detailed suggestions, for example, changes to a specific design feature of a rainwater tank system. The purposes of many of the strategies overlapped and were consequently grouped to form the eleven strategies analysed in more depth.

2.3.2. Small Group Strategy Analyses

Eleven strategies were analysed in depth by small groups, with many of the ideas from the various strategies overlapping. As a result, the strategy findings were re-grouped and are described in five themes, largely based on differences in purpose.

1. Self-Management Strategies

The purpose of these types of strategy was to enable tank owners to independently undertake tank maintenance. Essentially, the tank owners would be responsible for maintaining the tanks themselves, but with support provided by government to facilitate and enable tank maintenance. Ideas for this support included:

- communication campaigns: promoting benefits associated with maintaining a tank, and highlighting consequences of not maintaining a tank;
- creating awareness within the community of the need to maintain tanks;
- providing prompts to perform various tank maintenance tasks;
- promoting tank maintenance as part of routine house maintenance;
- information regarding a maintenance schedule (tailored to the tank owner's situation);
- web-based interactive resources;
- general fact sheets and information to encourage 'Do it yourself' maintenance;
- telephone help lines; and
- directories of services.

It was recognised that providing information alone would not necessarily result in improved motivation to undertake tank maintenance behaviour. A communication strategy was considered a necessary element to encourage and empower tank owners to assume responsibility for maintaining their tank. Tank owners were also recognised as being a disparate group with varying motivations, capabilities and attitudes.

2. Home-Based Service

This type of strategy was modelled on the current 'Climate Smart' program, with the aim of providing an inspection service requiring a small co-payment from the tank owner. This program would be subsidised by government. There were divergent opinions about the extent of the services that should be provided, ranging from an inspection and advice service, through to a hands-on maintenance service.

3. Changes to Regulations and Codes to Improve Design and Installation

The rationale behind these strategies was that prevention of problems can be influenced significantly by tank design and installation. It was suggested by some participants that some rainwater collection systems are not well designed, and that some tanks are not correctly installed, although to date there is no strong evidence about the extent of these problems. By ensuring a tank is "maintenance-proofed" at the outset, future maintenance needs are minimised. Similarly, ensuring the tank is properly installed would further diminish future problems. Enforced inspections of installations by plumbers were considered integral to these strategies. Amendments to various regulatory instruments would be required to support the strategy:

- Queensland Development Code Part MP 4.2 (QDC MP4.2) to address design and installation issues;
- Plumbing and Drainage Act 2002 and the Standard Plumbing and Drainage Regulation 2003; and
- AS3500.3 Plumbing and Drainage – Stormwater drainage; governing roof and gutter drainage standard requirements.

4. Create a Register of Tanks

The purpose of these strategies was to create a register of tanks that would provide information on tank assets within the region and allow evaluation of any policies related to maintenance. Local council was deemed as the suitable entity for maintaining a tank register. Various suggestions for how a tank register might be created included:

- compulsory registration, modelled on swimming pool registration; and
- registration and certification linked to installation, and a subsequent plumber's inspection at time of installation.

5. Regulate Ongoing Maintenance

The purpose of regulation was to ensure the ongoing maintenance of the tank through regular inspections and associated penalties. The current swimming pool model of regulation was suggested as a framework for management. Participants recognised that applying regulation to tank maintenance was likely to be difficult, expensive, de-motivating and potentially interpreted by tank owners as over-regulation (an example of the 'nanny state'). However, the idea of incorporating tank inspections into pre-sale building inspections, along with pest inspections, was considered favourably.

2.3.3. Perceptual Mapping and Voting

At the conclusion of the workshop, strategy ideas were mapped according to perceptions of how easy or difficult a strategy idea would be to implement, and how effective or ineffective the idea would be at achieving tank maintenance. Further to this, participants voted for their two most preferred strategies and their one least preferred strategy.

Perceptions of Difficulty: Perceptions of Effectiveness

- Self-management approaches were perceived as easy to do.
- Regulatory approaches were generally viewed as hard, or harder, to do.
- Self-management approaches and regulatory changes surrounding design and installation were viewed as effective.
- Regulatory approaches relating to ongoing operation and maintenance, such as routine inspections were viewed as less effective.

Voting Preferences

A net preference score was calculated for each group of strategies, with the most preferred and least preferred votes added together. A positive net score indicated a strategy was liked overall, whereas a negative net score indicated a strategy was not liked overall. Figure 1 displays the perceptions of each strategy group and the net score for preferences.

- The most-preferred strategies were the self-management approaches, and improvements to design and installation.
- The least-preferred strategies were those related to regulating ongoing operation and maintenance.
- There were mixed preferences surrounding registration: compulsory registration received nil support, while registration related to installation inspections received minimal support.

2.4. Discussion and Implications

This workshop identified a wide range of possible strategies for encouraging tank maintenance behaviour and this reflects more recent approaches to behavioural change programs, beyond the traditional use of regulations and incentives. The workshop identified five different groups of strategy options: self-management approaches, home-based services, amendments to regulations to improve design and installation, creation of a tank register, and regulation of ongoing maintenance. These groups of strategies incorporate a variety of elements, from education programs and social marketing concepts, through to more regulatory approaches. The range of these strategies is consistent with recent sustainability literature, which describes a range of possible interventions that policy makers can use to effect behavioural change within its communities (Gardner and Stern, 2002; MacKenzie-Mohr and Smith, 1999; Prendergrast *et al.*, 2008; Wilson and Dowlatabadi, 2007).

In addition, the policy solutions generated from the workshop recognise a three-way interaction between policy makers, consumers and industry. Interventions which directly involve tank owners, increase consumer motivation and promote self-management capabilities were suggested. Also suggested were strategic changes to tank design and installation that would target various parties within industry. The sustainability literature describes the value of involving government, consumers and business as a way to achieve change in the sustainability field (Tukker *et al.*, 2008).

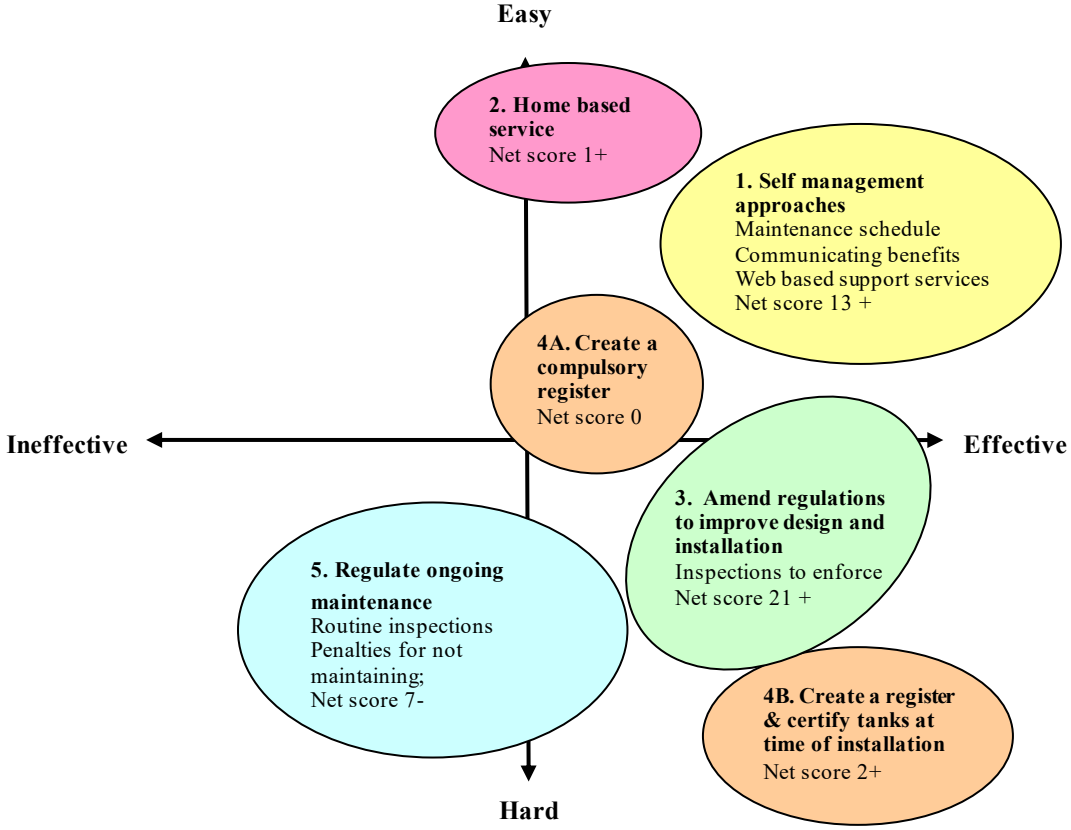


Figure 1: Perceptual map of strategy ideas and preferences: Workshop.

3. PHASE TWO: COMMUNITY ACCEPTANCE

3.1. Introduction

The aim of Phase Two was to explore community acceptance of a range of policy interventions that could be used for fostering tank maintenance behaviour in home owners. A prime concern in this phase was to explore the likely interplay between community acceptance of the need for government intervention, and their preferences for being free of 'government interference'.

When the actions of many individuals are required to achieve an outcome, which is in the best interest of the larger community, the extent to which a government should intervene is often difficult to determine. A government needs to consider the scope and extent of its interventions, over the rights of individuals to function autonomously (Prendergrast *et al*., 2008). Governments can be accused of being too paternalistic if they choose policies that are considered an overreaction, or too interfering, to a given situation. In such cases, the government is accused of 'nannying' the community. In part, this is because individuals seek the feeling of *agency*, the freedom to live their lives in a way that allows them to define their own goals, act upon them, and feel in control of their own choices (Bandura, 2001; Pick, 2007; Prendergrast *et al*., 2008).

This balance between a government's regulatory approaches to encouraging pro-social behaviour, over the individual's desire for being an agent of their own wellbeing has potential to directly affect the acceptance of policy.

The specific research questions addressed in this Phase were as follows.

RQ2. What are the views and attitudes of the community towards the various policy options?

RQ3. What are community members' preferred options for ensuring the ongoing performance of household rainwater tanks?

3.2. Method

For this study we adopted a qualitative focus group approach, because our purpose was to explore and understand attitudes towards tank maintenance and possible interventions for fostering maintenance behaviour. Furthermore, we were interested in gaining insights into these issues from three different research populations: people who had acquired a tank through a government assisted rebate scheme (retrofitted tank owners); people who had a tank because it was mandated as part of building a new house (mandated tank owners); and people who didn't own a tank. Focus groups are well suited to exploring a specific topic among different population groups (Hair *et al.*, 2008). This is achieved through the interactive nature of focus groups where spontaneous discussions generate diversity of views and reveal differences, not only within groups but also between groups (Flick, 2010; Hair *et al*., 2008).

3.2.1. Recruitment

Six focus groups were conducted over three consecutive evenings during November 2011, with a total of 40 participants. Recruitment was conducted by a market research company and participants were selected at random from the company's database, according to specific selection criteria. These criteria included having 14 participants from each of the three study populations (owners of retrofitted tanks, owners of mandated tanks, and non-tank owners), as well as having approximately equal males and females, a diversity of age, and a mix of working and non-working individuals. The recruitment company contacted potential participants by telephone, and used a screening script to determine suitability and availability for the focus group sessions. All participants lived in the Brisbane region, and were offered a $70 payment for their time and travel expenses. All recruitment procedures adhered to CSIRO's ethical requirements for social research (see Appendices C and D). Forty two participants were recruited and two participants did not attend, resulting in a final sample of 40 participants: 13 retrofitted tank owners, 13 mandated tank owners, and 14 non-tank owners. The three groups were subdivided at random into two smaller groups, resulting in six focus groups comprising six or seven participants and a researcher.

3.2.2. Focus Group Protocol and Procedure

A semi-structured protocol was developed based around the intervention strategies identified from the stakeholder workshop. The protocol was designed to explore each strategy and determine the perceived impact the strategy would have on effecting tank maintenance behaviour. Open-ended question formats were used to explore the benefits and barriers associated with each strategy idea. We were also seeking to understand participants' perceptions of acceptability, and developed questions that generated discussions about what they liked and disliked about each strategy idea. We also used a perceptual mapping technique to summarise the groups' views on each strategy. By consensus, the group positioned each idea onto a public map that used effectiveness and acceptability as the two assessment criteria. The anchors for each criterion were effectiveness of encouraging tank maintenance (effective to ineffective), and the community acceptability of the strategy (acceptable to unacceptable).

The protocol began with an initial activity designed to encourage general group discussion around the topic. This was followed by a short presentation of relevant background material to establish a shared understanding of rainwater tank systems and tank maintenance behaviour. The protocol then moved to the critical questions, which concerned possible strategy interventions for encouraging tank maintenance behaviour. A series of 11 different ideas was put to the group, and each idea was discussed in terms of its potential effectiveness at achieving change, and its likely acceptability by the community. Table 1 displays the 11 different strategy ideas. The perceptual mapping activity followed with each strategy idea positioned on the map. The relative position of a strategy was adjusted by the group as needed, in light of ongoing discussions of other strategies. The final part of the protocol was a voting process. Each participant was given three votes to indicate their preferences for the various strategy ideas: two votes for their most preferred, and one vote for the least preferred strategy.

Table 1: List of strategy ideas presented to focus groups.

Strategy Ideas	
1.	Leave it to householders to manage for themselves; the status quo
2.	Leave it to householders, but provide them with support
	• Advice on what's to be done; fact sheets; helpline; directory of plumbers and tank cleaning services
3.	Leave it to householders, but increase householder awareness
	• Promote benefits of keeping a tank maintained; highlight the consequences of not keeping a tank maintained; reminders and prompts
4.	Home service, like Climate Smart – you pay to have someone come and inspect your tank
5A.	Create a register of tanks – rely on tank owners' co-operation
5B.	Create a register of tanks – make it compulsory to have tanks registered
6A.	Inspect tanks – make it compulsory to have your tank inspected when it is first installed, to check it has been installed properly
6B.	Inspect tanks – make it compulsory to have your tank inspected every couple of years
6C.	Inspect tanks – make it compulsory to have your tank inspected when your house is sold
7.	Tank design – make it compulsory to improve the design of the tank so that fewer things will need maintaining
8.	Maintenance information – make it compulsory to be given information about tank maintenance when you have it installed

The focus group sessions were conducted over three consecutive evenings, with a specific population group designated per evening. The same two moderators from the research team conducted the focus sessions over the three evenings. The moderators worked from the protocol asking similar pre-planned questions and conducting similar activities. Each group session lasted approximately 90 minutes, and was tape recorded and later transcribed. Each focus group session proceeded with brief introductions, management of informed consent requirements, an outline of the research aim, and reassurances of confidentiality. The moderators used charts to explain various concepts related to rainwater tank systems and the recommended tank maintenance activities. A whiteboard was used to display the positioning map, and sticky notes to position strategy ideas. Each participant was provided with colour-coded stickers for indicating on the positioning map their most-liked and least-liked strategy preferences. Although the protocol was detailed, there remained scope for in-depth group discussion

around each discussion point. At the conclusion of each focus group session, participants were thanked for their contributions. The two moderators debriefed and made minor protocol changes for the following sessions.

3.2.3. Data Analysis

The recorded data was transcribed and analysed using thematic content analysis. Participants' general comments regarding rainwater tanks and maintenance, as well as specific comments regarding particular intervention strategies, were incorporated into themes. Related themes were combined, and seven groups of factors emerged as important to rainwater tank maintenance. The data from the various perceptual maps were analysed and a single map developed using a bi-polar scoring system for each map dimension. In addition the 'votes' for strategy preferences were counted and the most preferred and least preferred strategies identified.

3.3. Results

In general, tank owners and non-tank owners alike seemed unaware of the need for tank maintenance. The initial information provided to participants, which outlined a typical tank maintenance schedule, appeared new and surprising to most participants. This finding was consistent with previous research which has suggested that tanks are not being maintained by owners.

Analysis (Figure 2) indicated there was community support for self-management approaches, improvements to standards that govern design and installation, and home-based services modelled on the Climate Smart program. Findings suggested that if tank owners were provided with options for getting their tank maintained, ranging from 'do it yourself' information through to buying services, that this would enable many tank owners to maintain their tanks. This approach, combined with an effective communication program aimed at creating awareness and highlighting benefits, would increase motivation for keeping a tank maintained. In contrast, there was minimal support for inspections aimed at ensuring ongoing maintenance, or for creating tank registers. Tank inspections at the point of sale could be viewed more favourably if integrated into the current pest and building inspections.

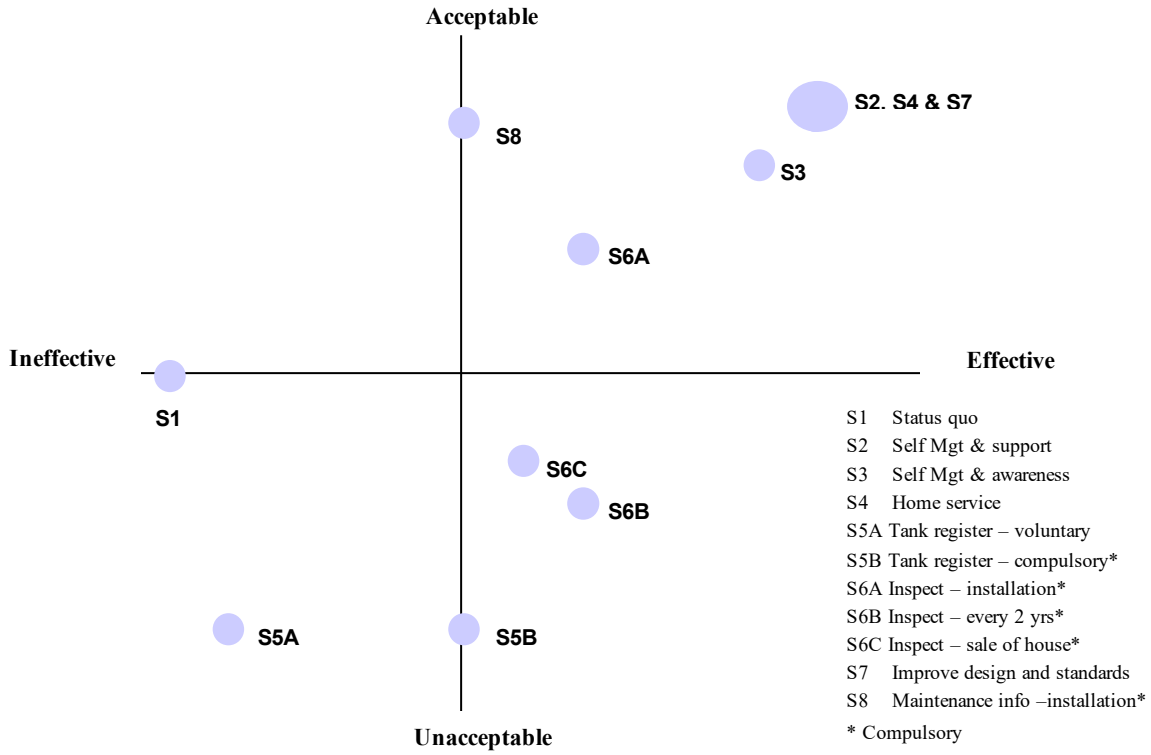


Figure 2. Perceptual map of strategy ideas: All focus groups.

The most negatively viewed strategies were those involving registration of tanks (Figure 2). Not only was a register viewed with suspicion (as a potential precursor of inspections, fees and fines), but also as an ineffective option for achieving tank maintenance. Participants suggested this type of approach could lead to people abandoning their tanks. A register, and associated fees and inspections, would add to the cost burden of tank maintenance and erode any savings benefit of having a tank; a benefit already considered marginal. Also, it would weaken the notion of autonomy, an important reason underlying the motivation for having a tank. However, there was evidence that a potential public health risk, for example mosquito-borne illnesses, could influence these views, and could result in greater acceptance of regulatory approaches for ongoing maintenance.

3.3.1. Differences between Groups

Some minor differences in attitudes towards the various policy interventions existed between the three research populations, although our limited samples don't allow us to quantify the extent of these differences. The main apparent differences were between non-tank owners and tank owners. Non-tank owners appeared to be the least accepting of the status quo, favouring no active intervention to encourage tank maintenance, and were also more accepting than tank owners of suggestions for regular inspections. This difference could reflect the fact that, as non-tank owners, they are not directly affected by these types of decisions.

In addition, mandated tank owners were the most negative group regarding inspections at time of sale of the property, describing this sort of requirement as 'another thing to do'. This reaction could be due to their more recent experiences with buying and selling property and the concomitant inspections associated with a sale, given that this group had presumably purchased a new home within the last four years.

It might be expected that different attitudes would be observed between mandated and retrofitted tank owners because of the greater cost impost to the mandated tank owner compared to the retrofitted tank owner, who typically got their tank through a government rebate. However, no such difference was evident in this research. It could be that the cost of the tank to the mandated owner is subsumed within the overall cost of the new home. As a consequence, mandated tank owners did not seem more concerned about maintaining the value of their tank than retrofitted owners, even though they had probably outlaid considerably more money for their tanks.

Relatedly, mandated tank owners did not report any added benefit of saving more water than a retrofitted tank owner, even though they had their tanks connected to more water using devices. Typically, mandated tank owners have their tank connected for both indoor and outdoor activities, whereas retrofitted tanks are typically connected for outdoor use only. This lack of regard for increased water saving, a potential saving of a third of overall water use (Chong *et al.*, 2011) could be because the mandated owners were unaware of how much water they were saving, given that they had moved into a new home and had no way to assess the contribution of the tank to their household water consumption.

3.3.2. Factors Relevant to Tank Maintenance Behaviour

Analysis revealed seven factors that were important in relation to undertaking prevention behaviours and accepting policy interventions for fostering such behaviour. The groups of factors included: the relative cost-benefit of undertaking the behaviour; issues of agency; awareness of the environment; efficacy; moral norms; self-identity and a lack of a perceived need for any intervention. Each factor is discussed below.

Relative Cost-Benefit

For many people, the potential advantage of saving money on water costs was an important motivating factor for maintaining a tank, and any erosion of this benefit would consequently act to demotivate the tank owner. Cost savings appeared to play a significant role in attitude formation and for many it was fundamental to the original purchase decision. However, tank owners reported that the costs actually saved from having a tank were probably marginal. Even though research suggests tanks contribute to water savings of up to one third for an average size dwelling (Chong *et al.*, 2011), this does not seem

to translate to a proportionate savings in costs. In part, this is due to the format of the utility bill, in which only a small portion reflects the variable cost related to water usage. The remaining parts of the bill reflect fixed costs passed on to the consumer as infrastructure charges. As a consequence, most participants only reported minor reductions in the water bill, despite reductions in water use likely to be more significant.

Therefore, participants assessed any potential strategies that incurred significant costs as unattractive, because of the likelihood to erode any cost advantage. Even interventions such as registers and inspections implied that there would be some sort of ensuing cost, for example, a licence fee to register or an inspection fee with any inspection process, and that this cost would be additional to any actual maintenance costs. This presumed cost would reduce the financial benefit as a motivation, and likely result in people reconsidering using their tank, especially if things began to malfunction. Reinforcing this perspective were the reports by some participants who had already experienced repair costs related to pump failure; that they were considering reverting to only mains water because the cost of repair outweighed the savings gained.

Issues of Agency

The ability to act autonomously, and be an agent of one's own decisions, appeared to be a major influence on participants' attitudes and views regarding tank maintenance behaviour and possible policy interventions. For many the idea of having freedom to 'do what I want with my water' was a significant motivation for getting a tank in the first place. This notion seemed to extend to attitudes related to managing the tank. The idea that an intervention might try to 'enforce' tank maintenance was viewed very negatively, as this seemed to work against the concept of agency.

The literature describes agency, according to the economist Sen, as 'the ability to define one's goals in an autonomous fashion and act upon them.' (Pick, 2007, p.234), and is akin to concepts of autonomy and self-determination. The importance of agency is highlighted by public concerns about 'the nanny state', where citizens react negatively to overly paternalistic policy approaches by government. Research has suggested that public perceptions of unfairness, infringement of freedom, and perceptions of coercion have been associated with lower levels of policy acceptance (Cherry, Kallbekken and Kroll, 2011; Ericksson, Garvill and Nordlund, 2006; Fujii, Garling Jakobsson and Jou, 2004). In this study, some participants indicated they would engage in counter-productive behaviour, such as abandoning their tank, if there were attempts at introducing regulatory approaches as a way of encouraging tank maintenance.

Rather, participants reported they wanted choices and options for managing tank maintenance. For some the preferred option was self-management, for others it was access to a home-based service, or information and web-based resources. Participants also supported interventions that did not directly affect them. For example, they were very supportive of any improvements to tank design and installation, and saw these types of interventions as very effective and acceptable, even if these changes resulted in additional cost to the initial outlay of the tank. It was also seen as important that a tank owner should be able to know up front the costs and benefits and the maintenance obligations associated with owning a tank. Full disclosure of costs involved with maintaining a tank would enable people to make informed decisions, and create awareness of the care and responsibility of owning a tank.

Awareness of the Environment

An awareness that a tank could contribute to safeguarding against a potential shortage of water was a perceived benefit to all groups of participants. Participants were positive about the idea of having a tank as a way of securing additional water during periods of a drought. Although the region was currently experiencing an abundance of water, participants felt that droughts were cyclical events and likely to return. There was a suggestion that if this were the case, their motivation levels for having the tank and maintaining it would be increased. This type of view is in line with previous research which has demonstrated that a perceived threat, such as a drought, is a motivator for adopting a tank or other decentralised water systems (Mankad, Tapsuwan, Greenhill, Tucker and Malkin, 2010).

Efficacy

The feeling of being capable of maintaining a tank was a major issue for all participants. Capability in terms of knowledge, skills and abilities were all important factors. Participants suggested efficacy could be improved through: increased awareness; knowledge of the activities involved; provision of 'how to do it' facts; and information on how to access relevant service providers. Thus, participants viewed any interventions that supported improvement in efficacy as both acceptable and effective. Conversely, interventions that didn't improve efficacy were judged negatively. For example, participants did not see how creating tank registers, or forms of mandatory inspections, would assist in getting a tank maintained.

Efficacy is a concept widely recognised in social science for its importance in achieving behaviour change. A person's belief that he or she has the necessary skills and abilities to undertake the target behaviour, and control over any environmental constraints, is a powerful variable in fostering behavioural change (Armitage and Conner, 2001; Azjen, 1991; Olander and Thogersen, 1995).

Participants also indicated that being provided with information alone would not be very effective. Rather, information needed to be used in tandem with other motivation strategies such as creating awareness and highlighting the benefits of keeping a tank well maintained. This view was supported by those participants who reported being provided with a maintenance information brochure at the time of installation, but, never having bothered to look at it again, were unaware of the value of maintaining their tank.

A final factor affecting efficacy was a busy lifestyle. Many participants felt that their lives were full, and their resources for attending to additional tasks were limited. The need to expend time, attention and care on activities to maintain the tank would be viewed as difficult, especially if the burden increased to include inspections and registration. However, if some of these tasks could be included in other routine 'house maintenance' tasks, it would not only improve the likelihood of getting them done, but also make them more acceptable. For example, if tank maintenance could be included in pest control, or swimming pool inspections, this would ultimately improve efficacy for tank maintenance behaviour.

Moral Norm

For some participants there was a sense of feeling obliged to look after their tank; that it was 'the right thing to do'. This sense of moral obligation seemed to be based on two main reasons: not wanting to waste the financial resources invested in the tank (both at a personal level and at a public investment level); and not wanting to create a potential public health risk. If equipped with suitable capability, these individuals felt they would be motivated to keep their tank maintained. A sense of moral obligation, or personal norm, has been described in the literature as a powerful motivator of pro-social behaviour, particularly in the environmental field (Harland, Staats and Wilke, 1999; Spinks, Fielding, Russell, Mankad and Price, 2011; Stern, 2000).

Self-Identity

Some people saw themselves as 'someone who keeps things maintained and in good repair'. These individuals viewed maintaining a tank as no different from keeping the air conditioner regularly serviced, or the carpets annually cleaned. They indicated that if they knew what and when things were to be done they would do them. Furthermore, some saw themselves as a 'do it yourself' type of person and suggested that all they needed to know was what was required and they would keep their tank maintained. This suggests if efficacy levels were improved this type of person would be motivated to keep the tank maintained. Self-identity has been an important predictor of behaviour across many domains including the environmental field (Sparks and Shepherd, 1992; Terry, Hogg and White, 1999; Whitmarsh and O'Neill, 2010).

No Perceived Need for Regulatory Intervention, Beyond Risks to Public Health

Participants indicated the level and type of intervention for encouraging tank maintenance needed to reflect the level of need for the intervention. Because many participants were 'only' using their tank water for external garden use, they found it hard to understand that this type of use warranted any interventions that were viewed as too 'heavy handed'. On the other hand, if the tank water was used

for drinking then they could understand the need for more regulatory interventions. Along this same theme was the recognition by participants that if a situation arose related to a public health risk, such as increased prevalence of mosquito-borne illnesses, then they would be more amenable to regulations, including registers and inspections to manage this type of situation.

Therefore, participants seemed unconvinced as to the need for an intervention response beyond self-management approaches, and viewed any alternate intervention with suspicion. In particular, tank registers were viewed very negatively, not only because tank registers were not perceived to help the tank owner maintain a tank, but also because participants felt that government should already have this type of information. Participants felt that data related to rebate schemes and new home builds would already exist, and they therefore did not understand the need to have a register.

3.4. Discussion and Implications

The community's acceptance of various policy interventions seemed to relate to attitudes and views around seven factors, some which were fundamental to the decision making of getting a tank in the first place, and some more directly related to maintaining tanks. A positive view of savings on water costs, the appeal of being autonomous and able to use water freely, and an awareness of the environment were original drivers of tank purchase, particularly for retrofitted tank owners. These factors were considered benefits of owning a tank, and confirmed as such by mandated tank owners, although to a lesser degree. A sense of self-efficacy in performing the tank maintenance behaviours, a concern for doing the right thing, and self-perceptions of being someone who looks after things, were also important factors underpinning tank maintenance behaviour. These concepts are depicted in Figure 3.

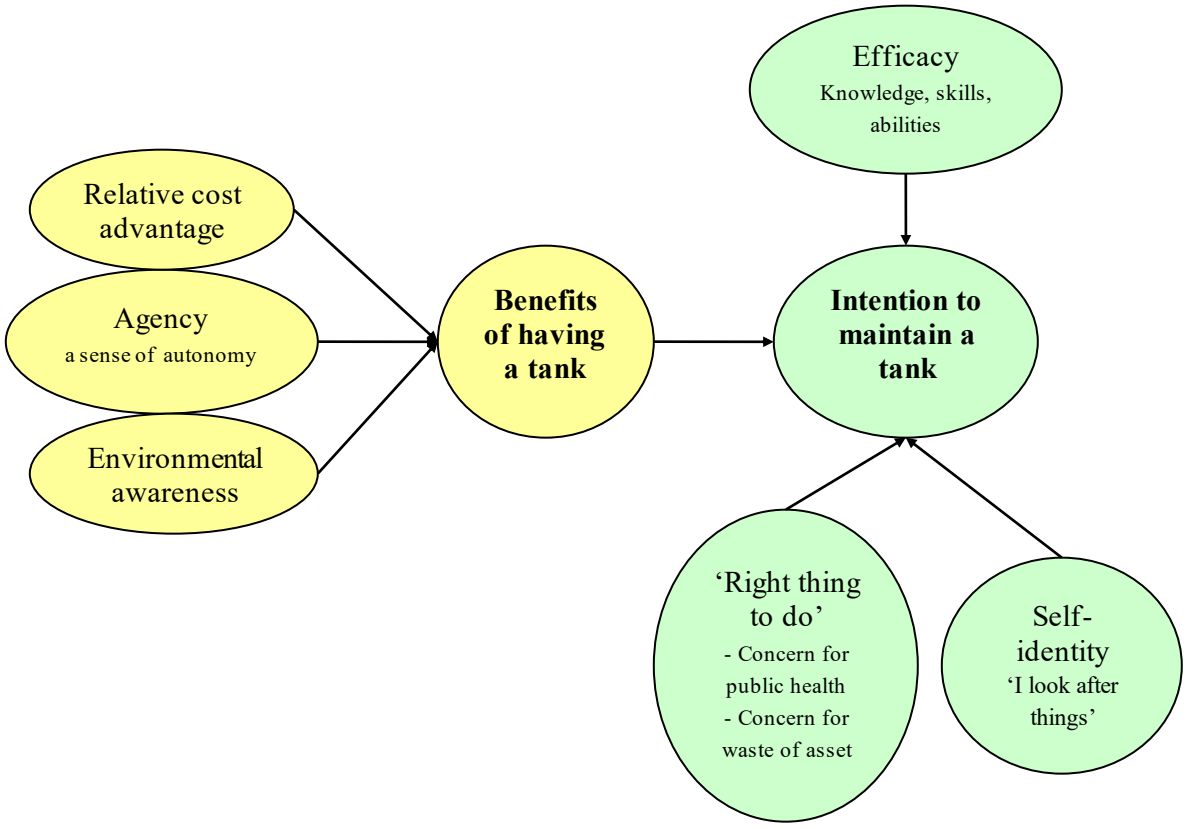


Figure 3. Model depicting psychosocial factors important to tank maintenance behaviour.

As a consequence of these underlying motivations, any policy interventions that directly affected these factors were reflected in corresponding positive or negative attitudes towards the interventions. For example, interventions that promoted efficacy were deemed to be acceptable and effective by the participants. Any interventions that potentially eroded any relative cost advantage were assessed negatively. In particular, policy ideas that interfered with a sense of agency were viewed most negatively. Most participants did not see tank maintenance as requiring a paternalistic approach from government. Rather, more regulatory types of approaches were seen as being 'nannied' by the State, and seen as unnecessary for an issue such as keeping a rainwater tank well maintained. As a consequence, these types of approaches were viewed with suspicion and scorn, with suggestion that any such attempts to regulate tank maintenance could result in tank owners choosing to abandon their tanks.

The caveat to this view was in relation to a public health risk. If a situation arose in which poor maintenance of rainwater tanks was assessed to be a cause of mosquito-borne illness, then attitudes would likely soften towards a more regulatory approach to tank maintenance.

4. OVERALL FINDINGS AND FUTURE RESEARCH

The overall findings from Phases One and Two suggest that there is some congruence between policy makers and consumers regarding possible policy interventions to foster tank maintenance behaviour. Both groups indicated a preference for self-management approaches and improvements to design and installation, as effective options for fostering tank maintenance behaviour.

Instigating change using self-management approaches incorporates some of the features of a social marketing program. Communicating the benefits of undertaking tank maintenance behaviour, highlighting the costs of not keeping a tank maintained, reducing perceived barriers to adopting the behaviour, and increasing a person's self-efficacy for performing the behaviours are all principles of a social marketing approach (Andreasen, 2006; McKenzie-Mohr and Smith, 1999). However, also fundamental to this approach is the concept of segmentation. Recognising that tank owners are not all the same, but rather a disparate group with differing needs and levels of motivation for tank maintenance, has a bearing on consequent interventions. Developing interventions to target each tank owner segment has potential to result in increased likelihood of successful outcomes (Andreasen, 2006). Phase Two research suggests that differences exist between retrofitted tank owners, mandated tank owners and prospective tank owners, although the extent of these differences is unclear. Potentially, any differences necessitate tailoring any interventions to maximise outcomes. It is important to address these differences in subsequent quantitative research, and to investigate this segmentation variable in evaluation of the policy ideas.

An additional way to segment the tank owner population is based around usage. The Phase Two research indicates there are primarily two patterns of use for tank water. Garden and outdoor use, or outdoor use combined with indoor toilet and laundry functions. Findings suggest that usage patterns could contribute to differences in views and attitudes towards tank maintenance, and underpin the need to introduce non-regulatory approaches. This factor, as a potential influence on attitudes and acceptance, also warrants further investigation.

Furthermore, another consideration is the choice of the target behaviour on which to focus the intervention. Choosing which behaviour to change is an important aspect of planning any intervention (Andreasen, 2006; Steg and Vlek, 2009), and this seems relevant to tank maintenance. Tank maintenance can be viewed as an umbrella term, incorporating two different types of activities; regular six-monthly checking of gutters and screens; and periodic de-sludging of the tank. These different activities require different levels of efficacy from the individual. It is possible that there are different attitudes and views associated with each of these behaviours that comprise tank maintenance, and that the final intervention needs to address these two types of behaviour differently. This issue could also be tested in forthcoming research.

A final point to highlight is the influence of context in affecting community acceptability and determining tank maintenance behaviour. Both Phase One and Phase Two were undertaken within the context of an abundant water supply situation. In this circumstance, the need for decentralised systems to provide water security is reduced compared to when these measures were first encouraged and adopted. Qualitative findings from both phases of research suggested that views and attitudes might be different if the region was again experiencing drought conditions. The literature describes the powerful effect of context to potentially alter attitudes and other psychological variables associated with pro-environmental behaviour (Stern, 2000; Steg and Vlek, 2009). The influence of a drought context on motivation for tank maintenance behaviour, and acceptance of policies that promote such behaviour, could also be investigated in further research.

5. CONCLUSION

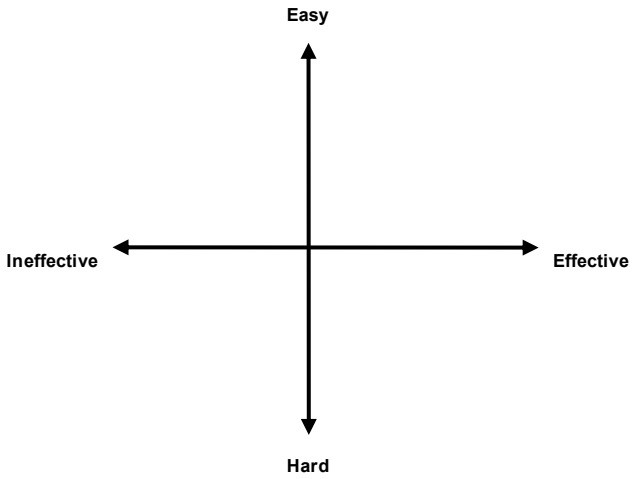
This research has explored possible policy options for encouraging tank maintenance, and investigated community attitudes and views towards these options. The research has been conducted as a two-phase qualitative study, collecting data from government and industry stakeholders and from the community. The study has used a workshop and focus groups as the methods for collecting data, and analysed and reported on findings, using a qualitative approach. The research has identified a range of possible policy intervention ideas ranging from self-management to regulatory approaches. From this range of policies, various interventions were presented to the community and their attitudes sought accordingly. In general, self-management approaches and changes to regulations that support improved tank design and installation were viewed most favourably by both stakeholders and the community. More coercive approaches that regulated ongoing maintenance, through use of registers and inspections, were the least favoured strategies among stakeholder and community groups. Seven factors were identified as possible reasons for explaining community reactions to the various policy options, some related to the benefit of owning a tank, and some directly to the issues related to undertaking tank maintenance activities.

However, qualitative research cannot make claims about the wider population's attitudes. The workshop didn't reflect the views of all stakeholders equally, nor did it incorporate the preferences and ideas of stakeholders who were not present. The focus groups aimed for depth of findings rather than breadth, and covered a limited number of different strategy ideas. The opportunity for the focus group discussions to cover novel ideas was reduced because discussions revolved around intervention ideas that were identified from the stakeholder workshop. However, a balance was sought between the need to explore opinions and ideas, and yet ensure that this exploration was relevant to the policy context. To more fully understand the extent of this study's findings, a quantitative approach is required. In this way, it would be possible to measure community attitudes towards these options more broadly, and to provide a more detailed assessment of the relative value placed on each of the various intervention options. Nevertheless, despite the weaknesses of a qualitative approach, this study has provided rich descriptive information on the relevant issues surrounding tank maintenance behaviour, and contributes to our wider understanding of knowledge about behaviour and sustainability.

APPENDIX A: Template of Questions for Stakeholder Workshop

(Questions for examining various intervention strategies in the Stakeholder workshop)

1. Name the strategy
2. Describe the strategy
3. Indicate what part of the lifecycle it affects
   (a strategy can cover more than one part of the lifecycle)
   - Policy, standards and guidelines
   - Design of system
   - Installation
   - Certification
   - On-going operation and maintenance
4. How should it be implemented? – funding, responsibility, other
5. What are the pros and cons?
6. Will it be easy to implement?
   - What can make it easier to implement?
7. Will it be effective?
   - What can be done to make it more effective?



APPENDIX B: Information Sheet for Workshop

INFORMATION SHEET

Workshop: Rainwater tank maintenance

The purpose of this workshop is to identify possible approaches for managing the maintenance of household rainwater tanks. If tanks aren't maintained, problems develop which may become costly and/or which stop the tank from saving mains water as intended. We are seeking to understand your thoughts and opinions about how best to ensure that rainwater tanks are maintained.

This workshop forms part of a larger study that is examining potential rainwater tank maintenance initiatives, and which will ultimately inform government and water policy makers. Understanding these issues will help to ensure that the ongoing contribution of rainwater tank systems to the water grid is maximised. This is important for South East Queensland's water future.

Who is funding this 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. The focus of UWSRA research is on reducing water grid demand, ensuring the quality of diverse water sources, and planning for efficiency and sustainability of water supply.

Who is participating in this workshop?
There are approximately 25 participants attending the workshop, each with a shared interest in the maintenance of rainwater tanks, and representing a range of stakeholder groups. Participants include representatives from various state government departments, regulatory bodies, local councils and industry groups.

What is involved?
The workshop will run for approximately three to four hours and will involve a structured group discussion where ideas and opinions can be considered among participants. There are two main areas to be discussed. The first relates to the activities that need to be performed in order to maintain a tank in sound functioning order, to deliver a quality of water suitable for non-potable use. The second area of discussion relates to approaches that can be taken by regulatory and industry bodies that will both encourage and ensure that the necessary maintenance activities occur. We are not expecting to reach consensus on the various ideas put forward. Rather, the workshop is aiming to identify a number of different options for addressing these issues, to explore in subsequent research.

What happens with the information from the workshop?
The ideas from the workshop will be presented to users of rainwater tanks for assessment of community acceptability in forthcoming focus group discussions. This information will then guide further research. Ultimately, the information from the workshop, along with the findings from the community research, will be used to inform government and water policy makers.

Information from the workshop will be used to inform a report for the USWRA. Similarly, the information may be incorporated into a research paper for publication in academic journals.

Confidentiality
The workshop discussions will not be recorded, and the notes and comments gathered during the workshop will not be attributed to individual participants. If the identity or affiliation of a specific individual could be inferred by the nature of their comments, the planned reporting of such material will be discussed individually with them in advance, so that we can reach agreement about how the comments are reported.

What are the risks to you?
Participation in the workshop will not involve any personal risks or demands beyond those typical of the individual's line of work.

Outcomes
We will send you summary information from the consumer findings in the first half of 2012 via the USWRA.

How can I find out more about the study?
If you would like to find out more information regarding the overall research please feel free to contact us through the details listed below.

Ethical clearance and Contacts
This study has been cleared in accordance with the ethical review processes of CSIRO and 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, you can contact the CSIRO Human Research Ethics officer on (07) 38335693.

Thank you for your help with this very important research.

Yours sincerely,

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APPENDIX C: Information Sheet for Focus Groups

INFORMATION SHEET

Community Focus Group: Rainwater tank maintenance

The purpose of the focus group is to identify possible approaches for managing the maintenance of household rainwater tanks. If tanks aren't maintained, problems develop which may become costly and/or which stop the tank from saving mains water as intended. We are seeking to understand your thoughts and opinions about how best to ensure that rainwater tanks are maintained.

This focus group forms part of a larger study that is examining potential rainwater tank maintenance initiatives, and which will ultimately inform government and water policy makers. Understanding these issues will help to ensure that the ongoing contribution of rainwater tank systems to the water grid is maximised. This is important for South East Queensland's water future.

Who is funding this 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. The focus of UWSRA research is on reducing water grid demand, ensuring the quality of diverse water sources, and planning for efficiency and sustainability of water supply.

Who is participating in the focus groups?
There are around 40 participants attending a series of focus groups and all participants are residents of Brisbane and selected as representative of the general community. You were recruited to this focus group by a professional marketing recruitment company. We are talking to a range of people, including people who do and do not own water tanks.

What is involved?
The focus group will run for approximately ninety minutes and will involve a structured group discussion led by a qualified researcher. The discussions will be undertaken in small groups of seven people and snacks and drinks will be available. We will discuss with you the different ways of keeping a rainwater tank in good condition. We are interested in your thoughts and opinions about how best to encourage and ensure tank owners keep their tanks well maintained. You are not required to have any special knowledge about rainwater tank systems, nor any understanding about how a tank should be maintained. Rather, we will explain these matters to you and gather your views about the different approaches available for maintaining a tank.

We will also ask you to complete an anonymous and confidential "Demographics" form, which will give us information about the people who participated in the groups (e.g., age, gender, occupation).

What happens with the information from the focus group?
The ideas from the focus group will be used in further research into rainwater tank maintenance. Ultimately, the information from the focus group, along with the findings from other research, will be used to advise government and water policy makers.

Information from the workshop will also be used as part of a report for the USWRA. It may also be used as information that is presented at conferences or in academic journals.

Confidentiality
All information collected in the focus group will be confidential and anonymous. Although the discussions from the focus group will be recorded and analysed by a researcher, the recordings will only be available to members of our research team. The data will be securely stored, and used only

for research purposes. Your personal information will not be identifiable at any stage of the research process.

Participation and withdrawal
Participation in the focus group is completely voluntary and you are free to withdraw at any time without prejudice or penalty. If you wish to withdraw, simply notify a researcher and you are free to leave. If you do withdraw from the study, please note that because focus group discussions are recorded your comments can not be removed, however your information will be unidentifiable as part of general group responses.

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 I receive any payment for taking part in the study?
You will receive $70 (as a Coles/Myer gift voucher), to cover your time and travel costs.

How can I find out more about the study?
If you would like to receive a summary of the findings of the study please complete the 'Permission to Receive Feedback' form. If you would like to find out more information about the research, please feel free to contact us.

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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APPENDIX D: Consent Form for Focus Groups

COMMUNITY FOCUS GROUP: Rainwater tank maintenance

Dear Participant

To be able to participate in the focus group we need your permission. CSIRO also seeks your permission to collect a sound recording of the focus group session.

Please review the information below, tick the boxes to indicate you are in agreement, and sign if you agree to participate in the focus group research.

- ❒ I have been provided with information about the project and had any questions regarding my participation and any associated risks and benefits answered to my satisfaction.
- ❒ I understand my participation in the research will involve participation in a 90-minute focus group discussion, which will be audio recorded.
- ❒ I authorise CSIRO and their representatives to make an audio recording of me, as part of the focus group, to be used for research purposes (i.e. researcher's notes and analysis, project reports).
- ❒ I have been provided with contact details of the investigating officers and understand that I can contact them at any point during the study. I have also been provided with the contact details of an independent ethics officer at CSIRO should I wish to raise any concerns or complaints about the conduct of the research.
- ❒ I understand that my participation in the project is entirely voluntary and that I am free to withdraw from the study at any time and without having to provide a reason for my withdrawal. If I withdraw, my recorded comments to that point cannot be deleted; however they will be anonymous and will be reported only as part of larger group discussion content.
- ❒ I understand that the information I provide for this research will be used for the following purposes: technical reports, journal publications and media releases, and will be treated confidentially. I will not be identified in any publications resulting from the study unless I separately give my written permission for this to occur.
- ❒ I understand information provided by me will only be accessed by members of the research team and used for the purposes outlined above. It will be stored securely by CSIRO and retained for a period of 2 years, after which is will be destroyed.

Name: _____

Signature: _____

Date: _____

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