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## Acceptance of water alternatives in Australia

A. Hurlimann  
*University of Melbourne*

Sara Dolnicar  
*University of Wollongong, s.dolnicar@uq.edu.au*

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## Acceptance of water alternatives in Australia

### Abstract

In a nationally representative study with a sample size of 1495, Australian residents were asked about attitudes to recycled and desalinated water, including a question on likelihood to relocate because of water supply. This was highest when there was insufficient water to meet their needs, followed by when recycled water was introduced into their supply, then the introduction of desalinated water. The scenario where residents had to rely on self-purified rain water from a tank had the lowest level of relocation intention. The results indicate that the increased provision of rainwater tanks may be the most publically acceptable water alternative for Australians.

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# ACCEPTANCE OF WATER ALTERNATIVES IN AUSTRALIA – 2009

**A Hurlimann, S Dolnicar**

## **Abstract:**

In a nationally representative study with a sample size of 1495, Australian residents were asked about attitudes to recycled and desalinated water, including a question on likelihood to relocate because of water supply. This was highest when there was insufficient water to meet their needs, followed by when recycled water was introduced into their supply, then the introduction of desalinated water. The scenario where residents had to rely on self-purified rain water from a tank had the lowest level of relocation intention. The results indicate that the increased provision of rainwater tanks may be the most publically acceptable water alternative for Australians.

## **Introduction**

In southern Australia in the past five years significant shifts in water policy have occurred because of the extended drought, low levels in key water storages, and the potential impacts of climate change on water quantity. Shifts in water policy include in some cases, the replenishment of major urban area supplies with alternative water sources such as desalinated or recycled water. The choices available to authorities have typically not undergone much public consultation and, possibly as a consequence, have often led to negative community reactions. In many instances (Perth, Sydney, Melbourne) public policy decisions have appeared to predicate that the public would prefer the use of desalinated water over other management options.

Yet, it is not clear whether these assumptions about consumer preferences have been based on research. To the authors' knowledge only one study has been undertaken to date which comprehensively compared public acceptance of recycled versus desalinated water (Dolnicar and Schafer 2006; Dolnicar and Schäfer 2009). Limited research has been undertaken or is publically available, which include comparison with further water alternatives. In a national Australian study, Marks et al. (2006) investigated willingness to use recycled water in addition to other sources of water. They found high support for sources including grey water and stormwater for garden watering and toilet flushing.

This study aims to (1) provide current information about the attitudes and acceptance levels of water from alternative sources among Australians, and (2) to assess stated relocation intentions comparing not only centralised water augmentation schemes such as recycled and desalinated water, but also decentralised solutions, in particular the use of rainwater tanks.

## **Prior research on willingness to use alternative water sources**

Research relating to community attitudes to recycled water has received significant attention. In the 1970s and 1980s Bruvold and others conducted a significant amount of work regarding attitudes to recycled water in the USA (Bruvold 1988; Bruvold et al. 1981; Bruvold and Ongerth 1974; Bruvold and Ward 1970). Bruvold found that acceptance of recycled water use was high for non-potable uses such as irrigation, and lower for uses with closer human contact such as swimming and drinking. Several large scale national studies investigating public attitudes to recycled water have been

conducted in Australia over the past decade. Marks et al. (2006) conducted a national survey of 2,504 people in December 2004 – January 2005. They found that 68% of respondents would be willing to drink recycled water ‘mixed with reclaimed water and treated to drinking water quality’. A similar acceptance rate was found by Sydney Water (1999), and slightly lower rates of acceptance found by Hurlimann (2006; 2007) when researching attitudes in Melbourne (38%, with 17% undecided) and Bendigo (37% with 16% undecided). Dolnicar and Schäfer (2006) found that 30% of respondents in an Australia-wide study indicated they would be likely to use recycled water for drinking purposes. The studies reported above, and others (see Po et al. 2005) have replicated Bruvold’s finding that acceptance of recycled water is higher for low personal contact uses, and lower for high personal contact uses such as drinking. A number of factors have been found to influence the acceptability of recycled water use. These factors include: prior experience with water re-use (Dishman et al. 1989; Hurlimann 2006; 2007; Sims and Baumann 1974), trust of the water authority (Hurlimann et al. 2008; Marks et al. 2006; Po et al. 2005), perception of fairness in terms of price (Hurlimann et al. 2008), belief that there is no risk (Hurlimann et al. 2008; Po et al. 2005), and information search behaviour, specifically newspaper reading behaviour and TV watching behaviour (Dolnicar and Schäfer, (2009).

There has been limited research regarding community attitudes to desalinated water. Dolnicar and Schäfer (2009) contributed by conducting in April 2006 a comparative study of knowledge, perceptions and acceptability of recycled water and desalinated water in Australia. They found that respondents differentiated between recycled and desalinated water. Respondents were found to understand that recycled water is a more environmentally friendly option than desalinated water, however they had fewer reservations about desalinated water quality. Dolnicar and Schäfer (2009) found that respondents’ preference for the source of water varied according to water use purpose. Respondents’ stated likelihood of adoption of water use for close to body uses (e.g. drinking and showering) was high for desalinated water when compared to lower contact uses such as irrigation and cleaning. For those uses, recycled water was ranked higher. The general trend of increasing acceptance for low contact uses was also observed for desalinated water. Marks et al.’s (2006) national study found 52% of respondents were willing to use desalinated sea water for any of the uses investigated.

## **Method**

This research has been conducted in two phases, a qualitative and a quantitative phase. In the qualitative phase one focus group and in-depth interviews with 6-10 people were conducted with residents in each of eight locations across the country (Melbourne, Sydney, the Mallee, Brisbane, Toowoomba, Darwin, Perth, and Adelaide). These locations were selected because of their specific and different water contexts. The Theory of Planned Behaviour (Ajzen 1991) was used as the theoretical framework for our research. This theory hypothesises that human behaviour can be predicted by people’s behavioural intentions which are in turn influenced by a person’s beliefs, social norms and their perceived behavioural control. These factors were included in the focus group and interview questions to elicit an in-depth understanding beyond simply attitudinal measurement. The data gathered from phase 1 informed the development of survey instruments for phase two.

Phase 2 involved quantitative data collection and analysis in four waves collected in six monthly intervals to assess if and how attitudes to water and environmental behaviours change over time. The first wave of data was collected in January 2009, and is the focus of this paper. The study was conducted using a permission-based research-only internet panel which enabled a representative sample to be drawn based on ABS census information (for age, gender, state, and education). In total 1495 respondents were recruited for participation in a 30 minute survey. 13,884 panel members were sent an invitation to participate in the study. Respondents were rejected when particular quotas had

been filled. Respondents received a compensation payment based on a standard rate dependent on length of questionnaire.

***Stated likelihood of use – recycled and desalinated water***

Respondents were asked to indicate how likely they would use recycled water and desalinated water for a series of 14 uses (see Table 1 for a list of all uses). Likelihood of use was measured using a visual analogue scale (a line with a slider that respondents had to move to the point which best represented their likelihood of use). A verbal description was provided at both endpoints of the scale (‘very unlikely’ on the left hand side and ‘very likely’ on the right hand side). While respondents only saw a line, the line was later translated onto a numeric scale ranging from 0 to 100. Before the task, respondents were provided with a preamble about recycled water and desalinated water as detailed in Box One. As can be seen from this preamble the aim was to develop a realistic scenario to frame the participants’ responses.

*Insert Box One*

***Stated intention to relocate***

Respondents were also asked to indicate the likelihood that they would relocate to another town or city under the following circumstances, if:

- Authorities put recycled water into their home water supply
- Authorities put desalinated water into their home water supply
- Their region had insufficient water supply for their needs
- They were required to use self-purified rain water from a tank

Respondents were asked to indicate if they would: ‘not relocate,’ ‘consider relocating,’ or ‘definitely relocate’ under each scenario.

**Results**

***Stated likelihood of use – recycled and desalinated water***

The average stated likelihood of use scores were calculated for all 14 uses investigated, for both recycled and desalinated water. The results are shown in Table 1.

*Insert Table One*

Results indicate that for both recycled water and desalinated water toilet flushing had the highest mean likelihood of use rating, and drinking water had the lowest mean likelihood of use rating. Overall, the results replicate previous recycled water attitudinal studies discussed earlier in this paper which found that acceptance is higher for low human contact uses of recycled water. This trend was also observed for desalinated water in our study as per Dolnicar and Schäfer (2009).

Table 1 shows that for toilet flushing, washing the car and watering the garden recycled water has a higher mean than desalinated water. This pattern is different for all other uses except cleaning, for which there was no difference in means observed. Statistical analysis (t-tests) were undertaken to establish if the differences observed between recycled water and desalinated water mean ratings are significant. As shown in Table 1, for 11 of the 14 uses there was a significant difference. These

differences were observed predominantly for the uses with high personal contact where desalinated water had a significantly higher stated likelihood of use. The exception is for watering gardens, where recycled water had a significantly higher stated likelihood of use than desalinated water.

Given that we used very specific scenarios as well as a visual analogue scale to measure acceptance of recycled water and desalinated water use (which to our knowledge has not been used in alternative water research before) we cannot directly compare our results to those of other studies discussed earlier in the paper. However, overall the trend of higher acceptance for low contact uses of water and lower acceptance for higher contact uses of water was also found in our study for both recycled and desalinated water.

### ***Stated intention to relocate***

For each of the four relocation scenarios, the number and percentage of respondents who indicated each intention category was calculated. Statistical analysis was undertaken (chi-square tests) to establish if there was a significant difference in responses between scenarios. The results of this analysis can be found in Table 2.

### *Insert Table Two*

The results of the statistical analysis found that there was a significant difference in the proportion of respondents replying to each category for each of the four water scenarios explored. As can be seen from Table 2, the scenario with the highest percentage of respondents indicating they would not relocate was if they were 'required to use self-purified rain water from a tank,' followed by 'desalinated water added to their home water supply', then 'recycled water added to their home water supply', and lastly, 'if the region had insufficient water to supply their needs'.

The results indicate that currently augmentation of water supply with desalination is preferred over recycled water. However, results also indicate that desalinated water is not the overall preferred option of Australians. Instead, the preferred public policy approach to water augmentation – as measured by the lowest relocation intention - is the increased use of rain water tanks.

## **Conclusions**

Results indicate that stated likelihood of use is higher for uses which have low personal contact (such as toilet flushing and garden watering) and lower for uses which have higher personal contact (such as drinking). This holds for both recycled water and desalinated water, and is in line with previous research findings. Overall, recycled water had a significantly higher stated likelihood of use than desalinated water for watering of gardens. For three uses (toilet flushing, car washing and cleaning) there was no significant difference between the two alternative sources of water. For all other uses, desalinated water had significantly higher mean stated likelihood of use ratings.

An additional contribution this research has made is the provision of information about the public's stated intention to relocate under four water scenarios: 1) if recycled water was added to their home water supply, 2) if desalinated water was added to their home water supply 3) if their region had insufficient water supply for their needs, or 4) if they were required to use a self-purified rain water from a tank.

Results indicate that the highest percentage of respondents who indicated that they would relocate was insufficient supply (65%), followed by recycled water (40%), desalinated water (27%) self-purified rainwater (24%).

These results have interesting public policy implications. The results indicate that people are least likely to relocate if they have a self-sustaining supply of water on their property (rain water tanks). This suggests that if public policy makers are interested in avoiding migration due to water scenarios, it may be worthwhile to consider not only centralised, large-scale projects of water augmentation, but also decentralised solutions, such as the increased use of rainwater tanks.

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**The Authors:** Dr Anna Hurlimann is a Senior Lecturer in Urban Planning in the Faculty of Architecture Building and Planning at the University of Melbourne, Melbourne 3010, Australia. Email: [anna.hurlimann@unimelb.edu.au](mailto:anna.hurlimann@unimelb.edu.au); Sara Dolnicar is a Professor of Marketing at the School of Management and Marketing at the University of Wollongong and the Director of the Marketing Research Innovation Centre (MRIC), Northfields Avenue Wollongong NSW 2522, Australia: [sarad@uow.edu.au](mailto:sarad@uow.edu.au)

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**Box One: Preamble at the beginning of the likelihood of use question series**

*We will use the term ‘recycled water’ to describe ‘highly purified wastewater.’  
 We will use the term ‘desalinated water’ to describe ‘highly purified seawater.’  
 We will assume that both recycled water and desalinated water were treated to the same level of water quality.*

*For the following question, imagine that you live in a town where:*

- *Dams supplying household water currently hold 20 per cent of capacity*
- *Level 5 Mandatory Water Restrictions are in place for the use of tap water (no outside watering of gardens, no watering systems, no refilling swimming pools, no washing vehicles except for windows and headlights*
- *Recycled water is readily available without restrictions*

*Under these circumstances, please indicate how likely you would be to use RECYCLED WATER for the following purposes by placing the slider in the respective position along the line. The extreme points of the line indicate “very likely” and “very unlikely”. Some of these behaviours may not apply to you, e.g. because you do not have a swimming pool. In this case please tick the “not applicable” options.*

<Recycled water use likelihood ratings>

*Again, please imagine that you live in a town where:*

- *Dams supplying household water currently hold 20 per cent of capacity*
- *Level 5 Mandatory Water Restrictions are in place for the use of tap water (no outside watering of gardens, no watering systems, no refilling swimming pools, no washing vehicles except for windows and headlights*
- *Desalinated water is readily available without restrictions*

*Under these circumstances, please indicate how likely you would be to use DESALINATED WATER for the following purposes by placing the slider in the respective position along the line. The extreme points of the line indicate “very likely” and “very unlikely”. Some of these behaviours may not apply to you, e.g. because you do not have a swimming pool. In this case please tick the “not applicable” options.*

<Desalinated water use likelihood ratings>

**Table 1: Stated likelihood of use for various uses of recycled and desalinated water<sup>#</sup>**

Use of water	Recycled water	Desalinated water
	Mean score (SD)	Mean score (SD)
Toilet flushing	92 (18)	91 (20)
Cleaning the house windows and driveways	86 (26)	86 (26)
Watering the garden – flowers trees and shrubs*	86 (25)	84 (26)

Washing the car	85 (27)	84 (28)
Washing clothes / doing the laundry***	76 (29)	83 (26)
Fishpond or aquarium**	73 (32)	76 (32)
Watering of the garden – vegetables and herbs to be eaten raw***	67 (36)	76 (32)
Refilling / topping up the swimming pool***	65 (37)	81 (30)
Showering / taking a bath***	61 (34)	75 (31)
Feeding my pets***	57 (37)	68 (35)
Cooking***	46 (36)	65 (36)
Brushing teeth***	42 (36)	60 (37)
Bathing the baby***	39 (36)	56 (38)
Drinking***	36 (36)	53 (38)

# Measured on a 100 point scale

Difference in means: \*=significant at the 0.01 level; \*\*=significant at the 0.001 level; \*\*\*=significant at the 0.0001 level

**Table 2: Stated intention to relocate under four water scenarios**

<b>Relocation scenario</b>	<b>'I would not relocate' %</b>	<b>'I would consider relocating' %</b>	<b>'I would definitely relocate' %</b>
Authorities put recycled water into the home water supply	66	26	8
Authorities put desalinated water into the home water supply	74	22	4
Their region had insufficient water supply for their needs	35	54	11
They were required to use self-purified rain water from a tank	76	20	4