WORKING PAPERS
SERIES TWO

no. 39 Public Perceptions of, and Responses to, Desalination in Australia: A Report on Findings

Tanya J King, Daniel Ooi, John Cary, Adrian Fisher, Renato Schibeci, Kristina Murphy, Kevin O'Toole, Malcolm Mearns, Jilleen A Donaldson

ALFRED | DEAKIN | RESEARCH | INSTITUTE
social sciences & humanities engaging policy

WORKING PAPERS
SERIES TWO

no.39 Public Perceptions of, and Responses to, Desalination in Australia: A Report on Findings

Tanya J King, Daniel Ooi, John Cary, Adrian Fisher, Renato Schibeci, Kristina Murphy, Kevin O'Toole, Malcolm Mearns, Jilleen A Donaldson

SERIES EDITOR
Peter Kelly

ALFRED DEAKIN RESEARCH INSTITUTE
Deakin University
Geelong VIC 3217
AUSTRALIA

ISBN 978-1-921745-38-6
ISSN (online) 1837-7440
ISSN (print) 1837-7432

NOVEMBER 2012

ALFRED | DEAKIN | RESEARCH | INSTITUTE
social sciences & humanities engaging policy

National Library of Australia
Cataloguing-in-Publication data:
King, T. J., Ooi, D., Cary, J., Fisher, A., Schibeci, R., Murphy, K., O'Toole, K., Mearns, M. & Donaldson, J. A.

Public Perceptions of, and Responses to, Desalination in Australia: A Report on Findings

Bibliography

ISBN 978-1-921745-38-6

1. Saline water conversion--Australia--Public opinion.
I. King, T. J., Ooi, D., Cary, J., Fisher, A., Schibeci, R., Murphy, K., O'Toole, K., Mearns, M. & Donaldson, J. A.
II. Alfred Deakin Research Institute.
III. Title. (Series: Alfred Deakin Research Institute;
Working Paper No. 39).

628.1670994

The Alfred Deakin Research Institute Working Papers

SERIES TWO

The Alfred Deakin Research Institute (ADRI) is a specialised research unit that was established at Deakin University in 2009. From its foundation in the humanities and social sciences, the Alfred Deakin Research Institute promotes research that integrates knowledge generated from a broad range of disciplines in ways that address problems of local, national and international importance.

This series of working papers is designed to bring the research of the Institute to as wide an audience as possible and to promote discussion among researchers, academics and practitioners both nationally and internationally on issues of importance.

The working papers are selected with the following criteria in mind: To share knowledge, experience and preliminary findings from research projects: To provide an outlet for research and discussion papers (some of which have a policy focus): To give ready access to previews of papers destined for publication in academic journals, edited collections, or research monographs, and: To present this work in a form that is scholarly, well written and which has a clear sense of particular purpose and context.

The Alfred Deakin Research Institute

Working paper series

No. 01 Lowe, D. *The Colombo Plan and 'soft' regionalism in the Asia-Pacific: Australian and New Zealand cultural diplomacy in the 1950s and 1960s.* April 2010.

No. 02 Murphy, K. and Cherney, A. *Policing ethnic minority groups with procedural justice: An empirical study.* April 2010.

No. 03 Ritchie, J. *'We need one district government to be set up to replace other district governments': The beginnings of provincial government in Papua New Guinea.* April 2010.

No. 04 Murphy, B. and Murphy, K. *'The Australian Tax Survey of Tax Scheme Investors': Survey methodology and preliminary findings for the second stage follow-up survey*. April 2010.

No. 05 Feeny, S. and McGillivray, M. *Scaling-up foreign aid: Will the 'Big Push' work?* April 2010.

No. 06 Murphy, K. and Gaylor, *A. Policing Youth: Can procedural justice nurture youth cooperation with police?* July 2010.

No. 07 Brown, T.M. *The Anglican Church and the Vanuatu Independence Movement: Solidarity and Ambiguity*. August 2010.

No. 08 Moore, C. *Decolonising the Solomon Islands: British Theory and Melanesian Practice.* August 2010.

No. 09 Hayes, M. *Re-framing Polynesian Journalism: From Tusitala to Liquid Modernity*. August 2010.

No. 10 Dickson-Waiko, A. *Taking over, of what and from whom?: Women and Independence, the PNG experience.* August 2010.

No. 11 Hancock, L. and O'Neil, M. *Risky business: Why the Commonwealth needs to take over gambling regulation*. August 2010.

No. 12 Bryant-Tokalau, J. *The Fijian Qoliqoli and Urban Squatting in Fiji: Righting an Historical Wrong?* August 2010.

No. 13 Murphy, B., Murphy, K. and Mearns, M. *The Australian Tax System Survey of Tax Scheme Investors: Methodology and Preliminary Findings for the Third Follow-up Survey*. September 2010.

No. 14 Hancock, L. *How 'responsible' is Crown Casino?: What Crown employees say*. November 2010.

No. 15 Murphy, K. and Cherney, A. *Understanding minority group willingness to cooperate with police: Taking another look at legitimacy research*. November 2010.

No. 16 Murphy, K., Murphy, B., and Mearns, M. *'The 2007 public safety and security in Australia survey': survey methodology and preliminary findings*. November 2010.

No. 17 Murphy, K., Murphy, B. and Mearns, M. *'The 2009 Crime, Safety and Policing in Australia Survey'*: *Survey Methodology and Preliminary Findings.* November 2010.

No. 18 Kelly, P. *'A Social Science of Risk: The Trap of Empiricism, the Problem of Ambivalence?* September 2011.

No. 19 Campbell, P., Kelly, P. and Harrison, L. *'Social Enterprise: Challenges and Opportunities'*, September 2011.

No. 20 Lowe, D. *'Old Wine, New Bloggers: Public Diplomacy, India and Australia',* November 2011

No. 21 Foster, J. E., McGillivray, M. and Seth, S. *'Composite Indices: Rank Robustness, Statistical Association and Redundancy',* November 2011.

No. 22 Turner, M. *'Historians as Expert Witnesses: How do Holocaust Perpetrator Trials Shape Historiography?'*, November 2011.

No. 23 Turner, M. *'The Irving-Lipstadt Libel Trial: Historians as Expert Witnesses and the Shaping of Post-Trial Publications',* November 2011.

No. 24 Campbell, P., Kelly, P. & Harrison, L. *'Transitional Labour Market Programs: Challenges and Opportunities*', December 2011.

No. 25 Robinson, G. *'American liberalism and capitalism from William Jennings Bryan to Barack Obama'*, December 2011.

No. 26 Koehne, S. '*"Peaceful and Secure": Reading Nazi Germany through Reason and Emotion*', December 2011.

SERIES 2

No. 27 King, T. J. & Murphy, K. *Procedural Justice as a component of the Not In My Backyard (NIMBY) syndrome: Understanding opposition to the building of a desalination plant in Victoria, Australia*, June 2012.

No. 28 Jackson, R. *Birthing Kits, NGOs and reducing maternal and neonatal mortality in Ethiopia*, June 2012.

No. 29 Speldewinde, C. & Verso, M. *Winchelsea: A Health and Wellbeing Profile*, June 2012.

No. 30 Speldewinde, C. & Verso, M. *Lorne: A Health and Wellbeing Profile*, June 2012.

No. 31 Campbell, P., Kelly, P. & Harrison, L. The Problem of Aboriginal Marginalisation: Education, Labour Markets and Social and Emotional Well-Being, July 2012.

No. 32 Jackson, R., Jatrana, S., Johnson, L., Kilpatrick, S. & King, T. *Making connections in Geelong: Migrants, social capital and growing regional cities*, July 2012.

No. 33 Jones, P., *Managing Urbanisation in Papua New Guinea: Planning for Planning's Sake?* August 2012.

No. 34 Phillips, S., *Widening Participation in Higher Education for People from Low SES Backgrounds: A Case Study of Deakin University's Existing Community Partnerships and Collaborations*, August 2012.

No. 35 Charles, C., *Constructions of Education and Resistance within Popular Feminist Commentary on Girls and Sexualisation*, August 2012.

No. 36 Graham, M. & Rich, S., *What's 'childless' got to do with it?* August 2012.

No. 37 Migdalek, J., *Aesthetics of Gender Embodiment*, August 2012.

No. 38 Tan, G., *Re-examining human-nonhuman relations among nomads of Eastern Tibet*, November 2012.

No. 39 King, T. J., Ooi, D., Cary, J., Fisher, A., Schibeci, R., Murphy, K., O'Toole, K., Mearns, M. & Donaldson, J. A., *Public Perceptions of, and Responses to, Desalination in Australia: A Report on Findings*, November 2012.

Public Perceptions of, and Responses to, Desalination in Australia

A report by researchers at
Deakin University, Victoria University, and Murdoch University.

Participating research institutions

Funded by

National Centre of Excellence in Desalination AUSTRALIA

Principal Researcher and Corresponding Author

Dr Tanya J King (Deakin University) tanya.king@deakin.edu.au

Authors

Dr Tanya J King (Deakin University)
Dr Daniel Ooi (Victoria University)
Prof John Cary (Victoria University)
A/Prof Adrian Fisher (Victoria University)
A/Prof Renato Schibeci (Murdoch University)
A/Prof Kristina Murphy (Griffith University, formerly of Deakin University)
A/Prof Kevin O'Toole (Deakin University)
Malcolm Mearns (Datacol Research)
Jilleen Donaldson (Deakin University)

Acknowledgments

The authors would like to thank the National Centre of Excellence in Desalination Australia (NCEDA) for funding this project, through a Round 1 competitive grant. The NCEDA is funded by the Federal Government as part of the Water for the Future program. The authors would also like to thank Deakin University, Victoria University, and Murdoch University for providing funding (actual and in-kind) for this project.

EXECUTIVE SUMMARY – *National Survey*

Desalination as a method of ensuring a rainfall independent source of potable water has become an increasingly favourable option for Australian governments, particularly over the last decade or so. This is especially true for metropolitan areas. The social acceptability of new sources of water, however, impacts on the readiness with which publics accept changed or augmented water supplies.

Researchers at Deakin University, Victoria University and Murdoch University, with funding from the National Centre of Excellence in Desalination Australia (NCEDA), have conducted a study of public attitudes to desalination in Australia. This report outlines the results of the 18 month project, which comprises three sections. The cornerstone of the project is a national survey (n=3077), conducted by Datacol Research. The second component of the study consists of focus groups in the vicinity of three existing or developing desalination plants: Wonthaggi (Victoria), Port Stanvac (South Australia), and Kwinana (Western Australia). The third component of the study presented in this report involves interviews with desalination scientists and other technical experts, in relation to their attitudes to communication with lay publics.

Key objectives of the research:

- Build upon previous research into attitudes to desalination;
- Build upon previous research into attitudes to large public infrastructure;
- Establish a national benchmark of Australian attitudes to desalination;
- Identify those factors that influence support and opposition for the use of desalination;
- Broaden the quantitative data provided by the survey with qualitative data from focus groups;
- Identify attitudes to communication held by desalination scientists and other technical experts in relation to their dealings with lay publics.

While establishing a benchmark of support or opposition to desalination technology has some value, the more important outcome of this research is a better understanding of the various factors that influence this support and opposition. The results of the national survey provide a wealth of information on Australian attitudes to desalination and water resource management in general, by addressing a range of factors that influence those attitudes, some of which are not directly related to desalination technology itself.

This study called for three distinct samples; a stratified random national sample of 7000 persons, a random sample of 1500 persons within 20km of the Wonthaggi desalination plant in Victoria; and a random sample of 1500 persons within 20 km of the Port Stanvac desalination plant in SA. The samples were drawn during January, February and March 2011, resulting in a total sample size of 10,000. The survey period extended from 22 July 2011 when the first questionnaires were posted through to the last receipt in January 2012 when the last completed questionnaire was received. A total of 3077 surveys were completed and returned, which constitutes an overall 30.8% raw response rate.

Raw response rates:

- National sample – 29%
- Wonthaggi sample – 38%

- Port Stanvac sample – 32%

51% of respondents are female, and the mean age of all respondents was 55 years old. The majority were born in Australia (72%) and the vast majority are home owners/buyers (78%). The education levels of respondents are quite variable, with 18% reporting they have completed Year 10, 17% finishing Year 12, while 14% have a Bachelors degree. Many of those who responded were working full time (36%) while 31% were retired. More respondents reported being Liberal voters than any other (29%), followed by 'swinging voters' (27%) and Labor (22%).

Overall responses to desalination:

Throughout the survey, participants were asked a number of questions about their general support for desalination as a technical response to water shortages in Australia. The following results, based on 3077 responses, give a snapshot of the overall picture. It should be kept in mind, however, that these questions were posed without any supplementary or contextualising information, and should therefore not be taken as a predictor for practical support for desalination. The factors that influence support or opposition, *in practice*, require a more sophisticated analysis of the data.

How supportive are you of desalination as a response to domestic water shortages in Australia?

Very negative	Somewhat negative	Indifferent	Somewhat positive	Very positive
11%	20%	23%	32%	14%

If it was announced that desalination was to be a preferred response to domestic water supply shortages in your local area, how positive or negative would you be?

Very negative	Somewhat negative	Indifferent	Somewhat positive	Very positive
23%	23%	15%	27%	12%

Desalination plants are generally a good idea.

Strongly disagree	Disagree	Indifferent	Agree	Strongly agree
9%	13%	24%	42%	12%

Breakdown of responses:

In addition to contextualising and demographic questions, respondents were asked to respond to survey items in five sections:

1. Water and your household
2. Water and desalination
3. Your views about the environment and water
4. Water saving behaviour
5. Domestic water supply and the government

All of the summary information, below, refers to the overall sample of 3077. Breakdowns of the responses from the national and local samples are provided in the body of the report.

1. Water and your household:

The majority of respondents sourced their water primarily from the mains (81%), as opposed to 'private sources', including rainwater tanks. People were more likely to use mains water for 'household use' (85%) than for 'garden use' (59%). In the latter case respondents indicated a greater use of tank or grey water ('private sources'). The vast majority of people drink tap water, either directly from the tap (59%) or filtered (30%).

47% of people said they were concerned about the availability of water in the future, while 67% were worried for future generations' water security. The preference for addressing future water shortages by reducing the demand for water (48%) or increasing its availability (52%) was quite balanced, particularly in comparison to the results of previous surveys. When asked more specifically about favoured methods of water conservation, the percentage of respondents who were 'supportive' or 'strongly supportive' of various approaches were as follows:

- infrastructure upgrades 94%
- installing rainwater tanks in homes 90%
- stormwater recycling 80%
- education campaigns 77%
- building/expanding dams 71%
- greywater recycling 66%
- reduce industrial use 62%
- piping water across the country 47%
- desalination (in general) 44%
- sewage recycling 40%
- tighter government restrictions 40%
- desalination (in local area) 37%

- reduce agricultural use 31%

2. Water and desalination:

Support for desalination and other water augmentation methods, such as recycling, are influenced by the perceived risks associated with each method. How willing someone is to use water can depend on what that use is, namely whether it is for 'close' use (drinking, washing), or 'distant' use (garden use, cleaning). Overall, 90% of those surveyed 'agreed' or 'strongly agreed' that they would feel comfortable using desalinated water for 'distant' use, and 77% felt safe using desalinated water for 'close' use. Other items in the survey indicated that 84% of respondents felt safe drinking desalinated water. These results are good news for those wishing to incorporate desalinated water into domestic supplies, as general concerns about the safety of desalinated water are low.

One of the mediating factors in the support for desalination is the consideration, use or supplementation of other water augmentation methods with desalination. Only 20% of those surveyed feel that desalination is the *best* solution to water shortages in Australia, while 14% think it is the *only* solution. 72% of people think that other methods should be tried or considered first, before desalination, and 80% reported believing that water shortage issues in Australia should be tackled using a variety of strategies.

Respondents report a being well informed about using grey water around their own home. Self-reported knowledge of desalination is slightly less than grey water knowledge, and similar to perceived knowledge of recycled water.

Participants were asked how concerned they were about particular aspects of the whole desalinated water augmentation process. People report very low concerns about the aesthetic qualities of plants (6% report 'agreeing' or 'strongly agreeing' that they are concerned), while concerns about location (66%), building and operating costs (62%) and environmental issues (51%) are deemed more important. When phrased differently, and asked how much they 'care' about various aspects of desalination, people report caring 'a fair bit' or 'very much' about human safety (90%), the environment (90%), political processes (88%), economics (79%) and how they are personally impacted (54%).

This last point – the role of personal cost/benefit analyses in support for desalination – was addressed further through questions about the 'fairness', on the one hand, and the 'equity', on the other hand, of plant implementation processes. In keeping with earlier studies, we found that people were more concerned that processes were 'fair' (a subjective term), than 'equitable' (implying equal distributions of costs and benefits). These findings relate to those discussed in section 5 of the survey results.

3. Your views about the environment and water:

Most respondents reported themselves to be highly environmentally conscientious with 87% of people either agreeing or strongly agreeing that they were environmentally aware. 76% feel that the

environment has intrinsic value. 90% feel a moral obligation to conserve water, and only 10% feel they have a right to use as much water as they wish.

4. Water saving behaviour:

The vast majority of people indictated that they tried to save water around the house through 'reactive' means such as turning off the tap while they brush their teeth (87%). When asked to rate their household use of water, most people responded that they use less water than others (58%), while only 5% of those surveyed said their household use was higher than average. It should be noted, however, that studies have shown that there is discrepancy associated with self-reporting of water-use and actual conservation behaviour. Nonetheless, these results speak to the general good intensions of Australians in relation to environmental issues and water conservation efforts.

Beliefs about how other people use water were surveyed, with a particular focus on percieved distinctions between 'rural' and 'urban' water users. The results were complicated, but not unexpected. More people report feeling an emotional connection to the country than to the city, even those who were not raised in rural or regional Australia. Most people reported that country dwellers are more conscientious with their water use than city residents, although most people also agreed that residence made no difference to water-use patterns. These results speak to the complex nature of social identification, and the strength of stereotypes (in this case, of the frugal and wise rural dweller, and the careless and ignorant urbanite), in the formation of opinions about environmental behaviours.

5. Domestic water supply and the government:

This section asked participants about their attitudes to their State/Territory government, and their role in managing water issues. The questions were developed in light of earlier research on the role of 'procedural justice' in shaping attitudes towards authority figures and their proposals. In keeping with this other scholarship, this survey found a strong correlation between the perceived fairness, trasparency and legitimacy of government bodies, and support for desalination, with the greater the trust in government, the more likely the support for desalination.

An important component of procedural justice is 'voice', or 'consultation'. The survey found that respondents have a low level of satisfaction with their government's consultation process. Parallel to this, however, it was found that there is a low level of understanding of formal consultation processes. This finding is consistent with scholarship that argues there is a wide range of definitions of 'consultation' in the community, from government control over decision making, to plebiscite. Our findings suggest that satisfaction with consultation could be improved by reconciling expectations about what kind of consultation can realistically be offered, or expected, in any given decision making scenario.

When asked who they trust to provide information about desalination, the most highly regarded groups were the CSIRO, the EPA, and Univeristy scientists, followed by desalination plant experts,

and then friends,family and neighbours. The least trusted sources were politicians, TV personalities and journalists.

When asked how they would prefer to find out about a major water decision in their area, most people favoured getting a letter from their government (70%), seeing a media story (62%), or hearing about it at a community meeting (61%). These results, which favour the sourcing of information from journalists and government, are puzzling when considered with those that suggest governments and journalists are among the less trusted of sources of information. Given the relationship between 'procedural justice' and support for desalination, a greater understanding of these complex public attitudes to consultation would aid those in the business of implementing desalination technologies in Australia.

The survey shows unequivocally the complexity of community perceptions of, and responses to, desalination. The data will be of immense use to desalination researchers, policy makers and interested publics.

Contents

LIST OF TABLES

LIST OF FIGURES

PROJECT INTRODUCTION

In recent years, concerns about climate change associated water scarcity in Australia have seen authorities explore a range of strategies for water conservation and supply augmentation. Perhaps the most significant of these has been the introduction of reverse osmosis desalination technology. In November 2006, the Kwinana desalination plant in Perth became the first fully operational facility in Australia for the processing of seawater into potable water for a metropolitan area. Since then, desalination plants have also begun operation on the Gold Coast, Queensland (2009); Kurnell, Sydney (2010); and Binningup, Perth (2012). Further plants are currently under construction, but not yet operational, in, Wongthaggi (VIC), and Port Stanvac (SA). Part of the initial impetus for increasing water production capacity was a prolonged nation-wide drought, but since 2010, conditions of water scarcity gave way to heavy rains and flooding in certain parts of the country. This context led some to question the necessity of desalination as a rainfall independent water supply. The introduction of desalination as a significant technology for domestic water supply in Australia raises numerous social issues. Researchers at Deakin University, Victoria University, and Murdoch University conducted this project to address the social aspects of the introduction of desalination, in a project funded by the National Centre of Excellence in Desalination (NCED).

This integrated social research program will inform the understanding and management of public perceptions and social issues associated with desalination implementation in Australia. The project will establish a national benchmark on public perceptions of desalination in relation to environmental, technical, water quality and social factors through a national survey. The researchers also conducted focus groups, as well as investigating how water professionals (including desalination experts) view communication with water users.

Project components

1 National Survey

A national survey was conducted in late 2011 to examine community responses to desalination. The main focus of this survey was to benchmark attitudes of different sections of the community to desalination as an alternative water source, and to desalination plants themselves. Additionally, the survey aimed to examine factors important to attitude formation, such as: perceptions of water shortage; self-perception of environmental consciousness; trust in government; and demographic variables underlying attitudes to desalination. Small target groups were also drawn from two areas in the immediate vicinity of desalination plants, in Wonthaggi and Port Stanvac.

This work followed on from earlier surveys conducted by the Deakin University and Griffith University researchers involved in this project on target populations in Wonthaggi, as well as similar studies carried out by Natasha Porter, Geoff Syme, and Blair Nancarrow (2004) on attitudes towards the Wanneroo Groundwater Treatment Plant, and June Marks, Bill Martin and Maria Zadorozny (2008) on attitudes towards recycled water. The final result is a report on national public attitudes to desalination in the context of broader environmental issues of climate change, and rural and regional relationships to government and industry.

2 Focus Groups

In conjunction with the national survey, researchers ran focus groups in Wonthaggi (VIC), Port Stanvac (SA), and Kwinana (WA) to examine the key issues of local residents. These were used to understand shifting community and consumer attitudes to desalination. The focus groups specifically explored the attitudes of residents living in the vicinity of the desalination plants towards desalination, with a focus on issues of procedural justice (due process), and the so-called Not In My Backyard (NIMBY) effect. These focus groups complemented the profiling of attitudes towards desalination being developed via the national survey. This part of the project also provided an improved basis for assessing customer satisfaction with perceived changes in water characteristics associated with the introduction of desalination.

3 Science communication

The Murdoch University phase of the project investigated how water professionals (including desalination experts) from the Perth and Melbourne areas viewed communication with water users. Through semi-structured interviews with water scientists and engineers, in particular those working at the 'membrane-face' of desalination, this project aimed to determine whether these professionals conceived of the audience for their knowledge as lay publics, scientifically literate, or otherwise. This phase of the project also began to examine how information about desalination is transferred among key stakeholders, including the water industry, water industry professionals and the general community, and the information which is perceived to be relevant in each case.

1. NATIONAL SURVEY

Introduction

This national survey aimed at creating a benchmark set of data on national attitudes towards desalination, and the broader context of environmental concerns, technical understandings of desalination, and responses to changes in water quality concerns that accompany it.

1.1 STUDY AREA AND PARTICIPANT SELECTION

Survey Title

'Water Management and Desalination Survey – A survey of your views and experiences'

Overview of the survey

This survey was managed and conducted by Datacol Research Pty Ltd on behalf of Deakin University between July and December 2011. The principal investigator was Dr Tanya King.

Sample Design

This study called for three distinct samples; a stratified random national sample of 7000 persons, a random sample of 1500 persons within 20km of the Wonthaggi desalination plant in Victoria; and a random sample of 1500 persons within 20 km of the Port Stanvac desalination plant in SA. All three samples were drawn at random by hand from the electoral rolls available to the public. As the sample was drawn from the electoral role, all those selected were over 18 years of age at the time of sampling. The national sample was stratified by State and Territory jurisdiction. The samples were drawn during January, February and March 2011, resulting in a total sample size of 10,000.

1.1.1 National Sample

A total of 7000 persons were selected from the electoral roll. These persons were selected from states and territories in direct proportion to their electoral population as specified by the Australian Electoral Commission on 30 November 2010. The number and percentage of electors and of sample participants of each state and territory are shown in Table 1.

Table 1: Sample by State

State	Electors	No in sample	Percentage
NSW	4 628 358	2289	32.0
Vic	3 586 522	1774	25.3
Qld	2 731 801	1351	19.3
WA	1 370 982	678	9.7
SA	1 106 626	547	7.8
Tas	359 793	178	2.5
ACT	248 271	123	1.8
NT	122 054	60	0.9
Total	14 154 407	7000	100.0

1.1.2 Wonthaggi Sample

Some 1500 persons living in settlements within an arc of radius 20 km centred on the desalination plant were randomly sampled from the Victorian electoral roll. The list of settlements is shown in Table 2. The Wonthaggi Desalination plant was under construction at the time of the survey and is located near the mouth of the Powlett River a few kilometres west of the Wonthaggi township.

Table 2: Settlements within 20 km of the Wonthaggi Desalination plant

Locality	Postcode	Locality	Postcode
Adams Estate	3984	Kernot	3979
Almurta	3979	Kilcunda	3995
Anderson	3995	Kongwak	3951
Archies Creek	3995	Korrine	3979
Bass	3991	Lance Creek	3995
Blackwood Forrest	3992	Newhaven	3925
Cape Paterson	3995	North Wonthaggi	3995
Cape Woolamai	3925	Queensferry	3984
Corinella	3984	Ryanston	3992
Coronet Bay	3984	South Dudley	3995
Dalyston	3992	St Clair	3995
Glen Alvie	3979	San Remo	3925
Glen Forbes	3990	Tenby Point	3984
Grantville	3984	Wattle Bank	3995
Harmers Haven	3995	West Creek	3992
Hicksborough	3992	Wonthaggi	3995
Inverloch	3996	Woolamai	3995

In 2010, a public attitude survey about the environment and desalination was undertaken by A/Prof Kristina Murphy (Griffith University) and Dr Tanya King (Deakin University). Again, that survey was administered by Datacol Pty Ltd on behalf of the researchers. A total of 1500 residents of Victoria were selected for that purpose (750 from the Wonthaggi Region and 750 drawn from the rest of Victoria (see King and Murphy 2012; Murphy, King, Murphy and Barkworth, in press). The persons from the earlier Victorian survey were excluded from selection for the broader national survey, as were persons living at the same addresses as these 1500 people.

1.1.3 Port Stanvac Sample

The sample design called for a sample of persons living within 20km of the site of the Port Stanvac desalination plant. No such list is readily available, so the desired arc was drawn on a map of South Australian state Electoral Districts and districts were chosen in order to include the majority of the desired population. Some 1500 persons living in these state electoral districts were randomly sampled from the SA electoral roll. These electoral districts do not form a perfect circular arc of radius around the Port Stanvac site. However, they encompass a reasonably good fit in the populated areas; although less so in the less densely populated outlying areas to the south east of Adelaide. The Local Area is defined as the area enclosed by the 12 South Australian electoral districts listed in Table 3.

Table 3: South Australian State Electoral Districts included in the Port Stanvac sample

Electoral District	Electoral District
Ashford	Mawson
Bright	Mitchell
Davenport	Morphett
Elder	Reynell
Fisher	Waite
Kaurna	West Torrens

1.2 SURVEY DEVELOPMENT AND DEPLOYMENT

The survey questionnaire was a 26 page self-completion questionnaire booklet of A4 size containing approximately 340 questions. The questionnaire was divided into 6 sections, entitled Water and Your Household, Water and Desalination, Your Views about the Environment and Water, Water Saving Behaviour, Domestic Water Supply and the Government, and finally Your Background. Each section included a number of attitude scales (both established and developmental) as well as questions covering knowledge and behaviour. In each section a broad range of questions was asked relating to the topic named in the heading. The questionnaire also contained a comprehensive set of demographic background variables covering the respondent and their family situation.

The opening remarks on the inside front cover of the questionnaire covered the aim of the study and specified the organisations involved in the research and mentioned the funding body. It also referred to the approval granted to the research by the Deakin University Ethics Committee and provided respondents with the project number (HEAG09-82). At the end of the questionnaire interested respondents were invited to include their name and contact details if they were prepared to be involved in focus groups or a face-to-face interview (18.1% replied positively) and to indicate if they were prepared to be contacted again in a few years (59.1% replied positively).

The majority of the questions were of the 5 point Likert scale type in which respondents were invited to choose one of 5 answers which best represented their attitude to a statement. Most other questions involved the respondent choosing the response they considered most suitable from a set of pre-defined answers. A small number of questions were posed in which respondents could answer in their own words.

1.2.1 Survey distribution and follow-up of non-response

The survey process was modelled on the Dillman Total Design Method (1978). The method provides for an attractive survey booklet with clear question layout and for multiple mailings following up non-respondents over a period of time. Up to four mail contacts were made during the survey in an effort to reduce non-response rates.

The survey period extended from 22 July 2011 when the first questionnaires were posted through to the last receipt in January 2012 when the last completed questionnaire was received. While there were no state or federal elections during the survey period, there was some political and public comment about desalination plants during that time.

The first mailing comprised a questionnaire, a reply paid envelope and a covering letter setting out the aims of the study and designed to stimulate interest and participation. The letter explained the intent of the study, identified Deakin University as the sponsoring organisation, guaranteed respondent confidentiality, and referred potential respondents to a Free-call 1800 number should they have any questions. To prevent respondents from declaring that they had missed the cut off and to prevent respondents not responding in general, no return date was nominated for the questionnaire. Each questionnaire contained a unique personal identification number so that only non-respondents to each wave of mail would be followed-up.

The second contact with non-respondents was a reminder letter in which the aims and sponsorship of the survey were restated and cooperation was again requested. Potential respondents were again referred to a free call 1800 number should they have any questions. The third contact with non-respondents was a questionnaire package which, like the first, contained a covering letter, an identified copy of the questionnaire and a reply envelope. The fourth contact with non-respondents was a single page reminder letter. The posting dates are shown in Table 4.

Table 4: Distribution of survey questionnaires

Item Posted	Date	Survey Day	Number posted
Questionnaire	22/7/2011	1	10 000
1st Reminder	5/8/2011	15	8 298
2nd Questionnaire	22/8/2011	32	6 825
2nd Reminder	9/9/2011	50	5 719

1.2.2 Survey Response

The last survey return was received in January 2012 by which time a total of 3077 useable responses had been received. Twenty one (21) of the returned questionnaires had their ID labels removed by the respondent. Throughout the survey administration period, respondents who telephoned the 1800 Freecall number and indicated they had lost or misplaced their questionnaire were sent another. A total of 433 calls were received on the 1800 survey hotline. Approximately one third of these calls were to refuse participation. The rest of the telephone calls were mainly to advise that the selected person was incapable of completing the survey, had moved away or had died. A few (24) requests were received for a replacement questionnaire and a few questions were asked about the purpose of the survey, the survey sampling, or survey timing.

A number of questionnaires were returned to sender or were returned with notes saying that the sampled individual was overseas or was deceased or otherwise incapable of completing the survey. In all, 295 explicit refusals were received from individuals by post, telephone or e-mail. A further 605 surveys were returned blank. Partially completed surveys were included in the data set. Overall, a raw response rate of 30.8% was achieved and, after adjusting for out-of-scope individuals (8.7%), an adjusted response rate of 33.5% was achieved. The number of responses classified by type is shown in Table 5.

Table 5: Number and percentage of all responses classified by type

Class of response	Number	%
Drawn sample	10 000	
In-scope	9131	91.3
Survey returned blank	605	6.1
Explicit refusals	295	3.0
Completed survey	3077	30.8
Not heard from at all	5154	51.5
Out-of-scope - Total	869	8.7
Out-of-scope-return to sender	642	6.4
Out-of-scope-deceased	21	0.2
Out-of-scope-incapable (sick/away)	206	2.1

As mentioned, the sample comprises three main groups, the 7000 drawn from the whole of Australia and the two samples of 1500 centred on the desalination plants at Wonthaggi and Port Stanvac. The number of responses, classified by type for these three sub-samples, are shown in Tables 6 to 8.

Table 6: Number and percentage of responses in Australian Sample classified by type

Class of Response	Number	%
Drawn sample	7 000	
In-scope	6380	91.1
Survey returned blank	389	5.6
Explicit refusals	178	2.5
Completed survey	1998	28.5
Not heard from at all	3815	54.5
Out-of-scope - Total	869	8.7
Out-of-scope-return to sender	642	6.4
Out-of-scope-deceased	21	0.2
Out-of-scope-incapable (sick/away)	206	2.1

Table 7: Number and percentage of responses in Wonthaggi Sample classified by type

Class of response	Number	%
Drawn sample	1500	
In-scope	1387	92.5
Survey returned blank	110	7.3
Explicit refusals	62	4.1
Completed survey	573	38.2
Not heard from at all	642	42.8
Out-of-scope - Total	869	8.7
Out-of-scope-return to sender	642	6.4
Out-of-scope-deceased	21	0.2
Out-of-scope-incapable (sick/away)	206	2.1

Table 8: Number and percentage of responses in Port Stanvac Sample classified by type

Class of response	Number	%
Drawn sample	1500	
In-scope	1364	90.9
Survey returned blank	106	7.1
Explicit refusals	55	3.7
Completed survey	485	32.3
Not heard from at all	718	47.9
Out-of-scope - Total	136	9.1
Out-of-scope-return to sender	94	6.3
Out-of-scope-deceased	1	0.1
Out-of-scope-incapable (sick/away)	41	2.7

The number of responses classified by type for the states and territories which comprise the sample of 7000 are shown in Tables 9 to 16 below.

Table 9: Number and percentage of responses in New South Wales classified by type

Class of response	Number	%
Drawn sample	2289	
In-scope	2106	92.0
Survey returned blank	139	6.1
Explicit refusals	61	2.7
Completed survey	622	27.2
Not heard from at all	1284	56.1
Out-of-scope - Total	136	9.1
Out-of-scope-return to sender	94	6.3
Out-of-scope-deceased	1	0.1
Out-of-scope-incapable (sick/away)	41	2.7

Table 10: Number and percentage of responses in Victoria (excluding Wonthaggi) classified by type

Class of response	Number	%
Drawn sample	1774	
In-scope	1644	92.7
Survey returned blank	96	5.4
Explicit refusals	55	3.1
Completed survey	499	28.1
Not heard from at all	994	56.0
Out-of-scope - Total	130	7.3
Out-of-scope-return to sender	86	4.8
Out-of-scope-deceased	4	0.2
Out-of-scope-incapable (sick/away)	40	2.3

Table 11: Number and percentage of responses in Queensland classified by type

Class of response	Number	%
Drawn sample	1351	
In-scope	1210	89.6
Survey returned blank	69	5.1
Explicit refusals	33	2.4
Completed survey	398	29.5
Not heard from at all	710	52.6
Out-of-scope - Total	141	10.4
Out-of-scope-return to sender	115	8.5
Out-of-scope-deceased	7	0.5
Out-of-scope-incapable (sick/away)	19	1.4

Table 12: Number and percentage of responses in South Australia (Excluding Port Stanvac) classified by type

Class of response	Number	%
Drawn sample	547	
In-scope	481	87.9
Survey returned blank	33	6.0
Explicit refusals	5	0.9
Completed survey	170	31.1
Not heard from at all	273	49.9
Out-of-scope - Total	66	12.1
Out-of-scope-return to sender	50	9.1
Out-of-scope-deceased	2	0.4
Out-of-scope-incapable (sick/away)	14	2.6

Table 13: Number and percentage of responses in Western Australia classified by type

Class of response	Number	%
Drawn sample	678	
In-scope	614	90.6
Survey returned blank	36	5.3
Explicit refusals	17	2.5
Completed survey	200	29.5
Not heard from at all	361	53.2
Out-of-scope - Total	64	9.4
Out-of-scope-return to sender	50	7.4
Out-of-scope-deceased	1	0.1
Out-of-scope-incapable (sick/away)	13	1.9

Table 14: Number and percentage of responses in Northern Territory classified by type

Class of response	Number	%
Drawn sample	60	
In-scope	46	76.7
Survey returned blank	2	3.3
Explicit refusals	1	1.7
Completed survey	12	20.0
Not heard from at all	31	51.7
Out-of-scope - Total	14	23.3
Out-of-scope-return to sender	13	21.7
Out-of-scope-deceased	0	0.0
Out-of-scope-incapable (sick/away)	1	1.7

Table 15: Number and percentage of responses in Tasmania classified by type

Class of response	Number	%
Drawn sample	178	
In-scope	161	90.4
Survey returned blank	12	6.7
Explicit refusals	6	3.4
Completed survey	54	30.3
Not heard from at all	89	50.0
Out-of-scope - Total	17	9.6
Out-of-scope-return to sender	14	7.9
Out-of-scope-deceased	0	0.0
Out-of-scope-incapable (sick/away)	3	1.7

Table 16: Number and percentage of responses in Australian Capital Territory classified by type

Class of response	Number	%
Drawn sample	123	
In-scope	118	95.9
Survey returned blank	2	1.6
Explicit refusals	0	0.0
Completed survey	43	35.0
Not heard from at all	73	59.3
Out-of-scope - Total	5	4.1
Out-of-scope-return to sender	4	3.3
Out-of-scope-deceased	0	0.0
Out-of-scope-incapable (sick/away)	1	0.8

1.3 FINDINGS GROUPED BY THEME

The survey was divided into six sections, each dealing with a different aspect of water user behaviour:

1. Water and your household
2. Water and desalination
3. Your views about the environment and water
4. Water saving behaviour
5. Domestic water supply and the government
6. Your background

The report below provides results in each of the sections of the survey, grouped under their relevant sub-headings. Where possible and relevant, these findings are contextualised within the results of other studies. Below, a more detailed discussion of a number of findings is presented in the context of the broader literature. These discussions highlight areas of particular interest or significance, point out gaps in our knowledge, and suggest relevant research directions.

1.3.1 Water and your household

Australian households use water from a range of sources for a variety of purposes. Understanding where household water comes from, and how water from different sources is used, can tell us something about the ways that different water sources are viewed and valued by Australians. The following tables give a summary of how Australians access and use water in their households. The categories have been grouped into two: the first to represent the most common source of water – mains or town water – and the second to represent 'private' sources – rainwater tanks, private dams or bores, and grey-water residents have saved.

Table 17: Mains Water Supply and Private Sources classification for respondents

Mains Water Supply	Private Sources
Town water supply (from reservoir, desalinated, or other sources)	Rainwater tank Private dam/bore Greywater you have saved

1.3.1.1 Household use

The key finding from this section of the survey reflects other studies (Roseth, 2008, Clarke and Brown, 2006) which show that people are more likely to use water differently depending on whether it is for 'close' use (drinking, food preparation), or 'distant' use (washing clothes, garden)

Figure 1: Main source of water for consumption

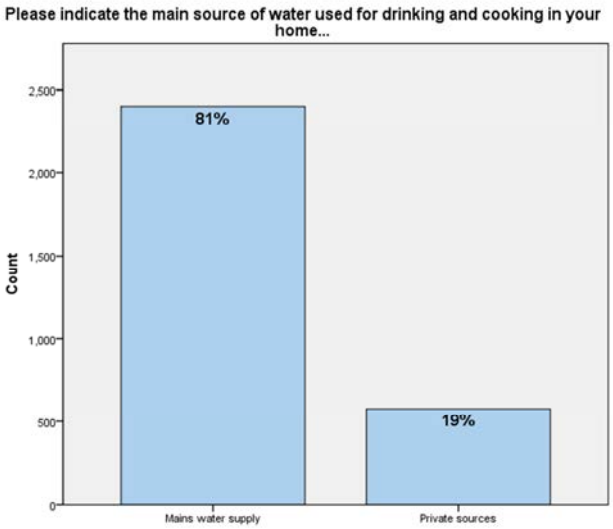


Table 18: Main source of water for consumption

			Source		Total
			Mains	Private	
Sample	National	Count	1631	332	1963
		% within Sample	83.1%	16.9%	100.0%
	Wonthaggi	Count	357	178	535
		% within Sample	66.7%	33.3%	100.0%
	Port Stanvac	Count	395	67	462
		% within Sample	85.5%	14.5%	100.0%
	Total	Count	2383	577	2960
		% within Sample	80.5%	19.5%	100.0%

The results in Figure 1 and Table 18 indicate that Australians primarily use mains water for their drinking and cooking ('close' use) purposes. Of the 'private' sources available for 'close' use, the vast majority of respondents indicated that they sourced water from rainwater tanks.

Figure 2: Main source of water for household use

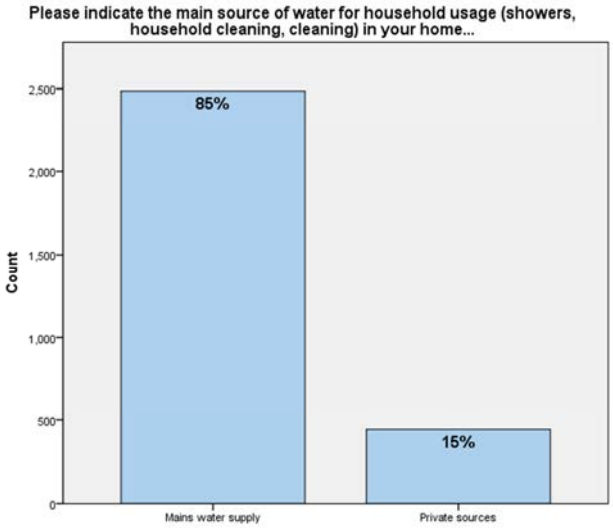


Table 19: Main source of water for household use

			Source		Total
			Mains	Private	
Sample	National	Count	1609	307	1916
		% within Sample	84.0%	16.0%	100.0%
	Wonthaggi	Count	436	100	536
		% within Sample	81.3%	18.7%	100.0%
	Port Stanvac	Count	425	34	459
		% within Sample	92.6%	7.4%	100.0%
	Total	Count	2470	441	2911
		% within Sample	84.9%	15.1%	100.0%

The results in Figure 2 and Table 19 indicate that Australians primarily use mains water for showering and bathing. Notably, there is a greater use of mains water for personal cleaning than for drinking. Given that most people *drink* water (the 'closest' of uses) from a mains supply, the heightened use of mains water for personal cleaning may be because rainwater tanks are less likely to be hooked up to household plumbing systems due to 'difficulty, cost and renter status' (Clarke and Brown, 2006:261), and, therefore, are less likely to be available for showering/bathing purposes. Of the 'private' sources available for showering and bathing, the vast majority of respondents indicated that they sourced water from rainwater tanks.

Figure 3: Main source of water for garden use

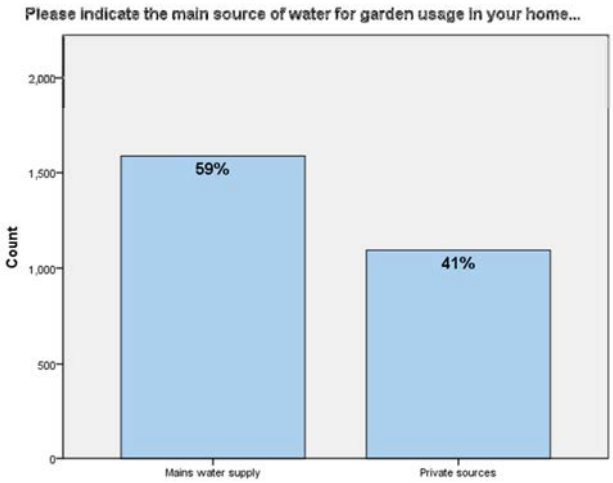


Table 20: Main source of water for garden use

			Source		Total
			Mains	Private	
Sample	National	Count	1056	713	1769
		% within Sample	59.7%	40.3%	100.0%
	Wonthaggi	Count	251	232	483
		% within Sample	52.0%	48.0%	100.0%
	Port Stanvac	Count	269	140	409
		% within Sample	65.8%	34.2%	100.0%
	Total	Count	1576	1085	2661
		% within Sample	59.2%	40.8%	100.0%

The results in Figure 3 and Table 20 indicate that Australians tend to use mains water far less for maintaining their gardens than they do for personal use within the home. Also of note is that of the 'private' sources used for garden maintenance, while the majority of this refers to rainwater collected in a tank (23%), nearly 5% of Australians primarily use grey water they have collected themselves to maintain their gardens. This 'distant' use is by far the most common for grey water.

Figure 4: Potable water preferences

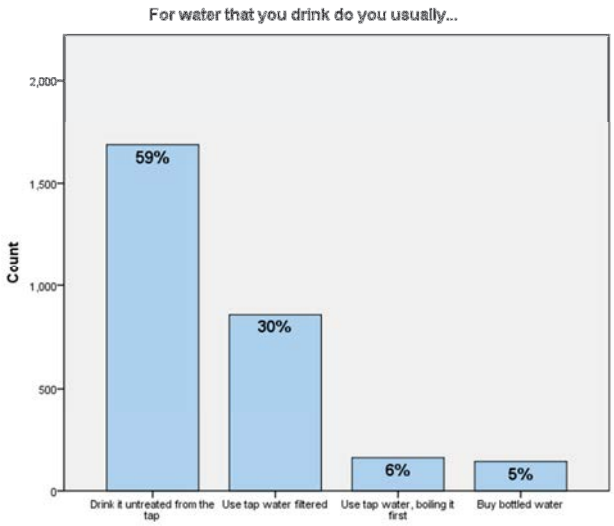


Table 21: Potable water preferences

			For water that you drink do you usually…				Total
			Drink it untreated from the tap	Use tap water filtered	Use tap water, boiling it first	Buy bottled water	
Sample	National	Count	1184	489	102	91	1866
		% within Sample	63.5%	26.2%	5.5%	4.9%	100.0%
	Wonthaggi	Count	306	161	28	23	518
		% within Sample	59.1%	31.1%	5.4%	4.4%	100.0%
	Port Stanvac	Count	182	204	29	27	442
		% within Sample	41.2%	46.2%	6.6%	6.1%	100.0%
Total		Count	1672	854	159	141	2826
		% within Sample	59.2%	30.2%	5.6%	5.0%	100.0%

The results in Figure 4 and Table 21 indicate that Australians tend to drink water from the tap, though 30% of people filter this water first. It is unclear whether households have a filter attached to their tap or if they use a separate filtering device (eg. a jug with a filtration system attached).

1.3.1.2 Concerns about water availability

Figure 5: Concern about future access to water

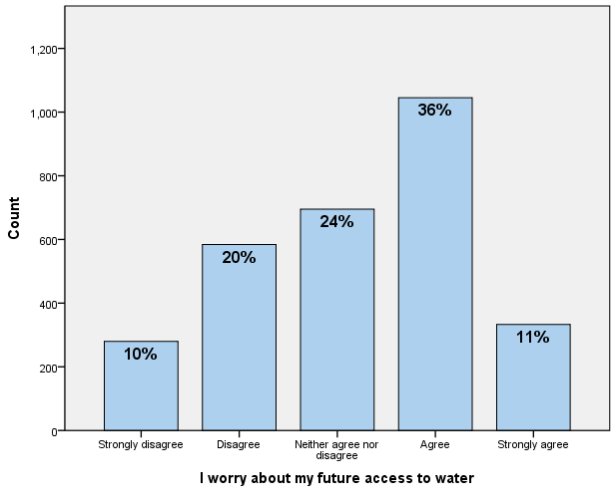


Table 22: Concern about future access to water

			I worry about my future access to water					Total
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
Sample	National	Count	173	352	438	714	243	1920
		% within Sample	9.0%	18.3%	22.8%	37.2%	12.7%	100.0%
	Wonthaggi	Count	67	144	148	151	27	537
		% within Sample	12.5%	26.8%	27.6%	28.1%	5.0%	100.0%
	Port Stanvac	Count	35	85	103	175	61	459
		% within Sample	7.6%	18.5%	22.4%	38.1%	13.3%	100.0%
Total		Count	275	581	689	1040	331	2916
		% within Sample	9.4%	19.9%	23.6%	35.7%	11.4%	100.0%

The results in Figure 5 and Table 22 indicate that slightly less than half of all Australians surveyed reported being worried about their personal access to water in the future. While around 30% were not concerned, a quarter of those surveyed had no clear opinion on their future water access.

Figure 6. Concern about future generations' access to water

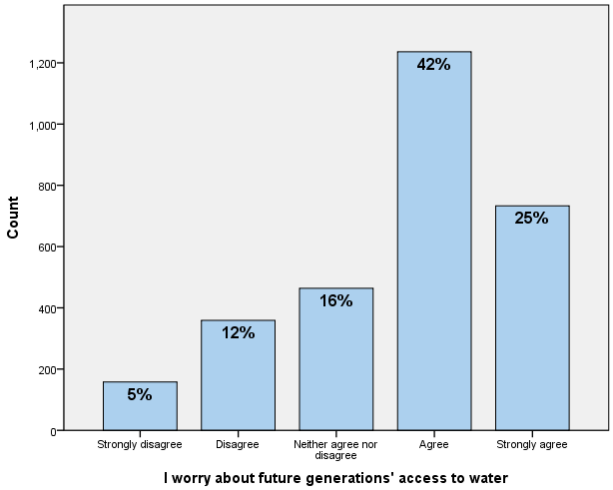


Table 23: Concern about future generations' access to water

			I worry about future generations' access to water					Total
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
Sample	National	Count	91	211	291	822	505	1920
		% within Sample	4.7%	11.0%	15.2%	42.8%	26.3%	100.0%
	Wonthaggi	Count	40	92	101	216	88	537
		% within Sample	7.4%	17.1%	18.8%	40.2%	16.4%	100.0%
	Port Stanvac	Count	26	50	68	191	137	472
		% within Sample	5.5%	10.6%	14.4%	40.5%	29.0%	100.0%
Total		Count	157	353	460	1229	730	2929
		% within Sample	5.4%	12.1%	15.7%	42.0%	24.9%	100.0%

The results in Figure 6 and Table 23 indicate that more Australians were concerned about future generations' access to water than they were about their own personal access. This suggests that people are worried about future water access though not necessarily as a pressing immediate and personal problem.

Figure 7: Personal concern about water shortages in next five years

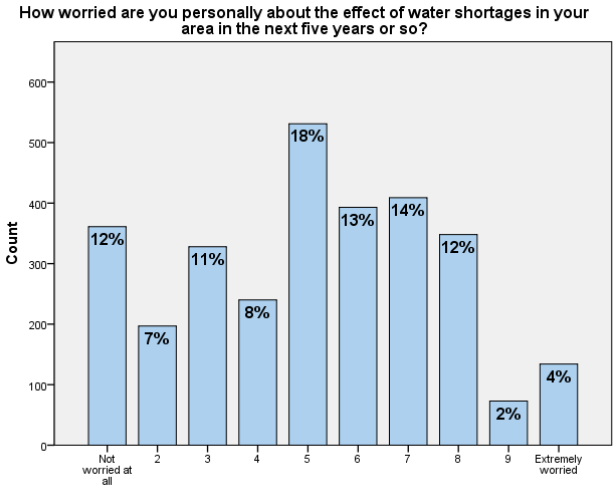


Table 24: Personal concern about water shortages in next five years

			How worried are you personally about the effect of water shortages in your area in the next five years or so?										Total
			Not worried at all	2	3	4	5	6	7	8	9	Extremely worried	
Sample	National	Count	208	120	195	149	335	274	288	244	49	102	1964
		% within Sample	10.6%	6.1%	9.9%	7.6%	17.1%	14.0%	14.7%	12.4%	2.5%	5.2%	100.0 %
	Wonthaggi	Count	110	52	90	41	119	51	41	39	5	8	556
		% within Sample	19.8%	9.4%	16.2%	7.4%	21.4%	9.2%	7.4%	7.0%	.9%	1.4%	100.0 %
	Port Stanvac	Count	37	23	42	49	74	65	78	64	18	23	473
		% within Sample	7.8%	4.9%	8.9%	10.4%	15.6%	13.7%	16.5%	13.5%	3.8%	4.9%	100.0 %
Total		Count	355	195	327	239	528	390	407	347	72	133	2993
		% within Sample	11.9%	6.5%	10.9%	8.0%	17.6%	13.0%	13.6%	11.6%	2.4%	4.4%	100.0 %

Figure 8: Perception of community concern about water shortages in next five years

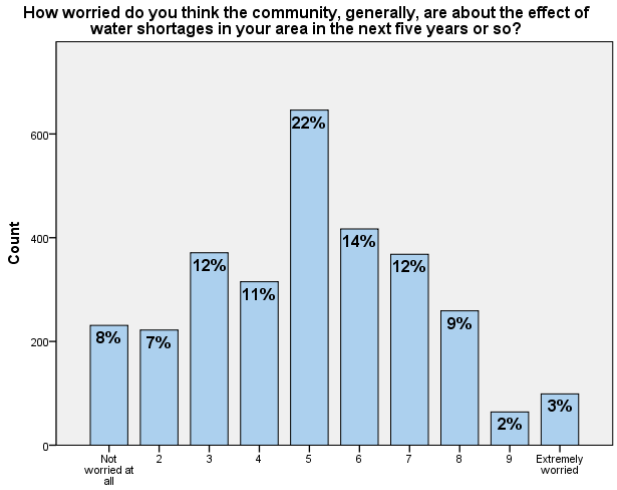


Table 25: Perception of community concern about water shortages in next five years

			How worried do you think the community, generally, are about the effect of water shortages in your area in the next five years?										Total
			Not worried at all	2	3	4	5	6	7	8	9	Extremely worried	
Sample	National	Count	144	148	235	204	409	278	248	165	44	82	1957
		% within Sample	7.4%	7.6%	12.0 %	10.4%	20.9%	14.2 %	12.7%	8.4%	2.2%	4.2%	100.0%
	Wonthaggi	Count	66	51	92	55	131	59	51	34	7	3	549
		% within Sample	12.0%	9.3%	16.8 %	10.0%	23.9%	10.7 %	9.3%	6.2%	1.3%	.5%	100.0%
	Port Stanvac	Count	17	20	43	52	103	76	67	60	13	14	465
		% within Sample	3.7%	4.3%	9.2 %	11.2%	22.2%	16.3 %	14.4%	12.9%	2.8%	3.0%	100.0%
Total		Count	227	219	370	311	643	413	366	259	64	99	2971
		% within Sample	7.6%	7.4%	12.5 %	10.5%	21.6%	13.9 %	12.3%	8.7%	2.2%	3.3%	100.0%

The results in Figure 7, Figure 8, Table 24, and Table 25 agree with data gathered by Roseth (2006:20-21) who found that people generally believed they were very slightly more concerned about water shortages than the community in general. It is interesting to note that 12% of respondents reported not being worried about water shortages 'at all'. When considering these results it is important to remember the diversity in rainfall around Australia, including the impact on public opinions of recent drought and severe flooding. In Figure 8, perceptions of community concerns over water shortages in the next five years are more normally distributed than those depicting personal concerns, and suggest that publics perceive others in the community to be slightly less worried about future water supplies than they are personally. It is important to keep in mind that assessments of community perceptions, rather than personal beliefs, are speculative.

1.3.1.3 Responses to perceived water shortages

Concerns about water supply can be addressed on two broad fronts: increasing supply and decreasing demand. As Dolnicar *et al.* (2012:44 emphasis added) state, 'ensuring a nation's long term water supply requires the use of *both* supply-sided approaches such as water augmentation through water recycling, and demand-sided approaches such as water conservation'. Before proceeding to consider how Australians viewed various specific options for tackling water shortages, consider how Australians responded to the question of whether or not they preferred one broad method over another.

Figure 9: Preferences for increasing the supply or decreasing the demand for water

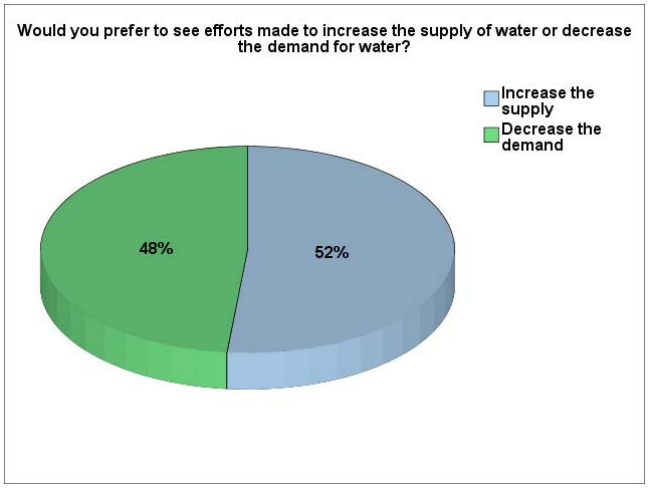


Table 26: Preferences for increasing the supply or decreasing the demand for water

			Increase the supply	Decrease the demand	Total
Sample	National	Count	949	894	1843
		% within Sample	51.5%	48.5%	100.0%
	Wonthaggi	Count	265	250	515
		% within Sample	51.5%	48.5%	100.0%
	Port Stanvac	Count	236	217	453
		% within Sample	52.1%	47.9%	100.0%
	Total	Count	1450	1361	2811
		% within Sample	51.6%	48.4%	100.0%

Australians were almost equally divided on whether or not reducing water demand was preferable to increasing supply, as a response to water shortage issues. While it is important to remember that these two approaches are not mutually exclusive – supply can be increased at the same time as demand is reduced – the parity in responses is striking. This result is similar to that found by the Australian Water Association (AWA) in 2010 when they asked the same question (AWA 2010:9-10), finding that slightly more people favoured increasingly supply (59%) over decreasing demand (41%). It is worth mentioning that as with the AWA study, this study found a common qualitative theme

accompanying this result. This was a preference for reducing or stalling population growth as a method of 'decreasing demand' (see also Roseth, 2006:23).

Australians support a range of responses to water shortages, though not every option is equally preferred. Further, 84% of those surveyed reported that their support for desalination was influenced either 'a fair bit' or 'very much' by whether or not alternatives had been investigated. In the following results it is important to note that respondents are not indicating whether the method they are commenting upon is to be used for 'close' (eg. drinking) or 'distant' (eg. gardening) use.

1.3.1.4 Responses to perceived water shortages – rainwater tanks

Figure 10: Support for rainwater tanks

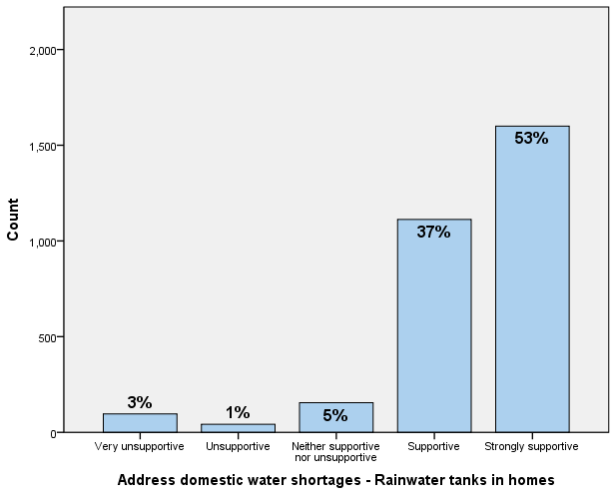


Table 27: Support for rainwater tanks

			Address domestic water shortages - Rainwater tanks in homes					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	58	28	104	770	996	1956
		% within Sample	3.0%	1.4%	5.3%	39.4%	50.9%	100.0%
	Wonthaggi	Count	26	6	29	170	322	553
		% within Sample	4.7%	1.1%	5.2%	30.7%	58.2%	100.0%
	Port Stanvac	Count	11	8	22	164	270	475
		% within Sample	2.3%	1.7%	4.6%	34.5%	56.8%	100.0%
Total		Count	95	42	155	1104	1588	2984
		% within Sample	3.2%	1.4%	5.2%	37.0%	53.2%	100.0%

The results in Figure 10 and Table 27 indicate that Australians are very supportive of installing rainwater tanks in homes as a measure for addressing domestic water shortages in Australia. Governments, also, have shown their support for rainwater tanks in recent years. For example, since 2004 all new or renovated homes in Victoria must fit either a rainwater tank for toilet flushing or a solar hot water system, and water efficient shower heads.

While a great many of those who participated in this study were enthusiastically supportive of rainwater tank installation, concerns about the health-risks associated with rain water gathered for potable use in domestic homes (Evans et al., 2006, Lye, 2009, Magyar et al., 2008) were rarely mentioned. A Monash University and CSIRO study in 2008 found that 'rainwater tanks in Melbourne are commonly contaminated with lead and other heavy metals at levels that exceed drinking water guidelines' (Magyar et al 2008:409). Publics may benefit from a greater understanding of the public health implications of widespread implementation of rainwater tanks as a potable alternative to mains water.

1.3.1.5 Responses to perceived water shortages – stormwater capture

Figure 11: Support for stormwater recycling

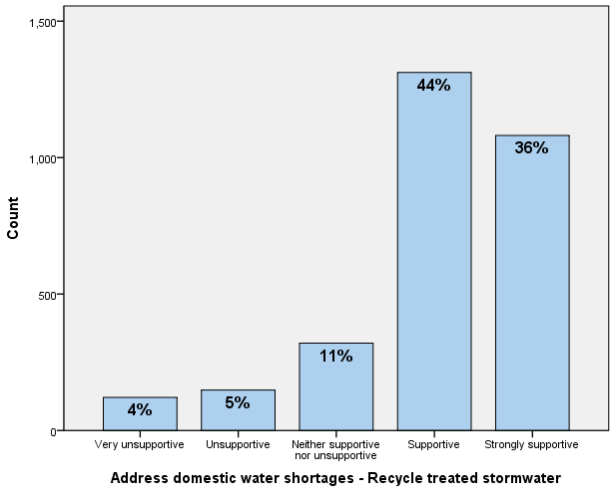


Table 28: Support for stormwater recycling

			Address domestic water shortages - Recycle treated stormwater					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	75	106	220	900	636	1937
		% within Sample	3.9%	5.5%	11.4%	46.5%	32.8%	100.0%
	Wonthaggi	Count	38	17	55	213	225	548
		% within Sample	6.9%	3.1%	10.0%	38.9%	41.1%	100.0%
	Port Stanvac	Count	7	22	44	195	208	476
		% within Sample	1.5%	4.6%	9.2%	41.0%	43.7%	100.0%
Total		Count	120	145	319	1308	1069	2961
		% within Sample	4.1%	4.9%	10.8%	44.2%	36.1%	100.0%

The results in Figure 11 and Table 28 indicate that support for treating recycled stormwater is high. According to Roy *et al.* (2008:347) 'the [Australian] perception of stormwater runoff has changed from strictly a liability to having a value as a water resource, and management of stormwater has shifted accordingly'. They note that, particularly since the 1990s, Australian governments have been

attentive to the various options open to them in regard to treated stormwater (*ibid.*346-7). It is perhaps unsurprising, then, that the majority of Australians in our survey are in favour of harnessing treated stormwater in order to address domestic water shortages.

1.3.1.6 Responses to perceived water shortages – recycled water

The treatment and reuse of sewage is a contentious issue in Australia, and this water has traditionally been destined primarily for agricultural and industrial purposes. According to Anderson (1996:155), 'Recycling of wastewater and storm water for all uses including potable uses has the potential to reduce urban and industrial demands on surface water resources by amounts varying from 40% to 100% depending on climate'. However, it has been noted that efforts to introduce recycled water augmented with treated sewage in response to domestic water shortages in Australia are challenged by negative public responses to such proposals (Price *et al.*, 2010:4, Pricea *et al.*, 2012, Simpson, 2012), or, the 'yuck factor' (Leong, 2010, Simpson, 2012:112).

Often cited is the 2006 referendum in the Queensland town of Toowoomba in which 62% of people voted against a proposal to introduce recycled water to the town supply (Hurlimann and Dolnicar, 2010:292). However, as Hurliman and Dolnicar (2010:296) point out, people sometimes make decisions based on beliefs and emotions rather than well-informed consideration, and that in the Toowoomba case, 'politics, timing, vested interests and information manipulation also played a part [in the referendum outcome]'. They found that just two and a half years after the referendum Toowoomba residents had changed their minds and were much more supportive of using recycled water (Hurlimann and Dolnicar, 2010:294-6).

Further, Ormerod and Scott (2012) have recently questioned the widespread assumption that the 'yuck factor' has a significant influence on the attitudes of publics to treated wastewater consumption; they argue the key factor is how trustworthy consumers believe the water supplier is, rather than the 'yuck factor' . June Marks' work (with colleagues) also emphasises the complexity of public opposition to the potable use of recycled water (see also Marks, 2003, Marks et al., 2003, Marks et al., 2008).

Figure 12: Support for recycling sewage

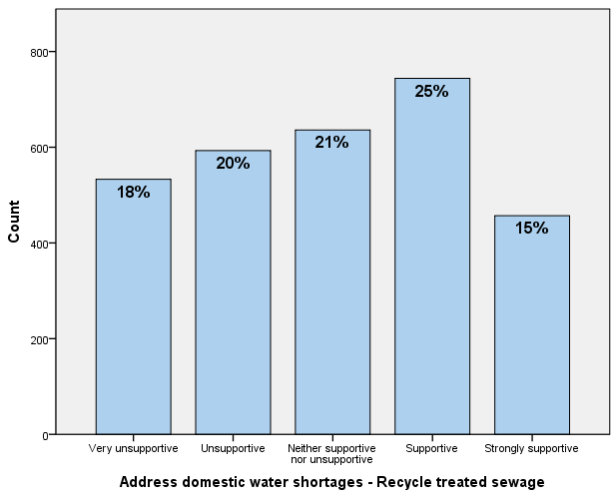


Table 29: Support for recycling sewage

			Address domestic water shortages - Recycle treated sewerage					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	374	390	404	491	277	1936
		% within Sample	19.3%	20.1%	20.9%	25.4%	14.3%	100.0%
	Wonthaggi	Count	101	101	115	119	103	539
		% within Sample	18.7%	18.7%	21.3%	22.1%	19.1%	100.0%
	Port Stanvac	Count	54	99	113	128	73	467
		% within Sample	11.6%	21.2%	24.2%	27.4%	15.6%	100.0%
Total		Count	529	590	632	738	453	2942
		% within Sample	18.0%	20.1%	21.5%	25.1%	15.4%	100.0%

The results in Figure 12 and Table 29 indicate that as more information becomes available about the safety of drinking recycled water, it should not be surprising to see support for this method of water augmentation increase. Certainly, the results of the current survey, showing that 41% of people are supportive of using recycled sewage while another 21% are undecided, suggests that this approach is not as politically unfeasible as the Toowoomba referendum results originally suggested.

Figure 13: Support for recycling greywater

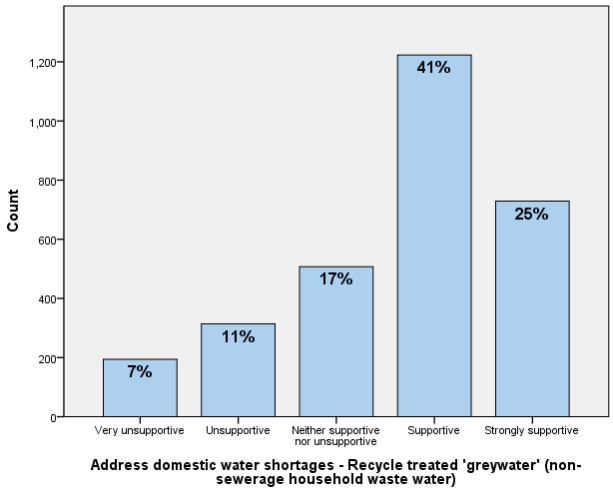


Table 30: Support for recycling greywater (non-sewage household waste water) Crosstabulation

			Address domestic water shortages - Recycle treated 'greywater' (non-sewage household waste water)					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	132	210	325	807	458	1932
		% within Sample	6.8%	10.9%	16.8%	41.8%	23.7%	100.0%
	Wonthaggi	Count	42	60	103	197	142	544
		% within Sample	7.7%	11.0%	18.9%	36.2%	26.1%	100.0%
	Port Stanvac	Count	18	42	77	211	123	471
		% within Sample	3.8%	8.9%	16.3%	44.8%	26.1%	100.0%
Total		Count	192	312	505	1215	723	2947
		% within Sample	6.5%	10.6%	17.1%	41.2%	24.5%	100.0%

The results in Figure 13 and Table 30 indicate, unsurprisingly, that a third of people surveyed, who were unsupportive or at least unsure about supporting the use of recycled water, supported the idea of using greywater which does *not* contain sewage.

1.3.1.7 Responses to perceived water shortages – desalination

Figure 14: Support for desalination (in general)

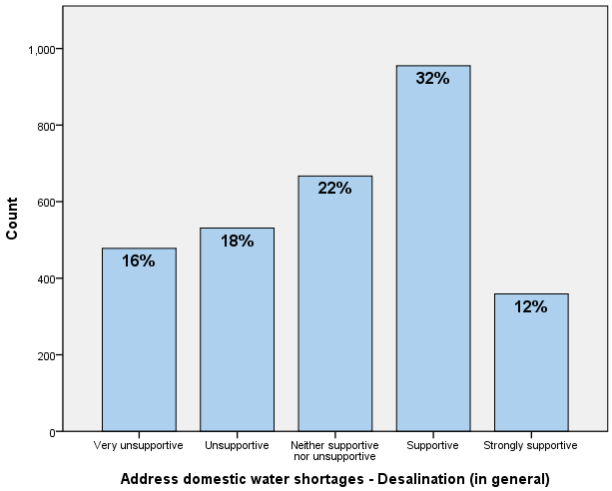


Table 31: Support for desalination (in general)

			Address domestic water shortages - Desalination (in general)					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	252	343	459	647	244	1945
		% within Sample	13.0%	17.6%	23.6%	33.3%	12.5%	100.0%
	Wonthaggi	Count	163	102	100	123	62	550
		% within Sample	29.6%	18.5%	18.2%	22.4%	11.3%	100.0%
	Port Stanvac	Count	59	79	103	183	50	474
		% within Sample	12.4%	16.7%	21.7%	38.6%	10.5%	100.0%
Total		Count	474	524	662	953	356	2969
		% within Sample	16.0%	17.6%	22.3%	32.1%	12.0%	100.0%

The support for desalination is similar to that for recycled greywater (non-sewage). It is important to keep in mind, however, that these figures do not tell us the reasons people support one or the other method. As Dolnicar and Hurlimann explain (2010), health and safety issues tend to be most relevant in relation to concerns about recycled water, while the potential cost to consumers tends to emerge more often in relation to desalinated water. Further, and in keeping with the findings of the current study, issues of trust in water providers and governments have been found to have a significant influence on public acceptance of water supply augmentation (Dolnicar *et al.*, 2010:1289, Simpson, 2012). Simpson (2012:119-20) goes so far as to advise: 'Utilities should endeavor to distance themselves as much as possible from "government" as, in general, the community does not trust "government"'. While providing factual production information about recycled and desalinated water has been found to increase the acceptance of both these methods of supply augmentation (Dolnicar et al., 2010), the present study suggests that 'knowledge' may not be as important in predicting acceptance of desalination as other factors such as 'trust in government'. We explore these findings, below in Section 1.3.5.2 Voice and Consultation.

Figure 15: Support for desalination (in my local area)

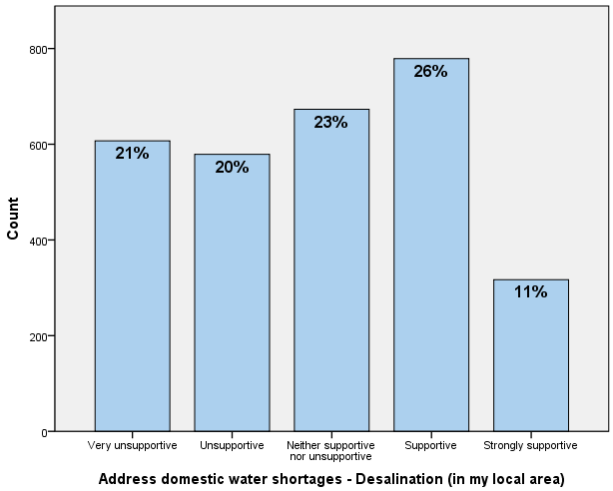


Table 32: Support for desalination (in my local area)

			Address domestic water shortages - Desalination (in my local area)					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	334	384	486	511	201	1916
		% within Sample	17.4%	20.0%	25.4%	26.7%	10.5%	100.0%
	Wonthaggi	Count	197	107	83	102	63	552
		% within Sample	35.7%	19.4%	15.0%	18.5%	11.4%	100.0%
	Port Stanvac	Count	70	81	101	164	50	466
		% within Sample	15.0%	17.4%	21.7%	35.2%	10.7%	100.0%
Total		Count	601	572	670	777	314	2934
		% within Sample	20.5%	19.5%	22.8%	26.5%	10.7%	100.0%

Figure 15 and Table 32 show that slightly fewer people were accepting of desalination as a measure suitable for their local area as displayed in Figure 14. One of the reasons for this may be that desalination is not suitable for all climates and geographical locations in Australia.

1.3.1.8 Responses to perceived water shortages – piping water across the country

Figure 16: Support for piping water from other parts of the country

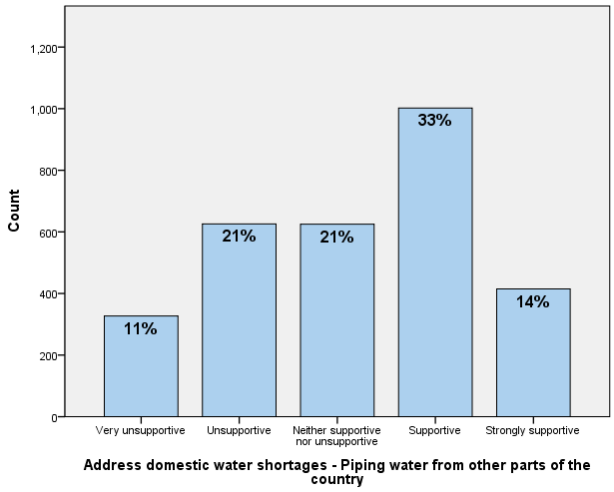


Table 33: Support for piping water from other parts of the country

			Address domestic water shortages - Piping water from other parts of the country					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	205	389	400	663	295	1952
		% within Sample	10.5%	19.9%	20.5%	34.0%	15.1%	100.0%
	Wonthaggi	Count	90	130	111	163	58	552
		% within Sample	16.3%	23.6%	20.1%	29.5%	10.5%	100.0%
	Port Stanvac	Count	29	103	109	171	58	470
		% within Sample	6.2%	21.9%	23.2%	36.4%	12.3%	100.0%
Total		Count	324	622	620	997	411	2974
		% within Sample	10.9%	20.9%	20.8%	33.5%	13.8%	100.0%

The results in Figure 16 and Table 33 display levels of support for piping water from other parts of the country. National media coverage of extreme flooding in some parts of Australia in the last few years may have contributed to the popularity of piping water between parts of the country. Not all proposals to transfer water are premised on the removal of excess water to areas of low supply, however (for example, Victoria's 'North-South Pipeline' (Golding and Campbell, 2009:344), and different circumstances are likely to generate very different levels of public support.

1.3.1.9 Responses to perceived water shortages – building and/or expanding dams

Figure 17: Support for building and expanding dams

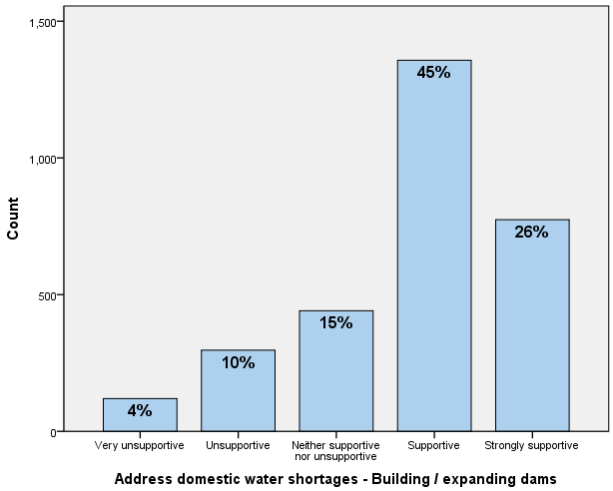


Table 34: Support for building and expanding dams

			Address domestic water shortages - Building / expanding dams					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	77	219	307	863	481	1947
		% within Sample	4.0%	11.2%	15.8%	44.3%	24.7%	100.0%
	Wonthaggi	Count	36	41	62	229	185	553
		% within Sample	6.5%	7.4%	11.2%	41.4%	33.5%	100.0%
	Port Stanvac	Count	7	36	69	257	99	468
		% within Sample	1.5%	7.7%	14.7%	54.9%	21.2%	100.0%
Total		Count	120	296	438	1349	765	2968
		% within Sample	4.0%	10.0%	14.8%	45.5%	25.8%	100.0%

As displayed in Figure 17 and Table 34, the building of new or upgrading of old dams is a popular option for addressing water shortages in Australia. This perspective is reflected in the qualitative data gathered with this survey.

Many comments cite dams as being preferable to desalination:

- *Water desalination plants provide a certain water supply to supplement appropriate water storage dams.*
- *I think a new dam would have been a better solution.*
- *A dam on the… river would have done less damage to the environment overall [than a desalination plant] and cost a fraction of the price.*
- *Other projects, such as dams, would be far more beneficial and cheaper for all communities.*
- *Victoria has not invested appropriate resources into dam construction as it is politically difficult.*
- *Rain is still around just not where the dams are now situated due to climate change.*
- *We should have built a dam.*

…or preferable as part of a raft of other options:

- *Have more dams and pipelines built and connected dams should be placed where it rains more often.*
- *I am appalled by the huge expanses of flood water throughout which though lack of DAMS is going slowly and wastefully into the SEA.*
- *If the… government had constructed more dams we wouldn't have a water problem.*
- *Water catchment facilities (dams, reservoirs etc.) should be created/enlarged to catch rainfall in established rainfall areas.*
- *Build more dams. Better for the environment, cheaper water bills, less green house gases.*
- *Government no dams policy is typical of their attitude and pandering to minority groups.*
- *Can't the government see they cannot keep letting new city surrounds real estate boom and more migrants with no new water storage dams. Wake up!*

1.3.1.10 Responses to perceived water shortages – government restrictions

Figure 18: Support for tighter government restrictions to reduce domestic water use

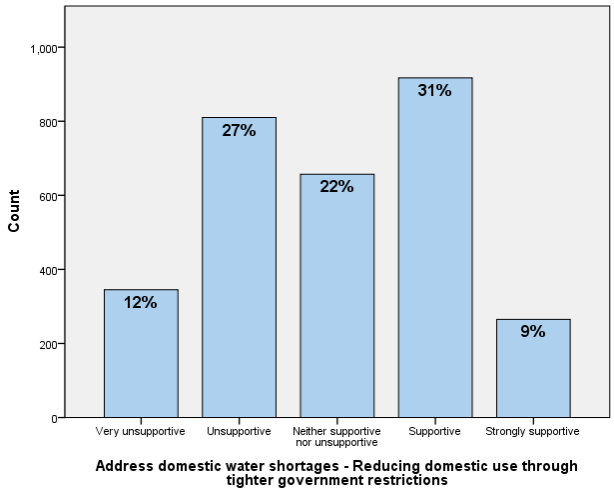


Table 35: Support for tighter government restrictions to reduce domestic water use

			Address domestic water shortages - Reducing domestic use through tighter government restrictions					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	218	506	426	627	172	1949
		% within Sample	11.2%	26.0%	21.9%	32.2%	8.8%	100.0%
	Wonthaggi	Count	63	143	112	172	64	554
		% within Sample	11.4%	25.8%	20.2%	31.0%	11.6%	100.0%
	Port Stanvac	Count	60	156	112	114	28	470
		% within Sample	12.8%	33.2%	23.8%	24.3%	6.0%	100.0%
Total		Count	341	805	650	913	264	2973
		% within Sample	11.5%	27.1%	21.9%	30.7%	8.9%	100.0%

Figure 18 and Table 35 display support for reducing domestic water use through tighter government restrictions. Survey respondents were divided in their support for tighter government restrictions as a method of addressing domestic water shortages. In section 5 of the survey, 74% of people said that they *would* reduce their water consumption if their State or Territory government asked them to do so voluntarily, compared to 70% who would do the same if asked by the Federal government. In other words, people were more open to voluntary or self-imposed restrictions than they were to enforced government restrictions. This suggests that the way water conserving behaviours are introduced to publics may have an impact on their initial reception, with 'requests' for behavioural change being viewed more favourably than 'demands'. How this distinction translates into water conservation *practice* (as opposed to *intention*), is another issue (Moore *et al.*, 1994, Trumbo and O'Keefe, 2001).

1.3.1.11 Responses to perceived water shortages – education campaigns

Figure 19: Support for reducing domestic water use through education campaigns

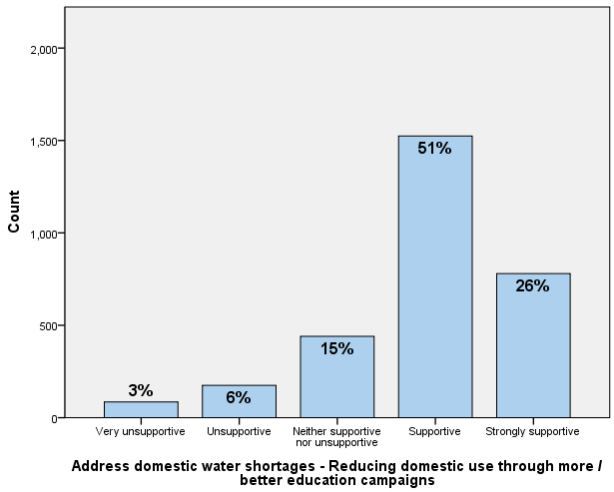


Table 36: Support for reducing domestic water use through education campaigns

			Address domestic water shortages - Reducing domestic use through more / better education campaigns					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	56	115	268	980	540	1959
		% within Sample	2.9%	5.9%	13.7%	50.0%	27.6%	100.0%
	Wonthaggi	Count	16	28	85	285	138	552
		% within Sample	2.9%	5.1%	15.4%	51.6%	25.0%	100.0%
	Port Stanvac	Count	13	32	82	252	93	472
		% within Sample	2.8%	6.8%	17.4%	53.4%	19.7%	100.0%
Total		Count	85	175	435	1517	771	2983
		% within Sample	2.8%	5.9%	14.6%	50.9%	25.8%	100.0%

Results indicating the level of support for reducing domestic water use through increasing education campaigns is shown in Figure 19 and Table 35. Following on from the results presented in Figure 16, it should not be surprising that a high percentage of respondents (77%) were supportive of educating publics about water conservation methods as a method of reducing domestic use (see Syme *et al.*, 2000).

1.3.1.12 Responses to perceived water shortages – improving infrastructure

Figure 20: Support for improving infrastructure to stop water wastage

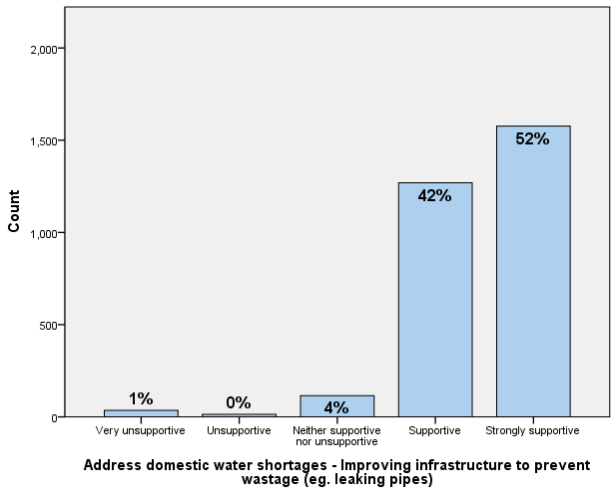


Table 37: Support for improving infrastructure to stop water wastage

			Address domestic water shortages - Improving infrastructure to prevent wastage (eg. leaking pipes)					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	18	5	75	804	1058	1960
		% within Sample	.9%	.3%	3.8%	41.0%	54.0%	100.0%
	Wonthaggi	Count	9	6	15	259	264	553
		% within Sample	1.6%	1.1%	2.7%	46.8%	47.7%	100.0%
	Port Stanvac	Count	8	3	23	200	241	475
		% within Sample	1.7%	.6%	4.8%	42.1%	50.7%	100.0%
Total		Count	35	14	113	1263	1563	2988
		% within Sample	1.2%	.5%	3.8%	42.3%	52.3%	100.0%

Figure 20 and Table 37 display level of support for improving infrastructure to prevent wastage (eg. leaking pipes). Water loss from leakage is a worldwide issue, though the amounts of water lost vary considerably, from 4% of demand to 60%, with the average Australian rate of loss estimated at approximately 15-18% of demand (Burn *et al.*, 1999:1, Smith, 2004:11). The vast majority of respondents were in favour of improving water infrastructure as a method of addressing water shortage issues. It seems that this approach is, at least in principle, politically uncontentious.

1.3.1.13 Responses to perceived water shortages – reducing industrial use

Figure 21: Support for reducing industrial use of water

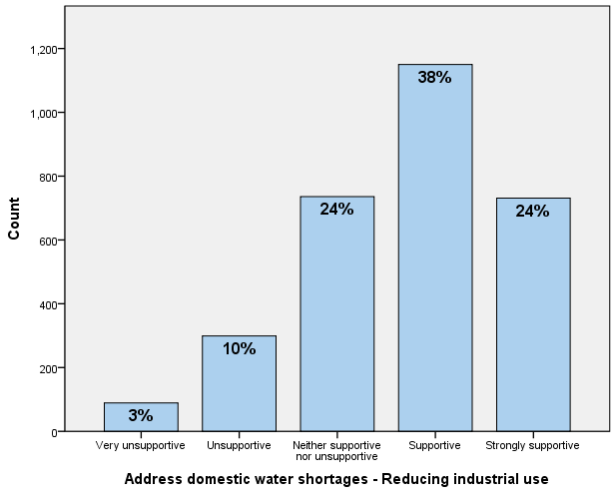


Table 38: Support for reducing industrial use of water

			Address domestic water shortages - Reducing industrial use					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	58	199	495	723	483	1958
		% within Sample	3.0%	10.2%	25.3%	36.9%	24.7%	100.0%
	Wonthaggi	Count	19	47	128	220	140	554
		% within Sample	3.4%	8.5%	23.1%	39.7%	25.3%	100.0%
	Port Stanvac	Count	12	50	109	199	102	472
		% within Sample	2.5%	10.6%	23.1%	42.2%	21.6%	100.0%
Total		Count	89	296	732	1142	725	2984
		% within Sample	3.0%	9.9%	24.5%	38.3%	24.3%	100.0%

Displayed in Figure 21 and Table 38 is the level of support for industrial use. A great many of those surveyed reported being in favour of reducing industrial water use, though almost a quarter did not hold strong views on this method. It should be noted that this result does not tell us what, exactly, respondents viewed as 'industrial' use. For example, 'industrial use' may include intensive agriculture and food processing, along with manufacturing and mining. The result is interesting in contrast to the following figure, which asks specifically about agricultural use.

1.3.1.14 Responses to perceived water shortages – reducing agricultural use

Figure 22. Support for reducing agricultural use as a means to address domestic water shortages

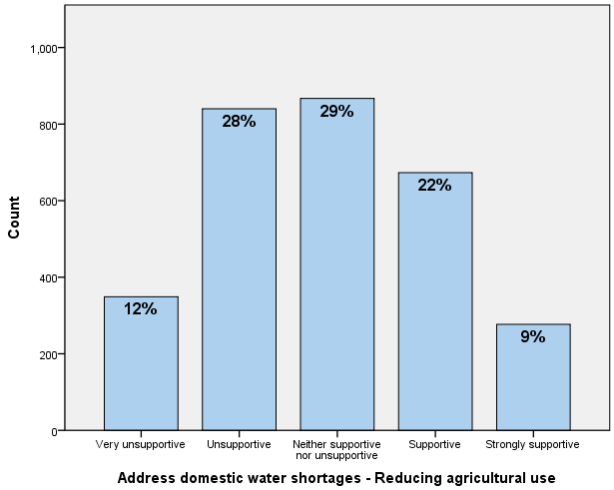


Table 39: Support for reducing agricultural use as a means to address domestic water shortages

			Address domestic water shortages - Reducing agricultural use					Total
			Very unsupportive	Unsupportive	Neither supportive nor unsupportive	Supportive	Strongly supportive	
Sample	National	Count	238	551	576	419	174	1958
		% within Sample	12.2%	28.1%	29.4%	21.4%	8.9%	100.0%
	Wonthaggi	Count	67	170	138	128	52	555
		% within Sample	12.1%	30.6%	24.9%	23.1%	9.4%	100.0%
	Port Stanvac	Count	43	112	147	121	49	472
		% within Sample	9.1%	23.7%	31.1%	25.6%	10.4%	100.0%
Total		Count	348	833	861	668	275	2985
		% within Sample	11.7%	27.9%	28.8%	22.4%	9.2%	100.0%

Respondents were far less likely to support reducing the use of water in 'agriculture' than they were in response to 'industrial' use. 40% of people were unsupportive of reducing agricultural use as a method of addressing water shortages, while 29% of people did not have strong opinions on this approach.

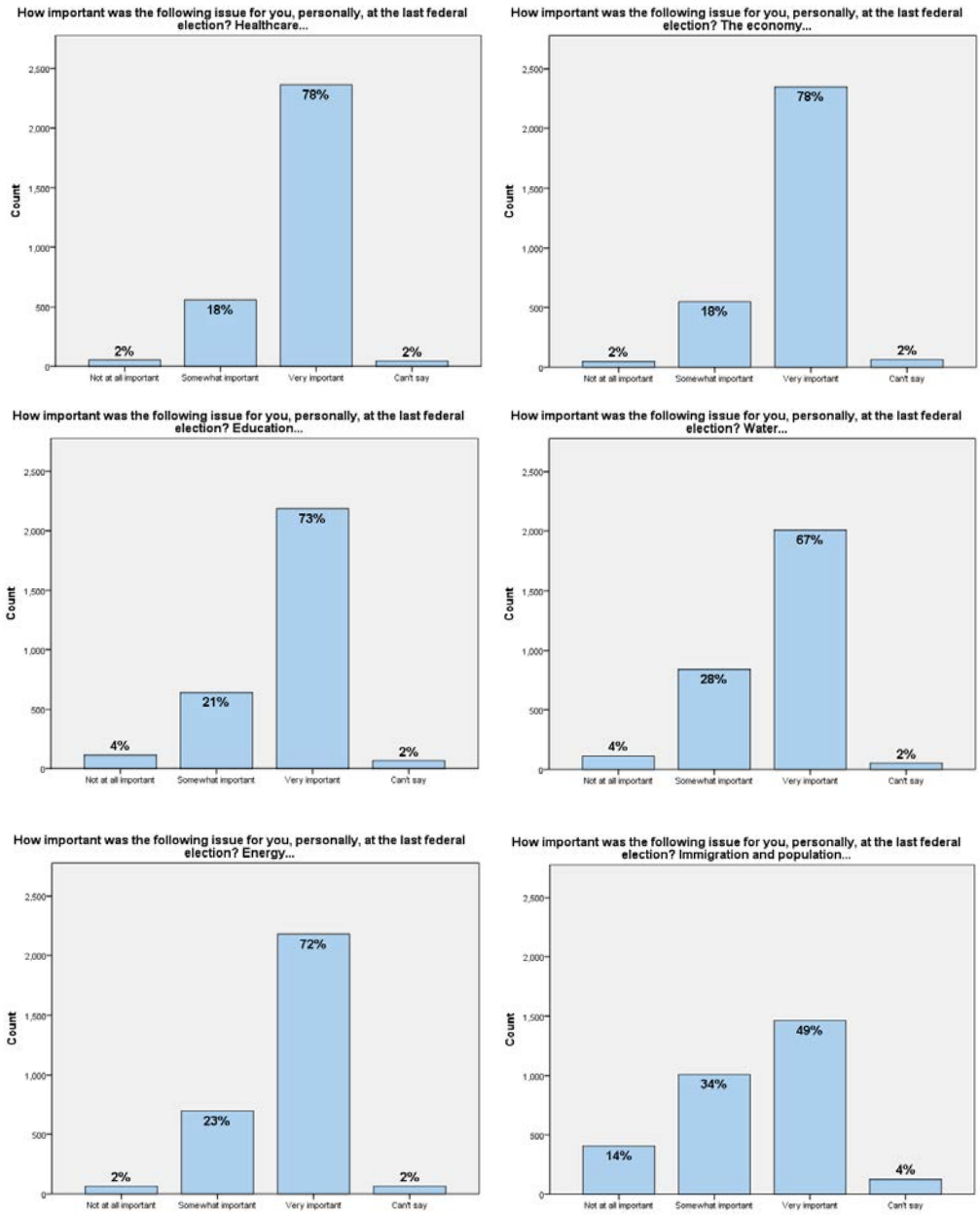
When considered with the results in Figure 21, one possible explanation for this response is that while people may not necessarily have a clear sense of how water use reductions would impact on industrial processes, there may be a stronger conceptual link between water use in agriculture and the output of fruit, vegetables, grains and meat. In other words, while respondents may readily imagine that reducing water use in 'agriculture' will result in reduced harvests, they may have more trouble imagining the impact of reducing water use in industries that do not directly rely on water for the creation of goods (eg. car manufacturing, aluminium production). Of course, such industries may rely on water in other ways (eg. to cool mechanisms), but the *public perception* of where savings can be made is what is being reported. Further, this question does not explicitly capture

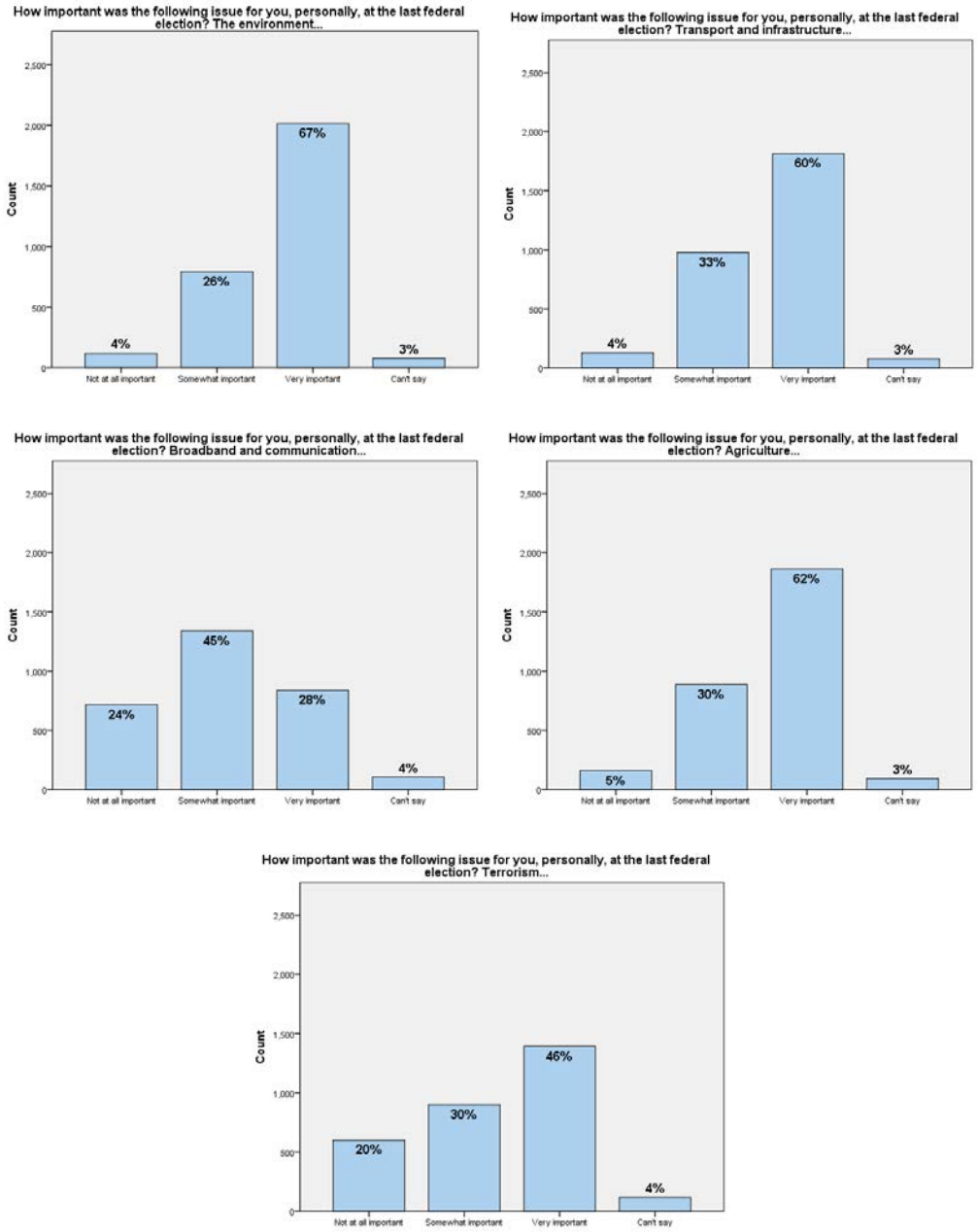
publics' responses to *altering* agricultural production to less water intensive models (for example, growing oats instead of rice). And finally, as will be discussed below, Australians – both rural and urban – perceive rural dwellers to be more responsible water users than their city counterparts, which may lead to a perception that rural agriculture is more deserving of water than urban based industries.

1.3.1.15 Importance of issues at the last Federal election

Healthcare and the economy were reported as the most important issues at the last Federal election by responding Australians, with 78% citing these issues as 'very important'. Water, as well as 'the environment', by comparison, was 'very important' to 67% of people, while only 28% of people felt that broadband internet access was 'very important' to them at the last election.

Figure 23: Importance of water in comparison to other issues at last federal election





1.3.2 Water and Desalination

Desalination has a long history of use both in Australia and internationally (Hoang *et al.*, 2009:1), though the first major desalination plant in Australia was not established until Perth's Kwinana plant began operation in 2006. Developments in desalination technology, the increasing economic viability of these technologies, as well as increased pressures on water security posed by climate variability in recent years has encouraged Australian governments to invest more in desalination plants. The CSIRO reports that planned production will increase around the country from 294 ML/day to 2,195 ML/day by 2013 (Hoang et al., 2009:3). The shift to desalination as a key mechanism for ensuring potable water supplies to our major cities has been relatively fast, and our understandings of public attitudes to desalination are in their infancy. Dolnicar and Hurlimann (2010) report that while satisfaction with the safety of drinking desalinated water is increasing, publics still have concerns

about the cost of the technology (see also King and Murphy 2009, Murphy, King, Murphy and Barkworth, in press). The results of the current survey concur with these findings and indicate that cost, as well as concerns about the environmental impact of desalination, and the political processes surrounding the implementation of desalination plants and water management more generally, contribute to shaping public opinion on desalination generally (see also King and Murphy 2009, Murphy, King, Murphy and Barkworth, in press). Reported 'attitudes to desalination' necessarily combine a raft of concerns that themselves have little to do with confidence in desalination technology or the safety of the finished product. Therefore, it is important to keep in mind that the reasons people indicate their 'support' or otherwise for desalination are numerous, complex and situational, and that efforts to gauge the publics' attitudes to desalination require a recognition of the various motivators of support.

1.3.2.1 Support for desalination generally, and locally

In Figure 24 and Figure 25 an aggregate score was displayed for questions asking about attitudes towards desalination in a *general* and a *local* context. The Cronbach's Alpha scores for these question sets was high, thus indicating a high level of correlation between responses.

For the set of questions formed by: p7q9a, 9c, 9e, 9g:

a. Desalination plants are a great idea **for Australia;**
c. I believe desalination would be useful **in Australia;**
e. Overall, I support the use of desalination plants to provide **Australians** with more water;
g. Desalination provides a solution to water shortages **in Australia**

Cronbach's Alpha	N of Items
.943	4

For the set of questions formed by: p7q9b, 9d, 9f, 9h:

b. Desalination plants are a great idea **for my local area;**
d. I believe desalination would be useful in **my local area;**
f. Overall, I support the use of desalination plants to provide people in **my local area** with more water;
h. Desalination provides a solution to water shortages **in my local area**

Cronbach's Alpha	*N of Items*
.957	4

Figure 24. General support for desalination as a response to domestic water shortages in Australia

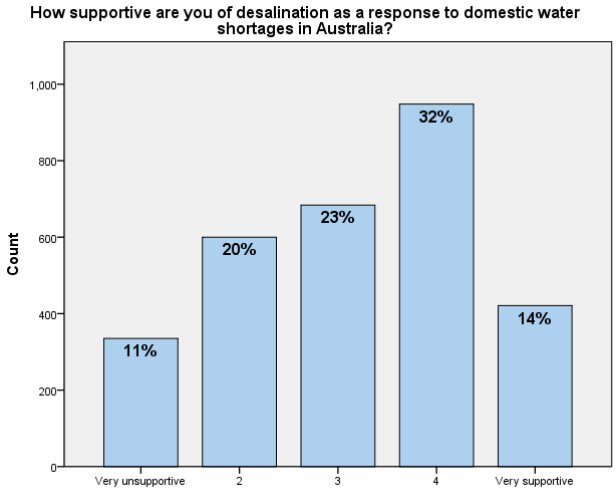


Table 40: General support for desalination as a response to domestic water shortages in Australia

			Very negative	Somewhat negative	Indifferent	Somewhat positive	Very positive	Total
Sample	National	Count	173	374	441	663	290	1941
		% within Sample	8.9%	19.3%	22.7%	34.2%	14.9%	100.0%
	Wonthaggi	Count	121	130	113	126	73	563
		% within Sample	21.5%	23.1%	20.1%	22.4%	13.0%	100.0%
	Port Stanvac	Count	38	93	122	157	55	465
		% within Sample	8.2%	20.0%	26.2%	33.8%	11.8%	100.0%
Total		Count	332	597	676	946	418	2969
		% within Sample	11.2%	20.1%	22.8%	31.9%	14.1%	100.0%

Figure 25. General support for desalination as a response to domestic water shortages in your local area

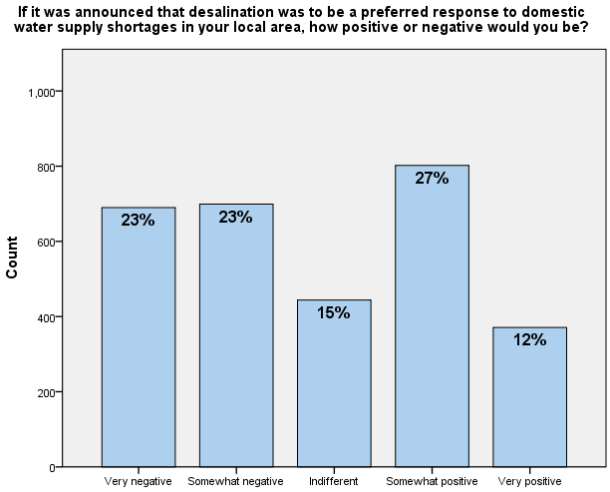


Table 41: General support for desalination as a response to domestic water shortages in your local area

			Very negative	Somewhat negative	Indifferent	Somewhat positive	Very positive	Total
Sample	National	Count	398	451	302	545	257	1953
		% within Sample	20.4%	23.1%	15.5%	27.9%	13.2%	100.0%
	Wonthaggi	Count	198	131	65	106	64	564
		% within Sample	35.1%	23.2%	11.5%	18.8%	11.3%	100.0%
	Port Stanvac	Count	87	112	74	149	47	469
		% within Sample	18.6%	23.9%	15.8%	31.8%	10.0%	100.0%
Total		Count	683	694	441	800	368	2986
		% within Sample	22.9%	23.2%	14.8%	26.8%	12.3%	100.0%

As Figure 24, Figure 25, Table 40, and Table 41 display, general attitudes to desalination in Australia are quite positive. Support for desalination to augment domestic use in local area – When asked about support for desalination for domestic use in their local area, the results differ markedly from those obtained when asking about desalination, generally. Some areas of Australia are more suited to desalination than others (those close to the ocean or with access to water that can potentially be treated desalination), and this will necessarily affect individual responses accordingly.

Figure 26: General support for desalination plants

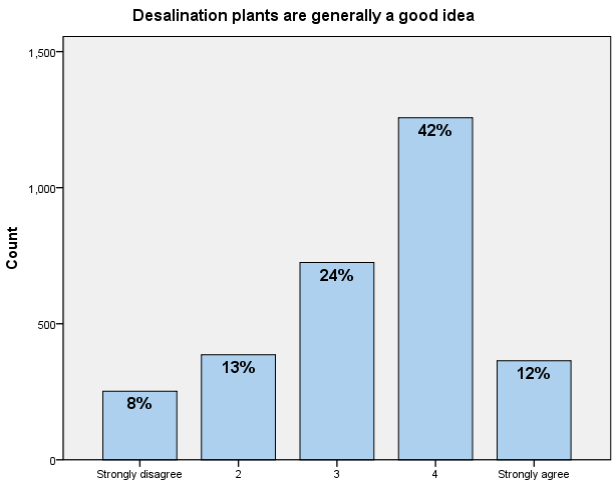


Table 42: General support for desalination plants

			Strongly disagree	Disagree	Indifferent	Agree	Strongly agree	Total
Sample	National	Count	145	231	465	854	252	1947
		% within Sample	7.4%	11.9%	23.9%	43.9%	12.9%	100.0%
	Wonthaggi	Count	78	99	133	184	58	552
		% within Sample	14.1%	17.9%	24.1%	33.3%	10.5%	100.0%
	Port Stanvac	Count	28	50	121	214	52	465
		% within Sample	6.0%	10.8%	26.0%	46.0%	11.2%	100.0%
Total		Count	251	380	719	1252	362	2964
		% within Sample	8.5%	12.8%	24.3%	42.2%	12.2%	100.0%

Figure 26 and Table 42 show that when asked their general support for desalination (without specifying whether it is for domestic use or otherwise), 54% of respondents were supportive while only 21% of people were unsupportive**.**

1.3.2.2 Concerns about desalinated water quality

Clean and safe water for human consumption is an essential service that the vast majority of Australians enjoy. Australian water quality standards are set by the Australian Drinking Water Guidelines (ADWG) (National Health and Medical Research Council and Natural Resource Mangement Ministerial Council, 2011), and outbreaks of water-borne illnesses in Australia are very rare.

Worldwide, however, millions of people die and contract diseases every year due to contaminated water supplies (Kariuki *et al*. 2012). The necessity of safe potable water does not escape the attention of Australian publics, and concerns are renewed by incidental outbreaks of water-borne contamination, such as the highly publicised 1998 contamination of Sydney's water supply with *Cryptosporidium* and *Giardia* (during which no one actually became ill!) (Stein, 2000).

It is therefore unsurprising that when a relatively new method of water production is introduced, concerns about the safety of this new method are paramount. What is perhaps surprising in the findings of the current survey is that while respondents were less likely to have concerns about the use of desalinated water for 'distant' use (eg. clothes-washing, gardening), than 'close' use (eg. drinking, food preparation), the overall level of concern about the safety of using desalinated water was low.

Figure 29: Response to safety of desalination water for distant use

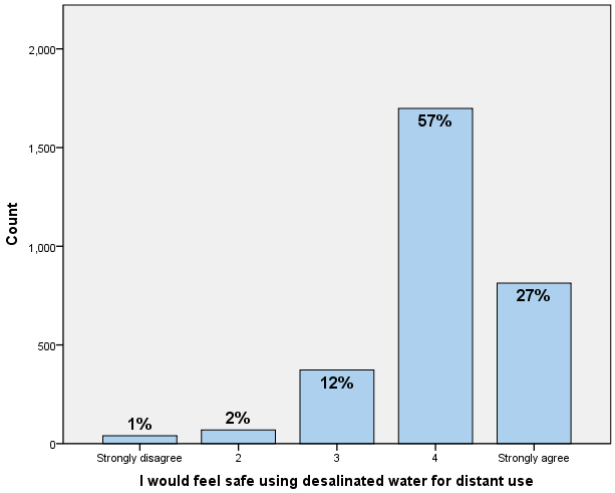


Table 43: Response to safety of desalination water for distant use

			Very negative	Somewhat negative	Indifferent	Somewhat positive	Very positive	Total
Sample	National	Count	21	45	227	1116	544	1953
		% within Sample	1.1%	2.3%	11.6%	57.1%	27.9%	100.0%
	Wonthaggi	Count	14	17	84	299	137	551
		% within Sample	2.5%	3.1%	15.2%	54.3%	24.9%	100.0%
	Port Stanvac	Count	4	5	57	277	126	469
		% within Sample	.9%	1.1%	12.2%	59.1%	26.9%	100.0%
Total		Count	39	67	368	1692	807	2973
		% within Sample	1.3%	2.3%	12.4%	56.9%	27.1%	100.0%

Summarising responses to questions about the safety of desalinated water for specific uses, 84% of people felt comfortable with the safety of using desalinated water for 'distant' use.

Figure 30: Response to safety of desalination water for close use

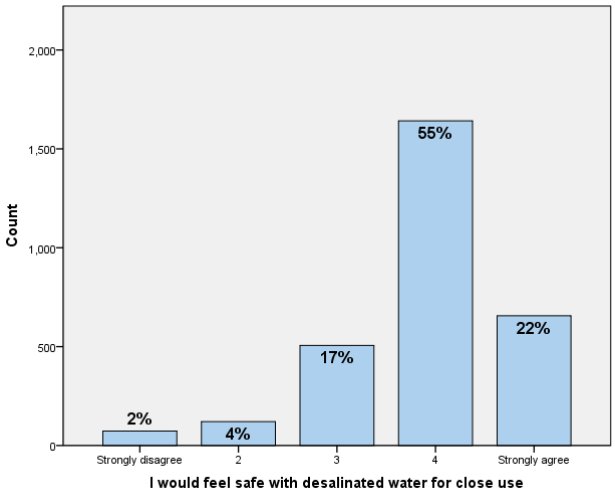


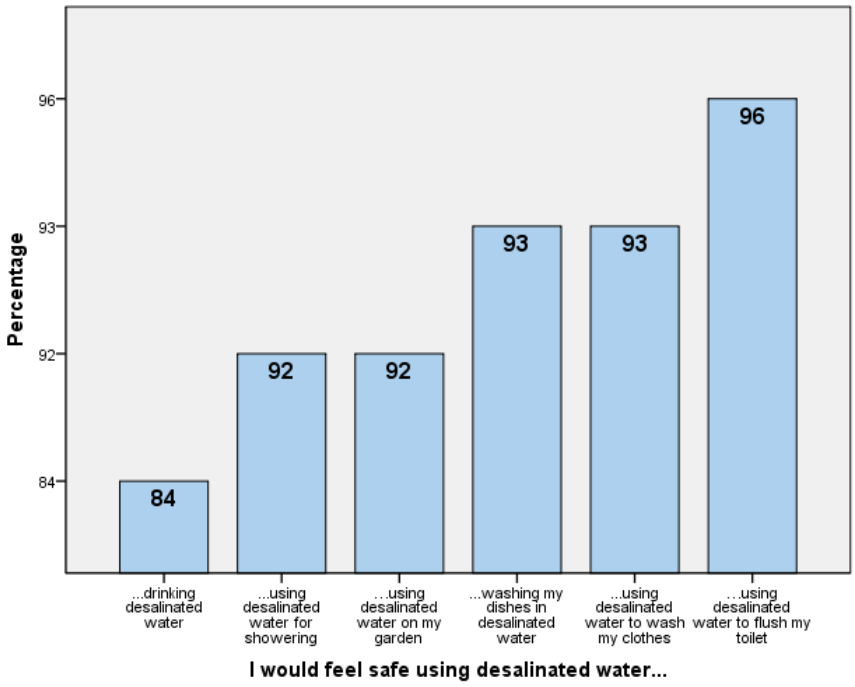
Table 44: Response to safety of desalination water for close use

			Very negative	Somewhat negative	Indifferent	Somewhat positive	Very positive	Total
Sample	National	Count	44	84	327	1064	435	1954
		% within Sample	2.3%	4.3%	16.7%	54.5%	22.3%	100.0%
	Wonthaggi	Count	20	19	96	304	113	552
		% within Sample	3.6%	3.4%	17.4%	55.1%	20.5%	100.0%
	Port Stanvac	Count	6	17	77	268	104	472
		% within Sample	1.3%	3.6%	16.3%	56.8%	22.0%	100.0%
Total		Count	70	120	500	1636	652	2978
		% within Sample	2.4%	4.0%	16.8%	54.9%	21.9%	100.0%

In Figure 30 and Table 44, in comparison to responses for 'distant' use, slightly less, 77% of Australians, were confident using desalinated water for 'close' use. Note that five *additional* percent of those who responded were not sure about the safety of desalinated water for 'close' use, as compared with 'distant' use.

In Figure 31 below, the percentages of respondents self-reporting being comfortable with using desalinated water for a variety of household activities is displayed.

Figure 31: Safety using desalination water for different uses



Only 4% of Australians surveyed reported feeling unsafe about using desalinated water to flush their toilet, while 16% were unconvinced of the safety of drinking desalinated water.

Figure 32: Drinking desalinated water as unpleasant

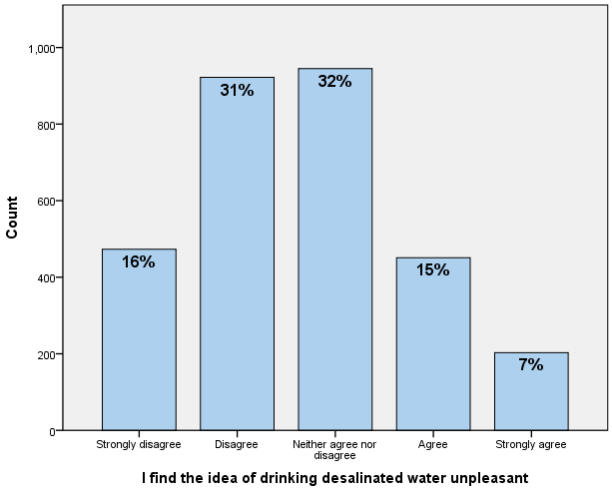


Table 45: Drinking desalinated water as unpleasant

			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Sample	National	Count	304	607	618	291	127	1947
		% within Sample	15.6%	31.2%	31.7%	14.9%	6.5%	100.0%
	Wonthaggi	Count	92	151	176	85	49	553
		% within Sample	16.6%	27.3%	31.8%	15.4%	8.9%	100.0%
	Port Stanvac	Count	77	159	143	69	26	474
		% within Sample	16.2%	33.5%	30.2%	14.6%	5.5%	100.0%
Total		Count	473	917	937	445	202	2974
		% within Sample	15.9%	30.8%	31.5%	15.0%	6.8%	100.0%

Despite being largely convinced of the safety of desalinated water, a significant proportion of respondents reported that they nonetheless found the idea of drinking desalintated water 'unpleasant'. While the 'yuck factor' has been explored extensively in relation to attitudes to recycled water (Leong, 2010, Christen, 2005, Russell and Lux, 2009, Po *et al.*, 2003:14-6), it can not be assumed that those who find the idea of drinking desalinated water unpleasant, do so for the same reasons they find the idea of drinking recycled water unpleasant. Public objections to recycled water use have been largely influenced by the discomfort associated with the idea of drinking water purified after domestic use, particularly sewage. Desalinated water does not evoke the unpleasant imagery of 'brown solids to clear liquids' (Po et al., 2003:15) associated with recycled water, therefore responses to the 'yuck factor' of drinking desalinated water should not be addressed in the same way. The reason for the perceived 'unpleasantness' should be explored further.

Figure 33: The water produced by desalination will be of a high quality for drinking

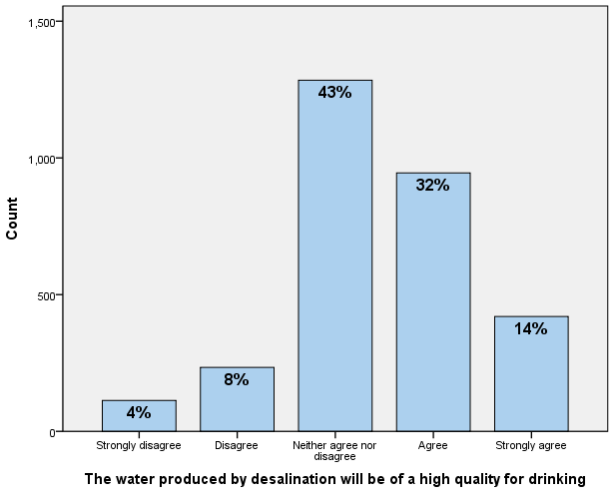


Table 46: The water produced by desalination will be of a high quality for drinking

			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Sample	National	Count	74	151	852	621	257	1955
		% within Sample	3.8%	7.7%	43.6%	31.8%	13.1%	100.0%
	Wonthaggi	Count	29	42	225	171	83	550
		% within Sample	5.3%	7.6%	40.9%	31.1%	15.1%	100.0%
	Port Stanvac	Count	7	39	196	150	79	471
		% within Sample	1.5%	8.3%	41.6%	31.8%	16.8%	100.0%
Total		Count	110	232	1273	942	419	2976
		% within Sample	3.7%	7.8%	42.8%	31.7%	14.1%	100.0%

Figure 34: Anticipated responses to the taste of desalinated water

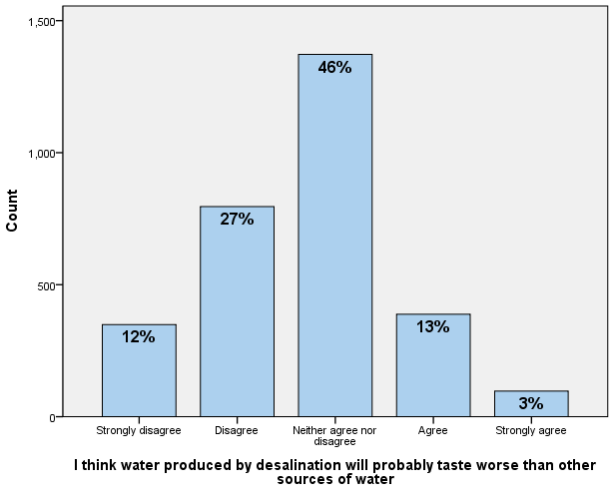


Table 47: Anticipated responses to the taste of desalinated water

			I think water produced by desalination will probably taste worse than other sources of water					Total
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
Sample	National	Count	209	500	913	275	61	1958
		% within Sample	10.7%	25.5%	46.6%	14.0%	3.1%	100.0%
	Wonthaggi	Count	81	147	243	58	22	551
		% within Sample	14.7%	26.7%	44.1%	10.5%	4.0%	100.0%
	Port Stanvac	Count	58	147	203	52	13	473
		% within Sample	12.3%	31.1%	42.9%	11.0%	2.7%	100.0%
Total		Count	348	794	1359	385	96	2982
		% within Sample	11.7%	26.6%	45.6%	12.9%	3.2%	100.0%

In Figures 32-34, attitudinal statements about the expected quality of drinking water are displayed. Feelings about the safety, 'unpleasantness' and taste of desalinated water are not always based on factual information but may be driven by perceptions that are founded in a variety of previous experiences. These experiences may have been both in Australia and abroad, with desalinated water itself, as well as with agencies charged with delivering safe public water and sanitation. A variety of factors may influence perceptions of the quality of desalinated water, including comparisons with other water sources, faith in the policing of Australian standards in regard to water purity, and trust in science to deliver a safe product. The following comments were made by those involved in focus groups as part of the current study and represent a range of responses to the question of perceived desalinated water quality:

- *They're [the government] not going to poison the population. You know, it might cost us as ratepayers a lot more money to process the water, but it's gonna be up to WHO [World Health Organization] standards or better. They can't afford to have people dying.*
- *If it's safe to drink, it's safe to drink, and that's it. So I don't have any doubts about it.*
- *I'm sure they're going to produce it to a standard that is drinkable.*
- *The point is it's so pure that it's not really healthy for you, so they'll have to introduce minerals into it.*
- *Notwithstanding that I support the idea of desalination… There are questions about boron levels in the finished product… Boron is a poisonous element and it hadn't crossed my mind; I just thought they take the salt out of it… I want to know if this is really safe.*
- *[Tank water is] just more natural and we are aware that it's full of bugs, but we take the punt or maybe we've just got used to it and developed a resistance to the bugs. But the chlorinated water that's supplied is fine when you drink it quickly, but if you leave it overnight, by the morning it's very, very strong and unpleasant.*
- *If the safety levels are implemented, yeah, I don't have a problem with desalination per se.*
- *The safety of the water: I think it's almost guaranteed that it's safe to drink; no issues with that whatsoever.*
- *I've only drunk desalination water in the Middle East and I don't know what ours is going to taste like, but it doesn't taste very nice, and I'm also concerned about what the quality of the water's going to be; whether it can be used to grow crops and things like that if it's salty.*

1.3.2.3 Desalination as an option among many, or as the only solution

One of the issues to emerge regularly in the debate over the Wonthaggi desalination plant in Victoria has been whether or not desalination is the best, or the only, solution to potential domestic water shortages. In 2007 the Victorian Government received the results of a commissioned study from ACIL Tasman, *Review of Victorian Water Supply-Demand: Options and Risks*, advising them to consider a range of options for reducing the risk of domestic water shortages. These options included putting plans in place to build a modest desalination plant, should alternative measures prove insufficient. The Government of the day opted for a desalination plant that, upon completion, will be the biggest in the Southern Hemisphere. The Government has cited the unprecedented severity of the drought as the reason for designating the Wonthaggi plant as the 'Keystone of Victoria's Water Plan' (Victorian Government, 2008). Despite ongoing investment in alternatives to desalination, including recycling for non-potable use, enhanced conservation education campaigns and rainwater tank rebates, the Victorian Government received considerable public criticism for favouring desalination over other approaches to securing domestic water supplies (King and Murphy, 2012:18).

While the case of the Wonthaggi desalination plant is a specific one, the current national survey shows that Australians' attitudes to desalination are influenced by their comparative perceptions of alternative methods of ensuring domestic water supply.

Figure 35: Desalination is the best solution

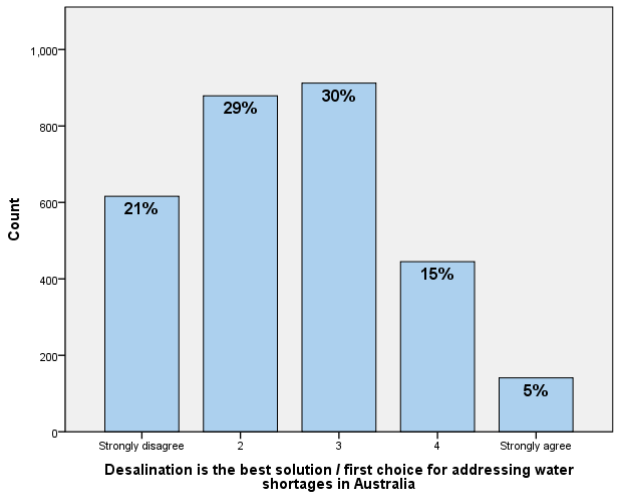


Table 48: Desalination is the best solution

			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Sample	National	Count	349	589	624	296	88	1946
		% within Sample	17.9%	30.3%	32.1%	15.2%	4.5%	100.0%
	Wonthaggi	Count	169	155	125	72	36	557
		% within Sample	30.3%	27.8%	22.4%	12.9%	6.5%	100.0%
	Port Stanvac	Count	90	133	155	75	17	470
		% within Sample	19.1%	28.3%	33.0%	16.0%	3.6%	100.0%
Total		Count	608	877	904	443	141	2973
		% within Sample	20.5%	29.5%	30.4%	14.9%	4.7%	100.0%

Half of those surveyed were not supportive of desalination as the 'best 'or 'first' solution to Australia's water supply challenges.

Figure 36: Desalination is the only solution

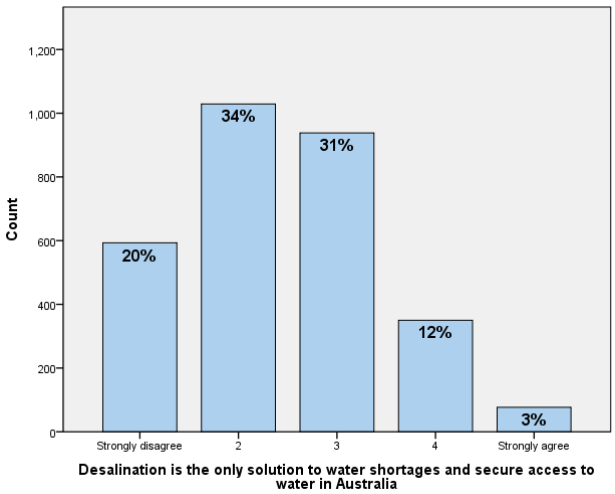


Table 49: Desalination is the only solution

			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Sample	National	Count	346	671	637	245	43	1942
		% within Sample	17.8%	34.6%	32.8%	12.6%	2.2%	100.0%
	Wonthaggi	Count	154	187	144	46	22	553
		% within Sample	27.8%	33.8%	26.0%	8.3%	4.0%	100.0%
	Port Stanvac	Count	86	166	150	59	11	472
		% within Sample	18.2%	35.2%	31.8%	12.5%	2.3%	100.0%
Total		Count	586	1024	931	350	76	2967
		% within Sample	19.8%	34.5%	31.4%	11.8%	2.6%	100.0%

15% of Australians agreed that desalination is the only solution to securing water access in Australia. Almost a third of respondents did not express strong views, and over half (54%) rejected the idea that desalination is the only option for addressing water shortages in Australia.

Figure 37: I would consider other solutions first

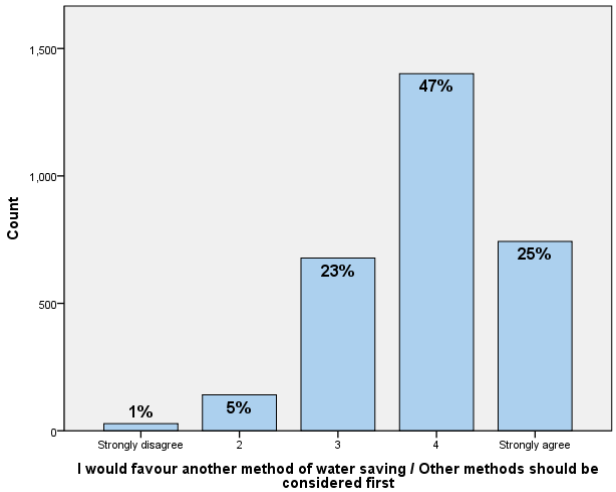


Table 50: I would consider other solutions first

			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Sample	National	Count	17	97	455	935	444	1948
		% within Sample	.9%	5.0%	23.4%	48.0%	22.8%	100.0%
	Wonthaggi	Count	7	20	106	241	175	549
		% within Sample	1.3%	3.6%	19.3%	43.9%	31.9%	100.0%
	Port Stanvac	Count	4	23	114	216	117	474
		% within Sample	.8%	4.9%	24.1%	45.6%	24.7%	100.0%
Total		Count	28	140	675	1392	736	2971
		% within Sample	.9%	4.7%	22.7%	46.9%	24.8%	100.0%

Nearly three quarters (72%) of surveyed Australians suggested that they would prefer to consider other methods of water saving before opting for desalination.

Figure 38: Respondents believing that a range of strategies should be employed for water shortages

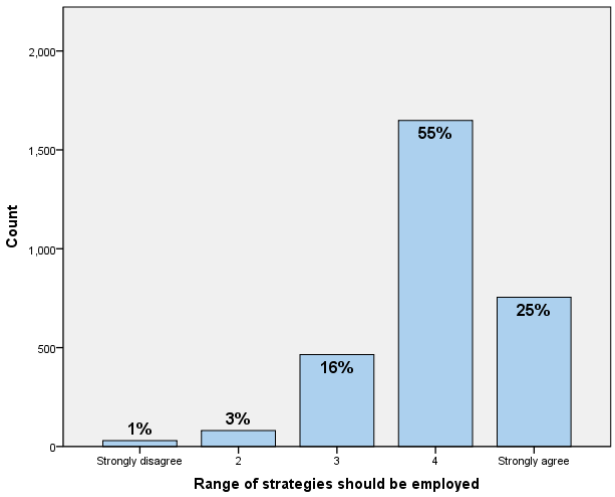


Table 51: Respondents believing that a range of strategies should be employed for water shortages

			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Sample	National	Count	14	49	311	1069	498	1941
		% within Sample	.7%	2.5%	16.0%	55.1%	25.7%	100.0%
	Wonthaggi	Count	13	26	93	301	118	551
		% within Sample	2.4%	4.7%	16.9%	54.6%	21.4%	100.0%
	Port Stanvac	Count	3	6	56	271	134	470
		% within Sample	.6%	1.3%	11.9%	57.7%	28.5%	100.0%
Total		Count	30	81	460	1641	750	2962
		% within Sample	1.0%	2.7%	15.5%	55.4%	25.3%	100.0%

A large majority of respondents (80%) reported believing that water shortage issues in Australia should be tackled using a variety of strategies.

The following comments are from those who participated in surveys and focus groups as part of this study (Wonthaggi, Port Stanvac, Kwinana). As the qualitative responses suggest, those surveyed were likely to refer to a package of approaches rather than a single response to existing or anticipated water shortages:

- *It makes sense to have desalination plants as well as the other options.*
- *Water recycling, well, you know we can't pump our raw sewage into our oceans; it needs to be cleaned up in some way, and removing the residual pollutants… from that water is far easier and cheaper via reverse osmosis than it is to remove salt [and boron] from sea water. So I strongly feel that even though it's expensive to recycle water, it's still way cheaper than desalination.*
- *I think, and it wouldn't be an easy thing to do, but I think Australia or the government in general needs to have a look at what's being farmed in these areas. Like the rice crops that are… in New South Wales… There's no [rainfall] out there, [yet] they're growing the most water intensive crops. I think that's an issue that needs to be looked at.*
- *There are many methods that can be implemented to combat the decreasing rainfall. I feel that many of [the] alternatives have not been implemented eg. water tanks <u>in cities</u> – less towns, stormwater collection,… <u>more</u> recycled reused water!*
- *One of the alternatives would be recycled water as some cities and countries have.*
- *Even in drought times we have never ran out of water on our farm because every drop in used wisely and saved. Our water problem is due to our population increase.*
- *The Government… should concentrate [on] ensuring cities/towns reduce their water consumption.*
- *I prefer recycled sewage to desalination.*
- *More environmentally friendly project should have been done. Like syphoning water from Tasmania.*
- *Other projects, such as dams, would be far more beneficial & cheaper for all communities, & would also lead people away from wasting this precious resource.*
- *Water recycling, another or extensions on existing dams, using the water of the concrete catchments [cities], should all be considered and implemented before costly (financial and environmentally) desalination is considered.*
- *A desalination plant is <u>one</u> way of ensuring future water supplies but… there are also other methods of water conservation such as recyclable water usage for <u>industries</u> and households, [alternatives] which have had little exploration.*

- *None of the [water supply] problems would be relevant if the population was capped as it is.*
- *There are other options to the desalination plants.*
- *I feel that desalination… isn't really the way to go. I feel there are other solutions such as not lowing water restrictions.*
- *Before a desalination plant is built a lot of other water saving programs could have been implemented.*
- *I think that commercial industry uses a large amount of our water and [I] don't feel that they are being encouraged/enforced to reduce their water usage.*

The feeling that desalination should be used as a backup for other strategies, or as a last resort, was also made explicit in many comments:

- *I think everybody's already said it: it should be a last resort.*
- *It should not be used unless it's necessary and, to me, it's a good investment for [the] future and, perhaps, hopefully in the future the power sources will become greener and cleaner and more available and cheaper.*
- *I think it is a great standby in case of – call it an emergency, call it what you like… To have a desalination plant there to top up the reservoirs to me is the way to go.*
- *I felt from the beginning that if we're building a desalination plant it should only be a small plant for emergency purposes.*
- *And I think desalination is fine in its place, but that is when all of the environmentally and economically and socially cheap alternatives have been exhausted first.*
- *I see desalination as the way of last resort and desalination, even then, should be coupled with producing its own energy to drive the plant by way-off floaters or windmills in the sea or whatever.*

Two key issues arose as reasons for considering desalination only after other methods have been explored. The first relates to the cost of desalination, both to the individual in terms of increased domestic water prices, and to the respondents' State/Territory in terms of building and operating costs. Many respondents were also worried about the environmental impacts related to the energy production required to run a desalination plant, as well as the more direct impacts associated with desalination (eg. brine disposal).

- *Cost is a big factor [in deciding between alternatives], [and] environmental impacts I think is very important. Just off the top of my head that's just about it I think: cost and environmental impact.*
- *I think there's other ways we can get the water Melbourne needs and Victoria needs without having to destroy our environment in the way that we're doing it, and without having to use all that energy, and without having to make water extremely expensive for people.*
- *There are much cheaper alternatives to conserve water.*
- *Water desalination is a joke!! Creating the need for increased power demand (another environmental issue) and possibly environmental damage with increased salt is crazy. I would 100% support the intelligent move for recycled water.*

Table 52: Correlation coefficients of three questions about the water supply, price, and environmental benefits of desalination

		I would favour another method of water saving over desalination plants	There are cheaper alternatives to desalination	There are alternative measures the government could pursue that are better for the environment
I would favour another method of water saving over desalination plants	Pearson Correlation	1	.508**	.608**
	Sig. (2-tailed)		.000	.000
	N	2986	2957	2951
There are cheaper alternatives to desalination	Pearson Correlation	.508**	1	.680**
	Sig. (2-tailed)	.000		.000
	N	2957	3005	2989
There are alternative measures the government could pursue that are better for the environment	Pearson Correlation	.608**	.680**	1
	Sig. (2-tailed)	.000	.000	
	N	2951	2989	2998

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation coefficients for items asking about preferred water saving, cheaper alternatives, and environmental benefits are displayed in Table 18. There is a reasonable correlation between opposition, and price and environment, and a good degree of cross-correlation between cost and environment. In other words, those who oppose desalination plants tend to cite cost *and* environmental concerns as reasons, rather than one or the other.

1.3.2.4 Self-reported knowledge of desalination and other water treatment processes

One of the factors governments and policy makers seek to address when implementing new infrastructure or technology is the understanding the public has of the relevant processes. There is certainly evidence to suggest that people are more likely to fear, or at least be unsure about, technologies or processes they do not understand (eg. Dolnicar *et al.* 2010). It is therefore in the best interest of community support to ensure that publics are well informed about the facts of various technologies as they are introduced. What is interesting to note in the findings from this survey is that Australians surveyed reported comparable knowledge of grey, recycled and desalinated water. Indeed, given that recycling of water has been more widely discussed and applied than desalinated water (though perhaps not for potable uses), it may be surprising that more people reported a low understanding of recycling processes (31%) than desalination technology (25%).

Figure 39: Surveyed Australians self-reported levels of knowledge about grey-water, recycled water and desalinated water

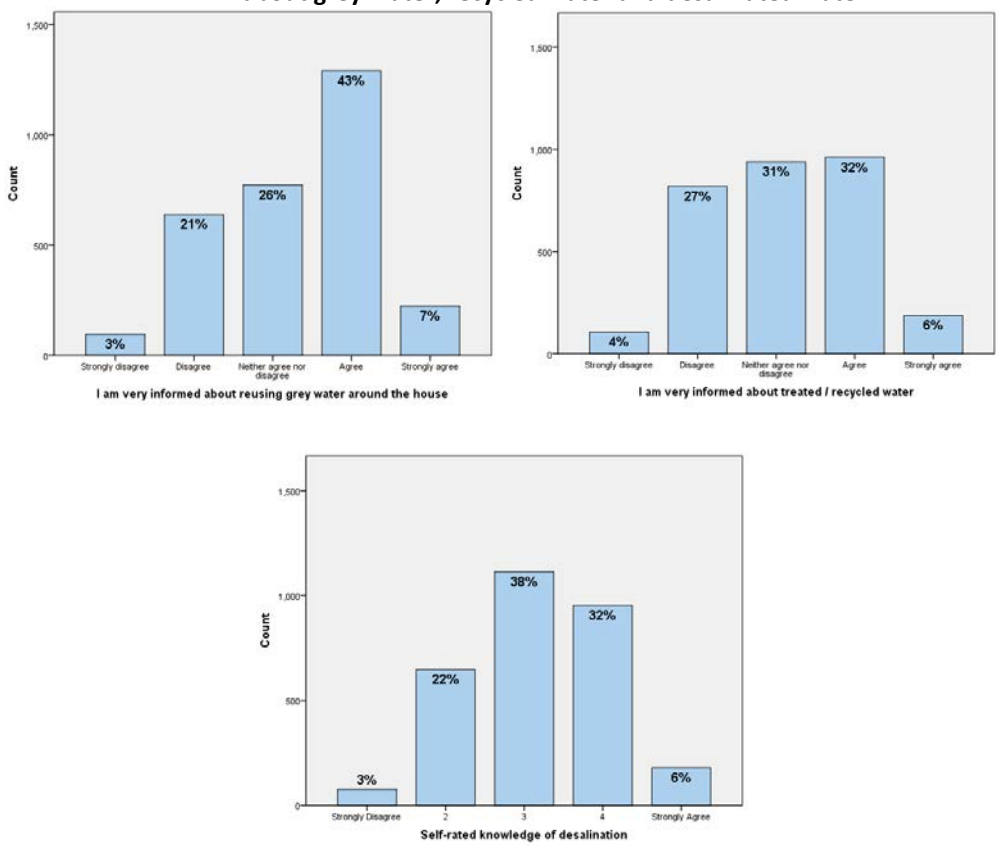


Table 53: Comparison of self-reported knowledge of desalination against other methods

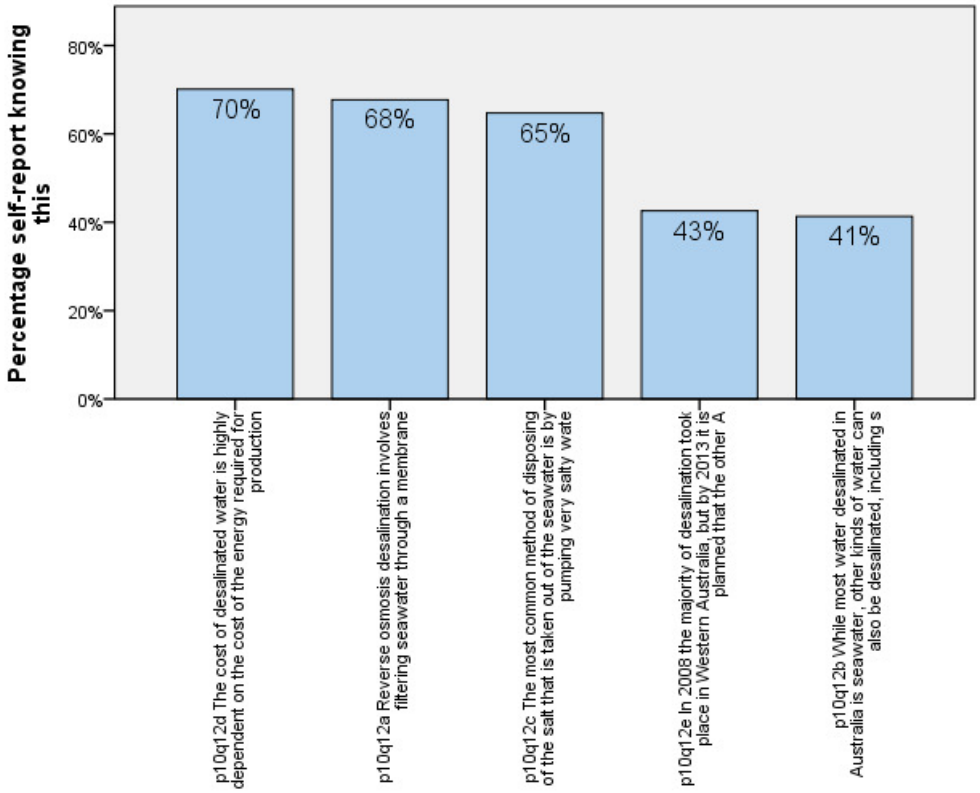
	Informed about grey water	Informed about treated / recycled water	Informed about desalinated water	Understanding of desalinated water	Confident explaining desalinated water	Understanding of desalinated water technology	Don't understand desalinated water
I am very informed about reusing grey water around the house (p9q11a)	1						
I am very informed about treated / recycled water (p9q11b)	.716	1					
I am very informed about desalinated water (p9q11c)	.493	.631	1				
I have a thorough understanding of what desalination is and how it works (p9q11d)	.408	.520	.764	1			
I would feel confident explaining how desalination works to a friend (p9q11e)	.376	.476	.700	.838	1		
I think the basic technology of desalination is easy to understand (p9q11f)	.297	.350	.510	.604	.657	1	
I have no idea how desalination works (p9q11g)	-.271	-.311	-.451	-.521	-.540	-.477	1

As displayed in Table 19 there were some differences expressed in terms of self-assessed knowledge of desalination, versus recycled and grey water. Those who reported a very good knowledge of reusing grey water around their house were also quite likely to report understanding water recycling processes (0.716). However, those who felt they understood grey water use were much less likely to report a solid grasp of desalination technology, with correlations ranging from .493 to -.271. Those who indicated a very good knowledge of recycled water were slightly more likely to report feeling confident in their knowledge of desalination, though the correlations were still quite low, ranging from .631 to -3.11.

When asked specific questions about desalination Australians reported mixed knowledge of desalination technology and Australian policy. The least understood knowledge was about the kinds of water that could undergo a desalination process (41% of those surveyed knew that brackish and other tainted water can be desalinated, as well as seawater), followed by knowledge of future policies for expanding the use of desalination across Australia (43%). Most people reported that they

knew the cost of desalinated water is highly dependent on the cost of the energy required for production (70%).

Figure 40: Bar chart of percentages who self-reported knowing the listed facts about desalination



1.3.2.5 Concerns about desalination

When expressing concerns about desalination plants a number of themes emerge. Figure 41 shows that concerns about where plants are located rate most highly as a concern with respondents (66% either agreeing or strongly agreeing), followed by economic concerns (62%), environmental concerns (51%), and political processes surrounding desalination plants (19%). Only 6% of respondents reported concerns about the aesthetic qualities of desalination plants. In other words, people did not report being particularly concerned about how desalination plants look.

When governments are deciding where to situate desalination plants, we know that the reasons for opposition include economic, environmental and political concerns, while the positive economic outcomes of such developments (in terms of local job creation, etc.), and the perceived need for the infrastructure (for example, due to prolonged drought), tend to be cited as reasons for supporting such developments. It is therefore likely that reporting concerns about the 'siting' of desalination plants is a 'catch-all' for related economic, environmental and (in some cases), political concerns.

Figure 41: Level of community concern with aesthetic, siting, economic, political, and environmental aspects of desalination plants.

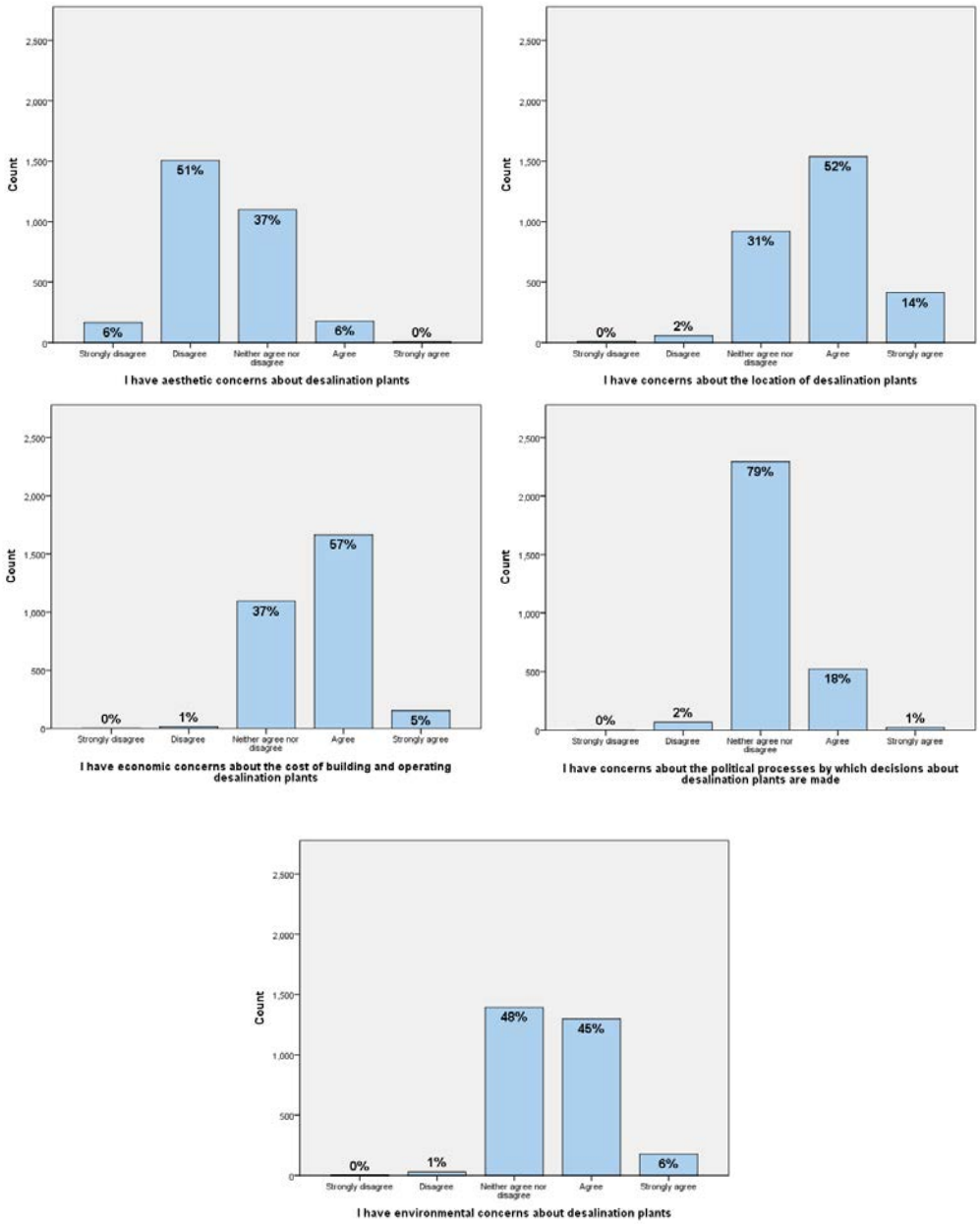
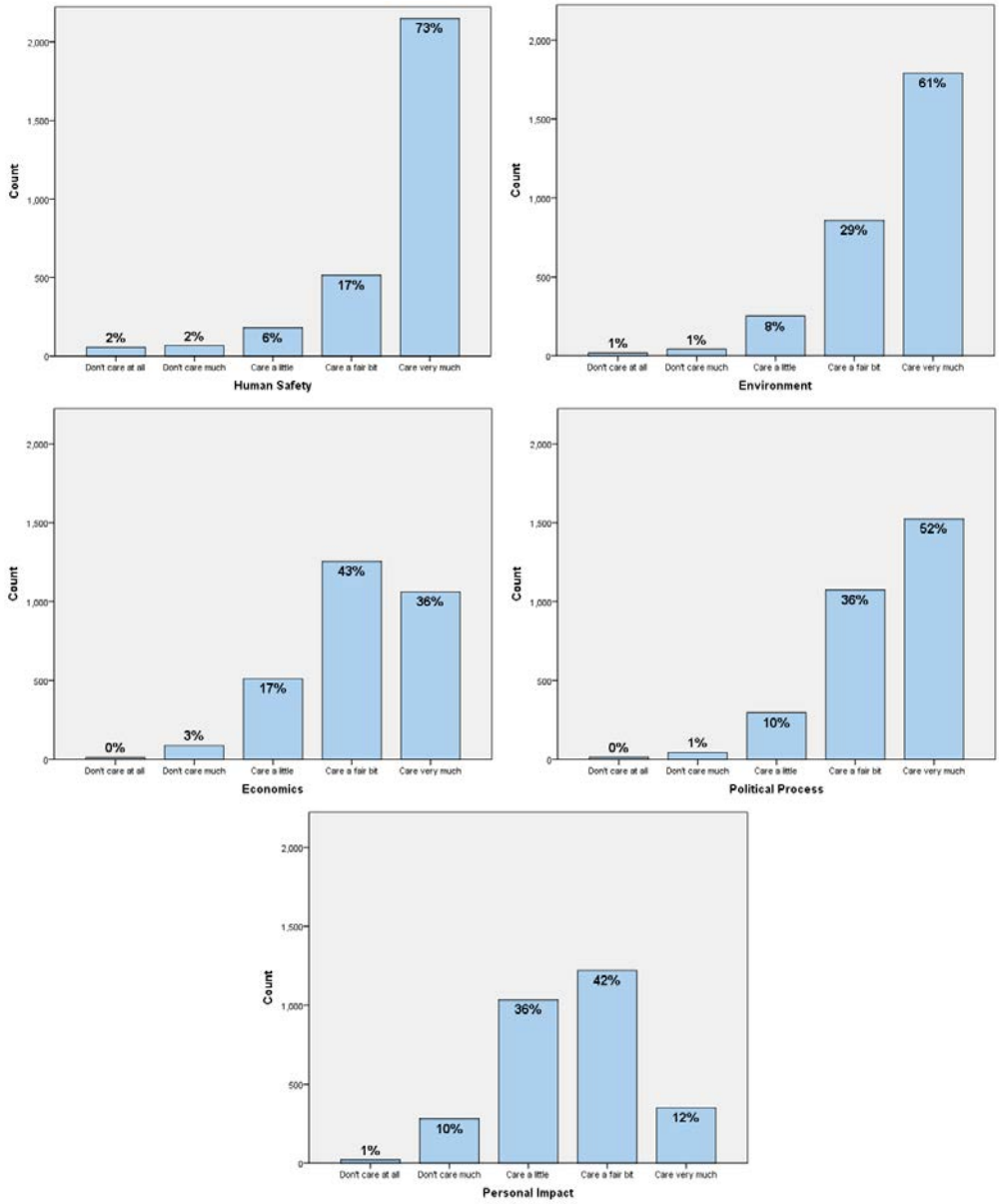


Figure 42 represents further responses to questions about the relative importance of particular aspects of desalination plant implementation. Participants were asked to rate how much they 'cared' about various aspects of desalination on a five point scale: don't care at all; don't care much; care a little; care a fair bit; care very much. The results indicate that 90% of respondents care 'a fair bit' or 'very much' about the environment, 90% care 'a fair bit' or 'very much' about personal safety; 88% care 'a fair bit' or 'very much' about the political processes involved (88%), and 79% care 'a fair bit' or 'very much' about the economic costs and benefits. When it came to the personal impact of desalination plants, however, markedly less people cared 'a fair bit' or 'very much' (54%), while 36% reported caring 'a little' while 10% were not particularly concerned about how they fared personally

in relation to desalination plants. This result warrants further explanation of existing scholarly work on 'self-interest' as a relative motivator, and a deeper exploration of the current findings.

Figure 42: National responses compared for the question "How much do you care about the following aspects of desalination?", for the categories of human safety, environmental impacts, economic costs and benefits, political process, and personal impact.



1.3.2.6 Fairness and equality

When responding to the implementation of large public infrastructure such as desalination plants, people report being concerned about the distribution of costs and benefits in terms of both 'fairness' and 'equality' (Syme *et al*., 1999). While these two terms are often used interchangeably their difference is important to grasping a full understanding of attitudes to desalination. 'Equality' denotes the equal distribution of costs or benefits, such that each person, community or region gets an even share. For example, if the distribution of large public infrastructure were 'equal', then each

community or region would be host to at least one. This is not how such distributions occur, however, and clustering of infrastructure around industrial regions or technically appropriate sites leaves, for example, residential or aesthetically valuable areas free of such infrastructure.

'Fairness', as a concept, is much more subjective than 'equality', and relies on judgement calls about 'deservedness' or 'propriety'. As Walker and Bulkeley (2006:656) note in their editorial preface to a collection on environmental justice, 'the term "equity", rather unhelpfully, too easily slips in its use between the descriptive sense of inequality, and the normative sense of justice, providing a further complication for the search for clarity in language and meaning'. As Syme *et al.* (1999:53) note, a further complication is that what people consider fair in an abstract or 'universal' sense may differ to what they consider 'situationally' fair, or fair once the full range of specific personal and situational factors have been taken into consideration. They urge, 'There is a need to understand how people interpret equity, justice and other principles when the outcomes of decision-making affect them personally. This will enable better prediction of judgements about the "fairness" or otherwise of government decision-making, as well as the likely impacts on the affected communities' (Syme *et al*., 1999:52).

This means that when it comes to siting new infrastructure, what people consider to be the most 'fair' distribution is not necessarily the most 'equal'. Likewise, what is seen to be 'fair' may not be the most economically efficient or technically appropriate, either.

Understanding how people respond to issues of fairness is important because it helps us to predict how people will behave when faced with scenarios in which they may gain or lose relative to others in the community. This is particularly important because, as noted above, large public infrastructure is not located evenly around the country, but tends to be built where it is the most technically, scientifically, economically, environmentally and politically appropriate (at least in the ideal). What we do know is that people don't necessarily behave selfishly, but that a range of 'pro-social motivations' temper self-interest (Syme *et al*., 1999:51).

The question of human 'selfishness' has been addressed extensively in the common property resource (CPR) literature, notably by recent Nobel Prize winner, Elinor Ostrom (Berkes *et al.*, 2003, Committee on the Human Dimensions of Global Change and National Research Council, 2002, Dietz *et al.*, 2003, McGoodwin, 1990, Ostrom, 2009, Ostrom *et al.*, 1994, Poteete *et al.*, 2010, Ostrom, 1990). Through a combination of laboratory based testing and field research Ostrom has, for some decades, demonstrated that the contexts in which people genuinely behave selfishly occur far less often than proposed by theories such as the 'tragedy of the commons' (Hardin, 1968) model (in which people always behave in order to maximise their personal benefit, regardless of the broader social and environmental impact). People exert social pressure on each other, as do governments, NGOs, environmental and community groups, to name a few, in order to compel cooperative, not self-interested, behaviour; people behave *as if* fairness matters.

In 1999, Syme et al. (1999:59) published findings from a study into water allocation strategies, in which participants were asked to indicate their response to the following questions:

- If the decision making process is fair, people should accept the final allocation decisions
- In water allocation, everyone should be treated equally

Though the methodology involved in Syme *et al*'s earlier study differed from the current survey, and the questions pertained to the distribution of water rights (as opposed to the cost/benefits of a desalination plant), the findings are instructive. Syme *et al.* (1999) found that while 'fairness' and 'equality' were generally favoured, respondents were more likely to express a preference for fairness.

In the current survey, too, respondents expressed more concern about the 'fairness' of siting decisions than for equality of burden/benefit.

Figure 43: Acceptance of final decision about location of desalination plants

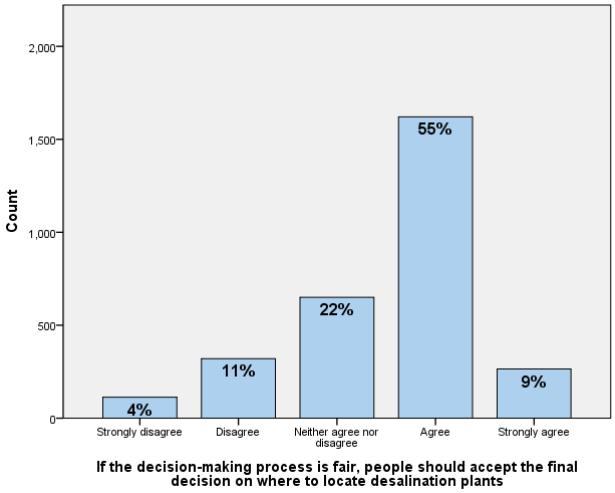


Table 54: Acceptance of final decision about location of desalination plants

			If the decision-making process is fair, people should accept the final decision on where to locate desalination					Total
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
Sample	National	Count	64	198	440	1060	169	1931
		% within Sample	3.3%	10.3%	22.8%	54.9%	8.8%	100.0%
	Wonthaggi	Count	35	70	89	296	58	548
		% within Sample	6.4%	12.8%	16.2%	54.0%	10.6%	100.0%
	Port Stanvac	Count	14	50	114	256	37	471
		% within Sample	3.0%	10.6%	24.2%	54.4%	7.9%	100.0%
Total		Count	113	318	643	1612	264	2950
		% within Sample	3.8%	10.8%	21.8%	54.6%	8.9%	100.0%

64% of respondents either agreed or strongly agreed that people should accept the final decision on where to locate desalination plants if the decision-making process has been fair. Only 15% of people were opposed to this sentiment.

Figure 44: Acceptance of location of plant if in the most technologically appropriate place

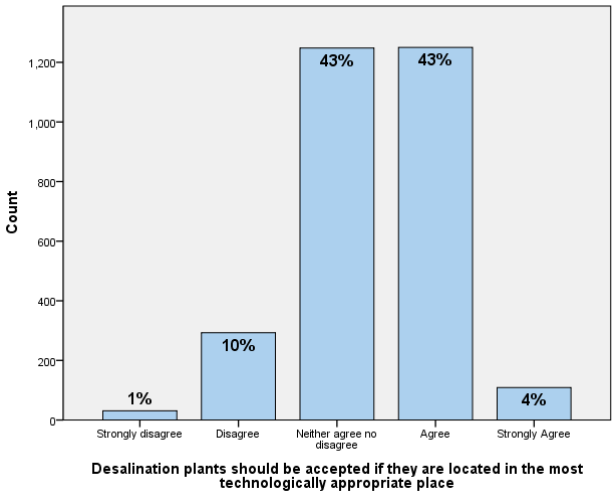


Table 55: Acceptance of location of plant if in the most technologically appropriate place

			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Sample	National	Count	13	156	821	831	79	1900
		% within Sample	.7%	8.2%	43.2%	43.7%	4.2%	100.0%
	Wonthaggi	Count	17	86	231	194	15	543
		% within Sample	3.1%	15.8%	42.5%	35.7%	2.8%	100.0%
	Port Stanvac	Count	1	47	191	216	14	469
		% within Sample	.2%	10.0%	40.7%	46.1%	3.0%	100.0%
Total		Count	31	289	1243	1241	108	2912
		% within Sample	1.1%	9.9%	42.7%	42.6%	3.7%	100.0%

By comparison, less than half (47%) of those surveyed agreed or strongly agreed that technical appropriateness (scientific, environmnetal, etc.), should be deferred to when deciding on whether or not to accept the siting of desalination plants, even if this meant that distribution was uneven. It is worth noting, in this figure, that almost as many people were 'undecided' about the relative weight of technical arguments as were 'supportive'. It is difficult to know how to interpret this result and further exploration of the influence of technical expertise on publics' acceptance of siting decisions should be explored. Certainly, any assumption that publics will unquestioningly support a project that is supported by scientific credentials alone, is unfounded; public motivations are far more complex (eg. Marks *et al*., 2008).

Figure 45: Responses to an even distribution of burden

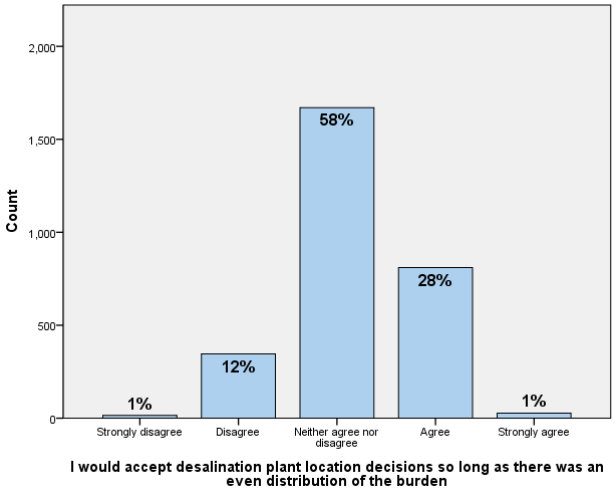


Table 56: Responses to an even distribution of burden

			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Sample	National	Count	8	218	1085	535	22	1868
		% within Sample	.4%	11.7%	58.1%	28.6%	1.2%	100.0%
	Wonthaggi	Count	4	64	292	160	4	524
		% within Sample	.8%	12.2%	55.7%	30.5%	.8%	100.0%
	Port Stanvac	Count	3	63	281	110	1	458
		% within Sample	.7%	13.8%	61.4%	24.0%	.2%	100.0%
Total		Count	15	345	1658	805	27	2850
		% within Sample	.5%	12.1%	58.2%	28.2%	.9%	100.0%

The majority of people (58%) who responded indicated that they were unsure about whether or not they should accept a desalination plant location in the case where there was an equal distribution of the associated burdens. Only 29% of people felt that 'equivalence' was a legitimising factor.

The results presented in Figures 43-45 and Tables 54-56 indicate that people were more than twice as likely to favour 'fairness' over 'equality' when deciding whether or not they would accept the location of a desalination plant. If we know that 'fairness' is a subjective term, the relevant question then becomes, what contributes to a perception of 'fairness'. We go on to propose some answers to this question in later sections of the report.

1.3.2.6 Willingness to pay for improvements in water quality

Figure 46: Willingness to pay for desalinated water

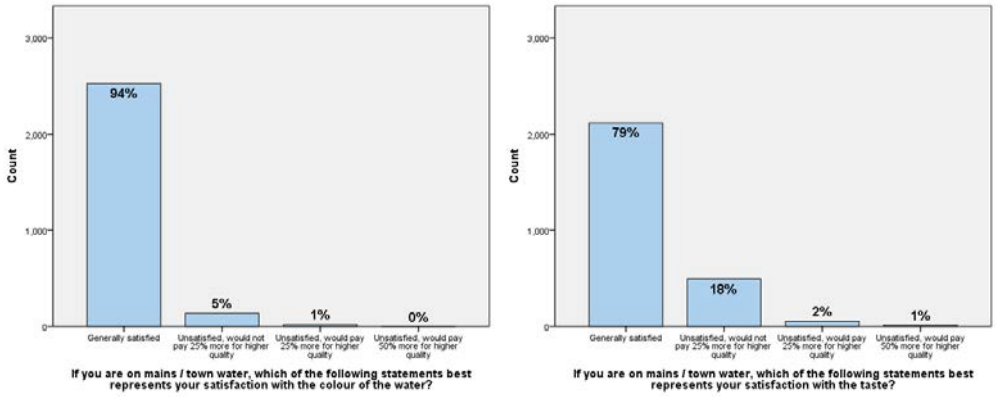


Table 57: Willingness to pay for improvements in quality

If you are on mains, which of the following statements best represents your satisfaction with the taste?							
			Generally satisfied	Unsatisfied but would not pay 25% more for improvement	Unsatisfied and would pay 25% more for improvement	Unsatisfied and would pay 50% more for improvement	Total
Sample	National	Count	1634	78	15	2	1729
		% within Sample	94.5%	4.5%	.9%	.1%	100.0%
	Wonthaggi	Count	433	35	5	0	473
		% within Sample	91.5%	7.4%	1.1%	.0%	100.0%
	Port Stanvac	Count	441	23	1	0	465
		% within Sample	94.8%	4.9%	.2%	.0%	100.0%
Total		Count	2508	136	21	2	2667
		% within Sample	94.0%	5.1%	.8%	.1%	100.0%

If you are on mains, which of the following statements best represents your satisfaction with the colour/odour?							
			Generally satisfied	Unsatisfied but would not pay 25% more for improvement	Unsatisfied and would pay 25% more for improvement	Unsatisfied and would pay 50% more for improvement	Total
Sample	National	Count	1462	212	34	10	1718
		% within Sample	85.1%	12.3%	2.0%	.6%	100.0%
	Wonthaggi	Count	311	156	7	3	477
		% within Sample	65.2%	32.7%	1.5%	.6%	100.0%
	Port Stanvac	Count	333	118	13	2	466
		% within Sample	71.5%	25.3%	2.8%	.4%	100.0%
Total		Count	2106	486	54	15	2661
		% within Sample	79.1%	18.3%	2.0%	.6%	100.0%

One significant advantage of reverse-osmosis desalinated water might be an improvement in taste emerging from lower levels of turbidity and dissolved solids. This may provide water quality improvement, if recipients are unhappy with the colour and taste of the water they currently receive, and, if they were also willing to pay for this. The two graphs in this figure show current satisfaction with water quality, and willingness to pay for improved water quality. While there are significant numbers of respondents on towns/mains water not happy with water quality, virtually none would be willing to pay a 25% quantum more to improve this.

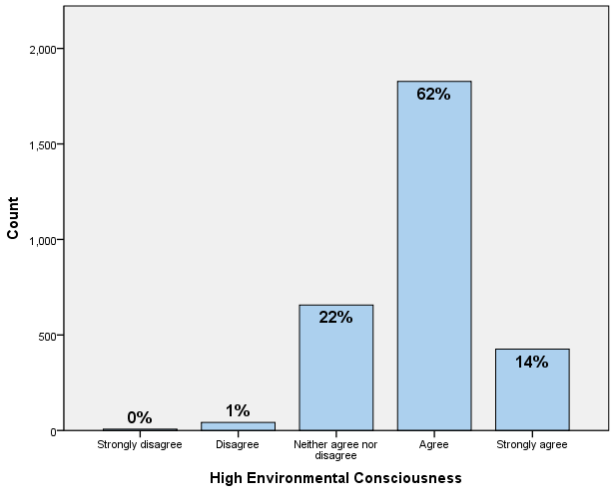
1.3.3 Your views about the environment and water

Understanding attitudes to desalination must be contextualised within broader attitudes to the environment and water. We know that attitudes and behaviours are influenced by more than just objectively understood knowledge, and that a variety of other factors play a part in shaping public responses (Marks *et al.,* 2008). This section of the national survey sought to provide some attitudinal context to the responses made directly in relation to desalination. Many of these 'attitudinal contexts' reflect the significant contributions made by other scholars to understanding why people behave as they do.

1.3.3.1 Environmental values

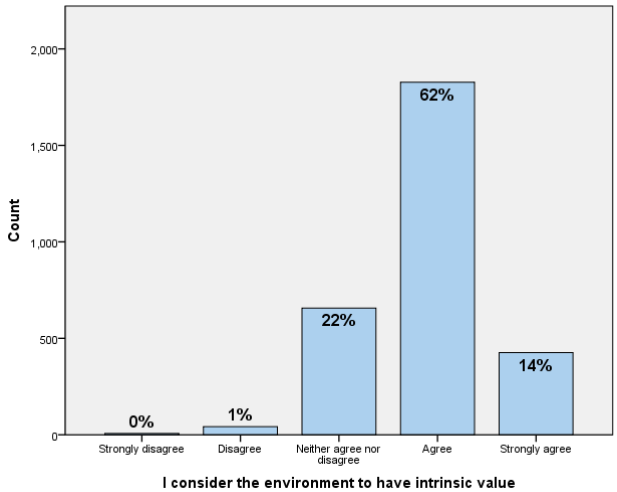
Understanding how people feel about water, the environment and conservation issues does tell us something about how they are likely to behave (eg. Kaiser *et al.*, 1999). Figures 47 and 48 draw on the work of Kaiser *et al* (1999), and depict participant agreement with various sentiments relating to water and the environment, generally.

Figure 47. Self-rating of high environmental consciousness



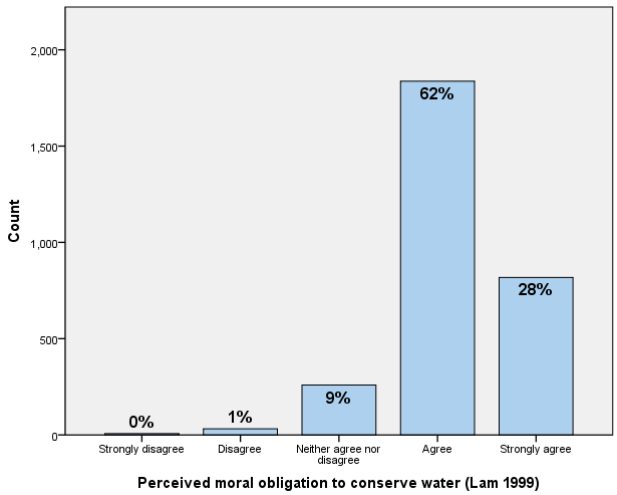
Those surveyed reported a high level of conscientiousness in regard to the environment, with 87% of people either agreeing or strongly agreeing that they were environmentally aware. Over half (53%) of respondents reported considering the environmental consequences of their every action.

Figure 48: Respondents who considered the environment to have intrinsic value



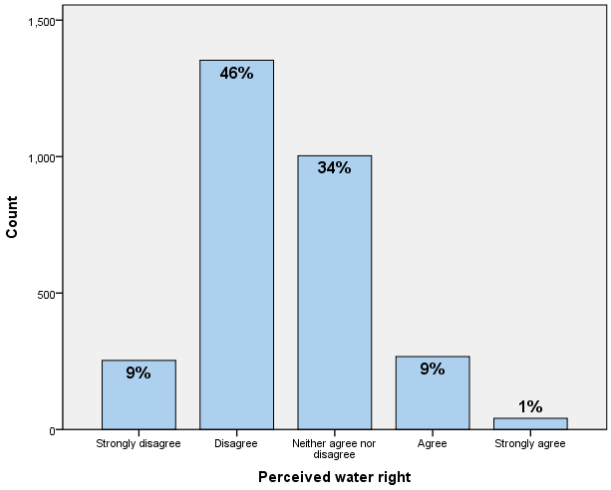
As displayed in Figure 48, over three quarters (76%) of repondents reported that the environment (including plants, animals and other naturally occuring items), has a value not linked to its utility to humans, but an intrinsic value.

Figure 49: Percieved moral oblication to conserve water



Figures 49-50 draw on the work of Lam (1999) and Ajzen (1991). As displayed in Figure 49, respondents reported a very high belief that they have a moral obligation to conserve water, with almost two-thirds (62%) agreeing and almost a third (28%) strongly agreeing. Only 1% of respondents suggested that they did not have a moral obligation to conserve water. Earlier research (commonly informed by Ajzen, 1991) has shown that Perceived Moral Obligation (PMO) may have an impact on water behaviour (Chu and Chui, 2006, cf. Lam, 1999), though factors such as practical capacity, income, education, societal motivation, context and political issues may also impact behavioural outcomes (Ajzen, 1988:133-4, Corraliza, 2000, Dolnicar and Leisch, 2008, Gilg and Barr, 2006).

Figure 50: Perceived water right (PWR)



The impact of individuals' perceived right to access and use water on their intention to conserve water (and their actual behaviour), has been explored previously by scholars (Gilg and Barr, 2006:412, Lam, 1999, Roseth, 2006:27-9, Syme *et al.*, 2000). The current survey found that only 10% of people felt they had a right to use water however they pleased (see Figure 50), while over half (55%) actively disagreed with this sentiment. This result bodes well for conservation efforts as perceived water right (PWR) has been negatively correlated with the intention to save water (eg. Lam 1999).

1.3.3.2 Rural/Urban identification

The 'pervasiveness of the agrarian myth in Australian culture' (Botterill, 2006:23) has been explored by many scholars and other commentators in relation to national cultural identity (Anderson, 1999, Austin, 1999, Blainey, 2001, Finkelstein and Bourke, 2001, Flinn and Johnson, 1974, Truss, 2005), as well as the rural policy implications of this self-identification (Botterill, 2006, Botterill and Fisher, 2003, King, 2010). The 'mythical' quality of Australians' identification with the symbols and iconography of 'The Bush', is informed by the widely known fact that Australia is one of the most urbanised countries in the world (Bessant, 1978, Cheers, 1990:5). In other words, while Australians tend to think of themselves as being particularly connected to rural, outback or country domains, most of us spend our whole lives living in cities.

Like the 'environmental values' described above (eg. *I consider myself to be environmentally aware*), there is a moral component to the identification as 'rural', as opposed to 'urban'. The moral implications of the so-called 'city/country divide', 'agrarianism' or 'countrymindedness' (as it is called in the Australian context) are well established, as noted by Botterill (2006:24): 'Agrarianism has a long history in Western thought. The idea that rural life is wholesome, fulfilling and morally uplifting dates back to Aristotle and earlier'. The moral implications of the city/country divide have been explored in the Australian context:

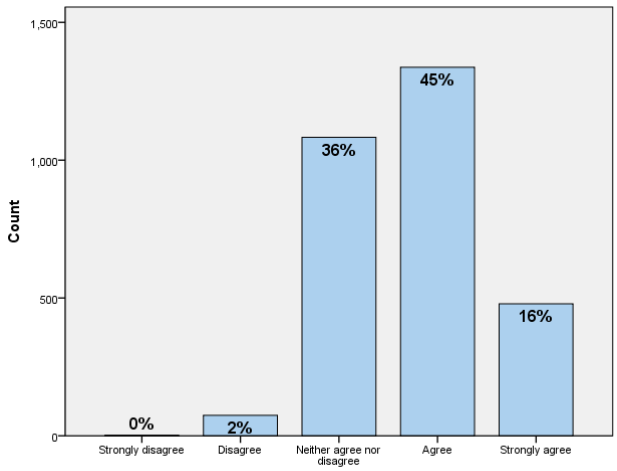
> This perceived division… typically manifests in expressions of derision, mockery and resentment by country people against city-dwellers. Typical charges against urban-dwellers includes that they do not understand where their food comes from; are protected from harsh environmental realities by vote-conscious politicians; are squeamish about dirt, animal blood and other natural substances; are extravagant with money; are overly concerned with clothes and appearance; are pretentious and arrogant, and that they unfairly deride and patronise rural

> people who rightfully hold a higher moral standing due to their wholesomeness, thrift and common-sense (King, 2010:8).

However, to suggest that Australians – rural and urban – *do not* feel a strong connection to rural locations, or think of themselves as having a particular affinity with the natural environment compared to those of other nations, or that these sentiments are made illegitimate by where they live, would be both incorrect and somewhat patronising (see Minnegal *et al.*, 2003). Rather, what is required is a better understanding of the relationship between countrymindedness and environmental attitudes, so that better predictions can be made about intended environmental behaviour. Greater attention to this relationship could also shed light on the challenges faced by government agents (who represent a city-based organisation), who attempt to communicate with 'country people'.

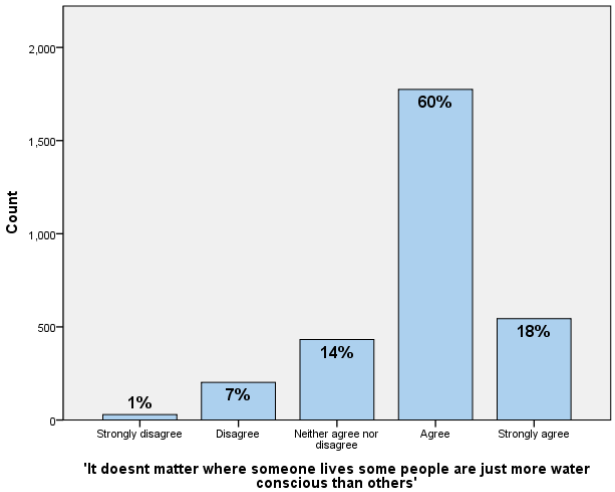
Figures 51-54 depict responses to questions about the city/country divide, and the associated environmental credentials of each category.

Figure 51: Perception that City and Country People Use Water Differently



When asked directly about the difference between city and country people, the majority of respondents reported feeling that the way city and country people use water or view the environment is different, and that country people are more conscientious when it comes to conserving water.

Figure 52: 'It doesn't matter where someone lives some people are just more water concious than others'



When asked to respond to the statement, 'It doesn't matter where someone lives – some people are just more water conscious than others', most people agreed. This result seems to indicate a contradiction with the findings presented in the previous figure. However, what this hints at is the influence that can be had by deeply held symbolic associations (ie. those who live in the country are morally/environmentally superior to those living in the city). In other words, while people might acknowledge that individuals can be environmentally conscientious or otherwise, regardless of their address, they may also be influenced by 'gut' reactions to questions that draw on powerful symbols and culturally meaningful metaphors.

Figure 53: I feel strong ties to the country/I feel strong ties to the city

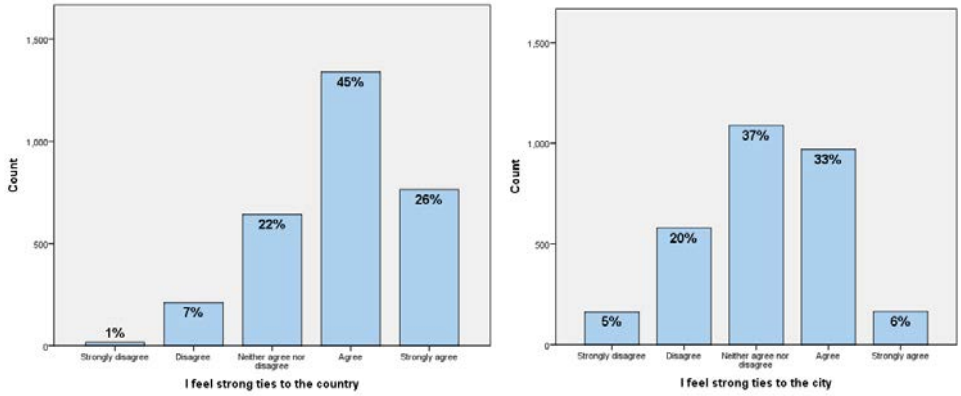


Table 58: I feel strong ties to the country / I feel strong ties to the city

			I feel strong ties to the country					Total
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
Sample	National	Count	15	167	445	826	481	1934
		% within Sample	.8%	8.6%	23.0%	42.7%	24.9%	100.0%
	Wonthaggi	Count	1	4	59	289	202	555
		% within Sample	.2%	.7%	10.6%	52.1%	36.4%	100.0%
	Port Stanvac	Count	1	40	135	213	77	466
		% within Sample	.2%	8.6%	29.0%	45.7%	16.5%	100.0%
Total		Count	17	211	639	1328	760	2955
		% within Sample	.6%	7.1%	21.6%	44.9%	25.7%	100.0%
			I feel strong ties to the city					Total
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
Sample	National	Count	111	348	679	681	112	1931
		% within Sample	5.7%	18.0%	35.2%	35.3%	5.8%	100.0%
	Wonthaggi	Count	49	184	207	91	22	553
		% within Sample	8.9%	33.3%	37.4%	16.5%	4.0%	100.0%
	Port Stanvac	Count	2	44	196	192	30	464
		% within Sample	.4%	9.5%	42.2%	41.4%	6.5%	100.0%
Total		Count	162	576	1082	964	164	2948
		% within Sample	5.5%	19.5%	36.7%	32.7%	5.6%	100.0%

Of the people surveyed, 26% reported feeling a strong connection to the country, while 6% reported a strong connection to the city.

Figure 54: Did you grow up mostly

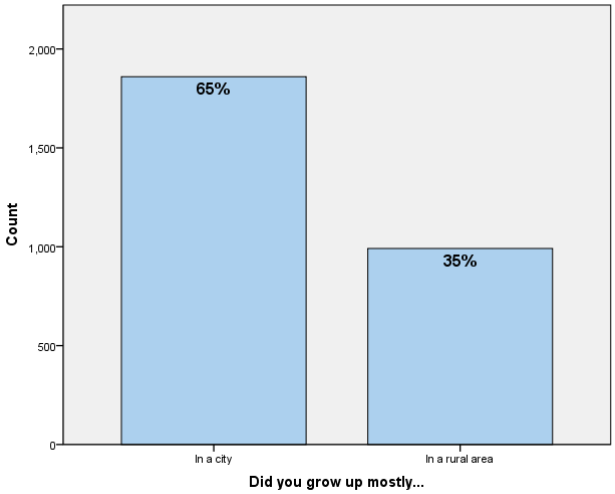


Figure 54 suggests that 35% of those surveyed grew up in a rural area (a farm, or a country town). This reflects a significant sample bias with the combination of the national sample and target areas samples in order to maximise total survey number. In section 1.3.6, we show comparison of means between state and target areas, for those statistics where the target areas significantly differ from the broader national sample.

Unsurprisingly, those who grew up in a rural or regional area report feeling a strong connection to the country. However, in keeping with observations on the pervasive symbolic appeal of rural areas, we find that those who were raised in urban centres and capital cities also report feeling a strong connection to the country (rural identification score: M=3.65, SD=0.905, compared to M=4.27, SD=0,728 for those from a rural area). In contrast, far fewer people reported feeling a strong connection to the city, and those who did so were almost exclusively raised in an urban centre. In other words, while those raised in the city were likely to report feeling a connection to the country, those who grew up in the country rarely reported feeling a connection to the city. These findings reinforce what we already know about the appeal of 'countrymindedness', right across the nation.

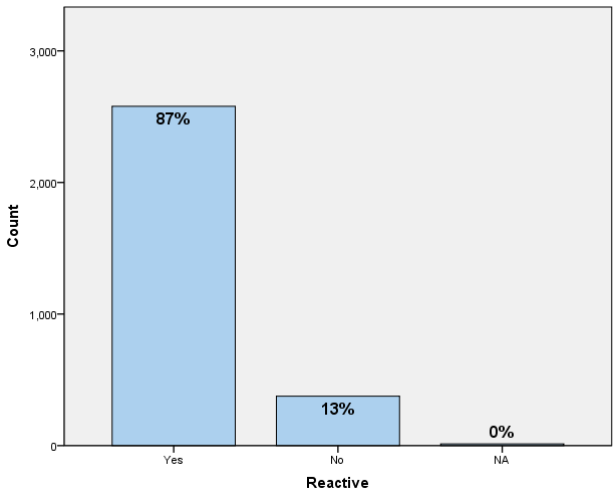
1.3.4. Water saving behaviour

This section of the national survey asked people about their day-to-day water-use, as well as how they anticipate their use may change in various circumstances.

1.3.4.1 Self-reported water-use behaviour

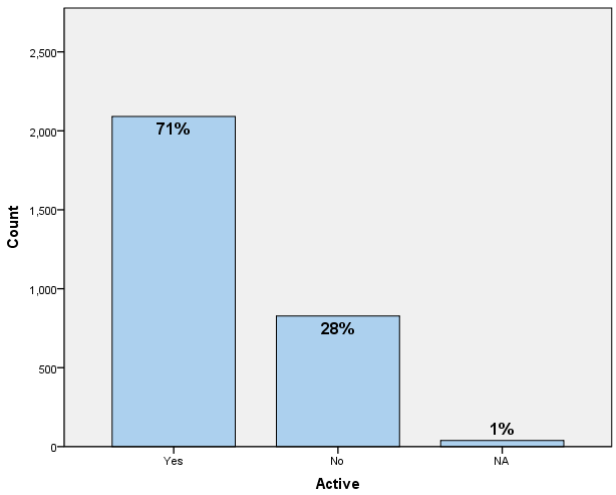
Water saving behaviour can be divided into two categories. 'Reactive' behaviours include those which require little capital investment and modification of existing behaviour. For example, shortening the length of ones shower is an example of a reactive water saving behaviour. 'Active' behaviours are those which require more investment, either capital, temporal or motivational, such as installing a low-flow shower-head or changing to a dry-climate garden.

Figure 55: Reactive



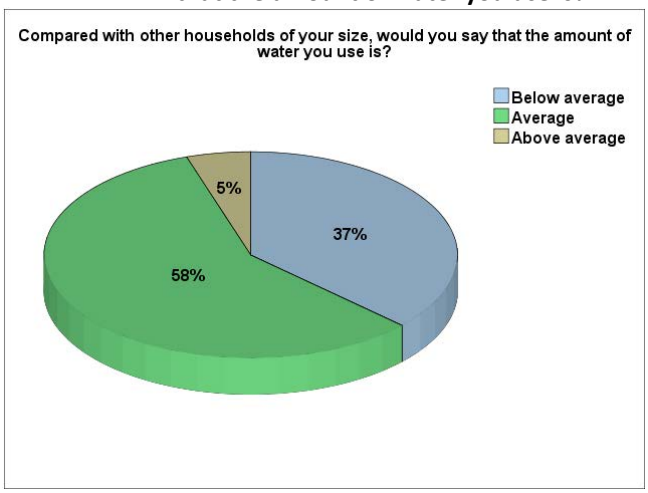
A large proportion (87%) of respondents indicated that they engaged in reactive water saving behaviours.

Figure 56: Active



In keeping with earlier research, respondents were slightly less likely to report active water saving behaviours (71%) than reactive. Reasons for this may include the cost of equipment, or the technical ability to make changes around the house.

Figure 57: Compared with other households of your size, would you say that the amount of water you use is?

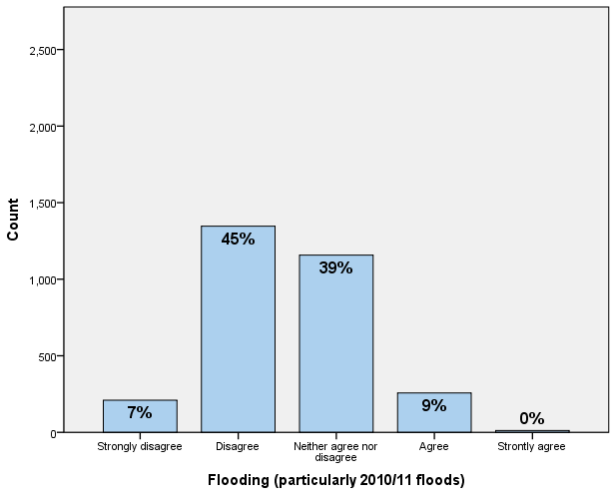


Self-reported household use found that most people (58%) feel they use about an 'average' amount of water, while 37% reported that they use less than the average amount. Only 5% of respondents reported that they use more water than average compared to other households. These findings are not surprising. Roseth's study of five Australian capital cities for the Cooperative Research Centre (CRC) for Water Quality and Treatment (2006:30) found that 5% of repondents felt they used more water than average, while 44% felt they used less, and 46% thought they used about the average amount. Such figures should be viewed with some caution, however, as studies have shown that there is discrepancy associated with self-reporting of water-use and actual conservation behaviour (Hamilton, 1987). This is consistent with the wide range of optimism biases reported in Psychology (for example, Chapin & Coleman, 2009).

1.3.4.2 External factors influencing anticipated water saving behavioural intensions

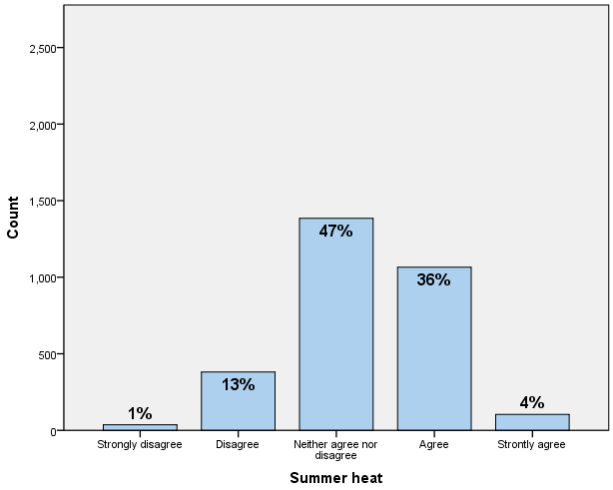
The motivation to practice water conserving behaviours is affected by a variety of external factors (eg. Corraliza, 2000). The following figures represent responses to questions about situations or circumstances in which attitudes to water saving behaviours might change.

Figure 58: Motivation to conserve water in light of flooding (particularly 2010/2011 floods)



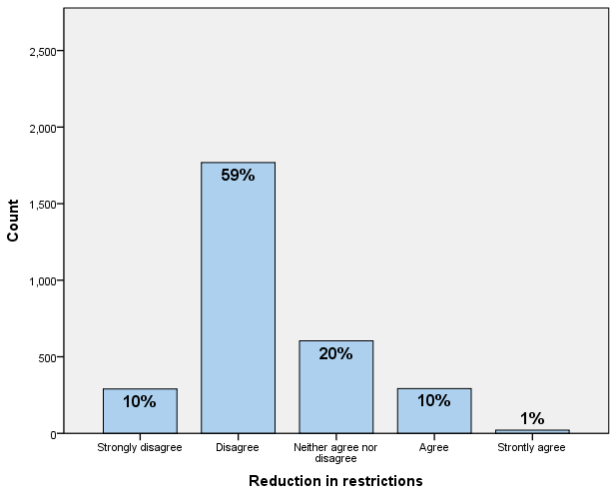
In light of the flooding which occurred in various parts of Australia in 2010-1, participants were asked whether or not they thought that the recent floods had changed their appraisal of the need to conserve water. Over half (52%) of the respondents indicated that this was not the case, although 39% of people did not express a strong opinion on this question. 15% of people said that the recent floods suggested to them that 'the drought' was over.

Figure 59: Motivation to conserve water in light of Summer heat



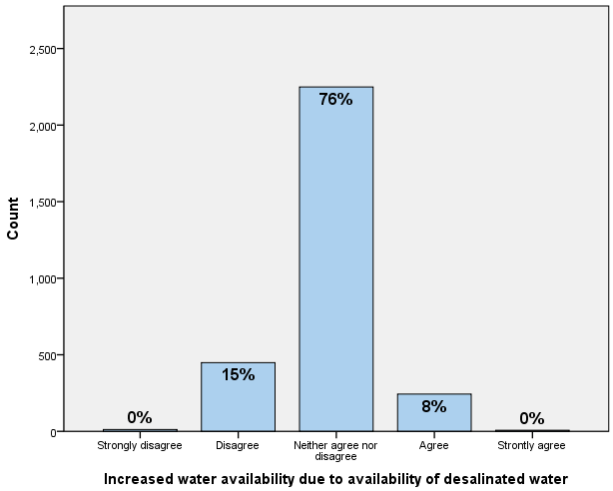
A great many people (39%) indicated that they were more concerned about water conservation in the summer months, although nearly half (47%) of those surveyed did not express a strong opinion on this matter. Only 14% of people suggested that the season had no effect on their attitude to water availability.

Figure 60: Motivation to conserve water in response to easing of water restrictions



Very few (11%) participants reported that they would increase water use around the home if water restrictions were eased in their area. Indeed, 69% of people indicated that they would not change their behaviour, while 20% were not sure. This is a good sign for water conscious habits in Australia, and suggests that once conservative water practices become habitual that people will be unlikely to (report an intention to) revert to wasteful behaviours.

Figure 61: Motivation to conserve water in response to increased water availability due to availability of desalinated water



While even fewer people (8%) said that they would favour a relaxing of water restrictions and that they would increase their domestic water use, only 16% of people actively disagreed with this proposition. Over three quarters of respondents indicated that they were not sure how they would respond to increased water supplies brought about by augmentation with desalinated water. It is difficult to know what to make of this response, though it may have to do with the limited familiarity many Austrlalians (particularly those in the eastern States), currently have with desalination. It is important for future desalination research to closely monitor the water behaviours of people both before and after the introduction of desalination into the water supply. While is it widely accepted that a variety of factors impact on water saving behaviour, including 'perceptions of abundance, trust in the water authority and attitude to governments' past performance on water management, some personal factors (e.g. garden importance) and some situational factors (e.g. allocation limits)' (Graymore and Wallis, 2010:89), further research into the impact of desalination on perceptions of abundance is required so that policy makers can better predict behavioural responses to desalination.

1.3.5 Domestic water supply and the Government

Attitudes to water and conservative behaviour are impacted by a variety of factors, including 'trust in the water authority and attitude to governments' past performance on water management' (Graymore and Wallis, 2010:89). A significant body of research has been conducted into the impact on compliance with a range of issues, associated with attitudes to governments. This literature may be coined under the term, 'procedural justice'.

Much of the international work on procedural justice has concerned the attitudes of the public towards police and other authority figures (Greenberg, 1990, Murphy, 2004, Tyler, 1990). Procedural justice in Australia has mirrored this trend and has been largely applied to cases of policing and tax fraud (Gross, 2007, Murphy, 2003, Murphy, 2004, Murphy and Cherney, 2011, cf. Gross 2007, King and Murphy 2009). International procedural justice work in environmental contexts, primarily in North America and Europe, have largely been limited to studies of siting issues associated with waste disposal and recycling facilities (Ebreo *et al.*, 1996, Fletcher, 2003, Upham and Shackley, 2006), and renewable technology, particularly wind farms (Devine-Wright, 2007, Krogh, 2011, Zoellner *et al.*, 2008).

Procedural justice research tells us that people are not motivated to respond to the decisions of authorities solely according to what they stand to gain or lose. Rather, their response is significantly influenced by how equitable they think the decision making process is, how fairly they feel they have been treated, whether or not they feel their views have been 'heard', and how well the outcomes accord with their social values (Lind and Tyler, 1988, Murphy, 2003, Murphy, 2004, Tyler, 1989, Tyler, 1990, Tyler, 1997, Tyler, 2000).

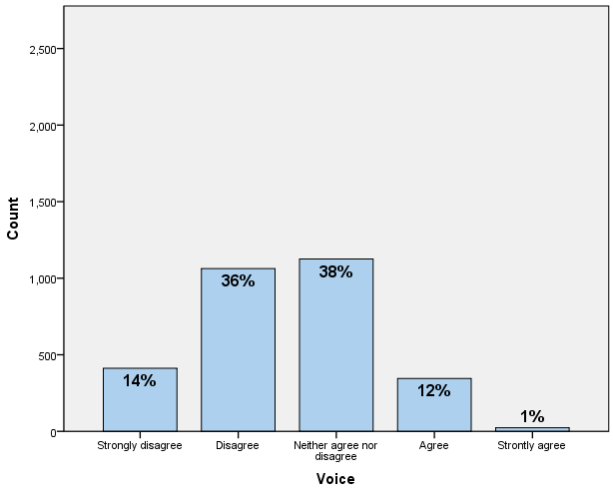
Related to procedural justice is 'distributive justice', which is concerned with the satisfaction people feel towards a process of sharing resources and occasionally costs. Allocations that are seen to be 'equitable' (each party receives an equal share) or 'fair' (everyone gets the 'right' amount), are deemed more acceptable than those which are perceived as neither (Syme *et al.,* 1999:52-53). As noted above, there is an important difference between the notions of 'equity' and 'fairness', with the former dealing primarily with the actual costs/benefits received by people, while the latter relates to a more subjective understanding of the term 'fairness' that does not necessarily involve equal distributions. While both distributive and procedural justice take into account both equity and fairness, distributive justice tends to focus on attitudes towards allocation proportions, while procedural justice highlights the importance of how people perceive the legitimacy and trustworthiness of such procedures.

With the exception of Gross's (2007) work on the siting and development of wind-farms in NSW, and King and Murphy's (2009) work on the siting of the Wonthaggi desalination plant, 'environmental justice' issues in Australia in the past couple of decades have focused on the fairness of allocations (eg. Syme et al., 1999). While other water studies have tended to address irrigation distributions among farmers, and competing claims made by urban centres and environmental advocates, the current research has highlighted the effect of procedural justice rather than distributive justice issues, in a case where people do not necessarily stand to gain a windfall. Indeed, the literature shows that the importance of procedural justice – or perceived fairness – is heightened when individuals stand to lose out, or when the resource under consideration is believed to be scarce, as in the case with water in Australia (Lawrence *et al.*, 1997:580, Lind and Tyler, 1988).

1.3.5.1 Procedural justice

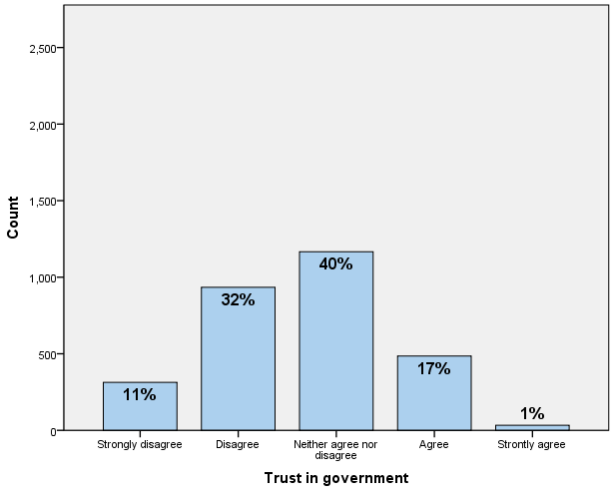
Previous research at Deakin University and Griffith University (King, 2008, King, 2010, King and Murphy, 2009, King and Murphy, 2012), has shown that procedural justice has an impact on attitude to desalination (namely in the Victorian Wonthaggi desalination plant case). Figures 64-69 represent responses to reliable scales of procedural justice in the national context.

Figure 62: 'Voice'



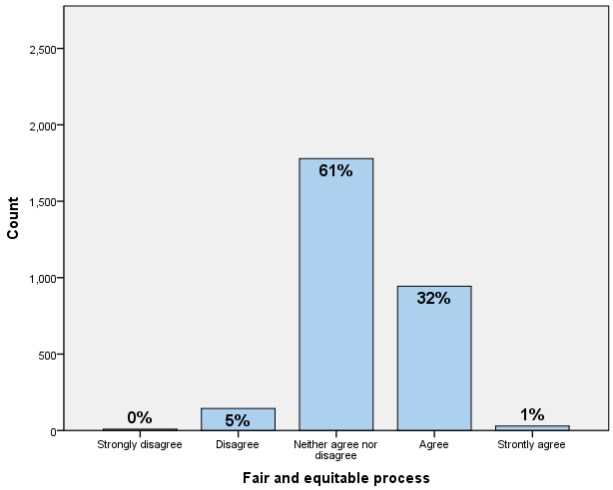
'Voice', or whether or not people feel like they have had a say in the decision making process, is an important component of procedural justice. The more people feel they have been listened to the more likely they are to percieve the government as 'just'. When asked whether or not they felt they had had a chance to have their views expressed and heard on water mangement issues, only 12% of respondents agreed. Half of those surveyed felt that they had not been given an opportunity to have their opinions heard. This does not bode well for the perceived legitimacy of governments on water management issues, as the less 'voice' people perceive themselves to have the less legitimate they judge governance.

Figure 63: Trust in government



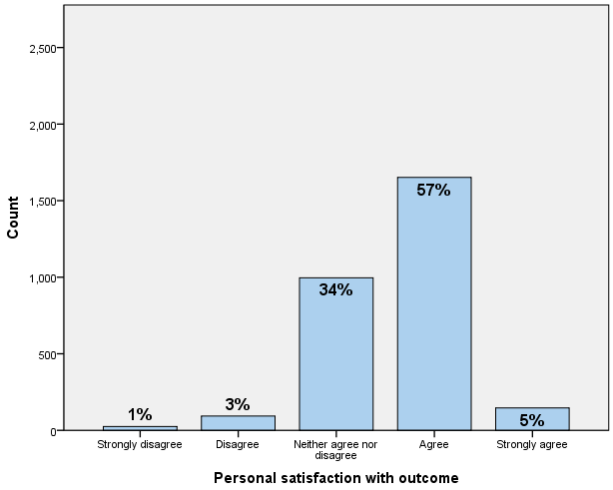
'Trust', is another component of procedural justice, with those who trust their government to make proper and impartial decisions on their behalf percieving them to have more legitimacy. When asked about the honesty of their State/Territory government in relation to water management issues, 18% of people responded that they trusted the government, while 43% indicated that they did not.

Figure 64: Fair and equitable process



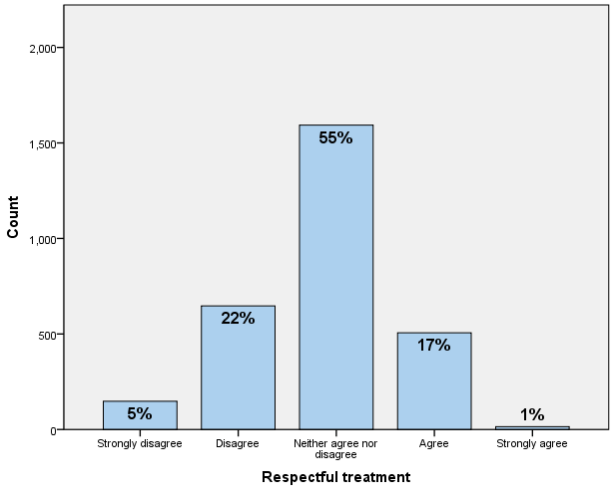
When asked specifically about the fairness of water management in their State/Territory, a third of people indicated that it had been fair, while only 5% indicated that it had not. The majority of people did not feel strongly either way.

Figure 65: Personal satisfaction with outcome



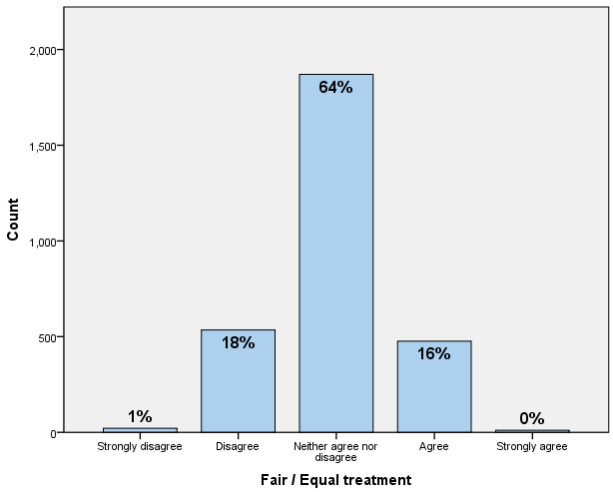
The majority of people (62%) reported feeling that they had personally been granted access to an acceptable amount of water. Only 4% of people did not feel this way

Figure 66: Respectful treatment



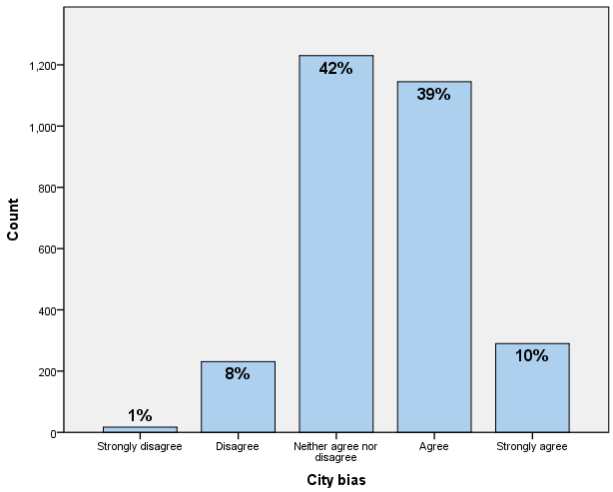
A significant proportion of resondents (27%) did not agree that their government treated them with respect.

Figure 67: Fair/equal treatment



Only 16% of respondents agreed or strongly agreed that their State/Territory government treated citizens fairly and impartially.

Figure 68: City bias



A majority of people (49%) felt that governments were more responsive to the wants and needs of those living in the city than people living in rural regions. This is an interesting result given that a high proportion of overall respondents were city dwellers. The impact of attitudes to 'countrymindedness' and the relationship this has to attitudes to desalination, have been explored elsewhere (King, 2010), and data from the current survey will add significantly to our understanding of how rural identification relates to attitudes to environmental issues.

1.3.6 Key questions by state area

Attitudes to desalination varied significantly by state area. Support for desalination in general was highest in Western Australia and Tasmania, while lowest in New South Wales and Victoria, as shown in Table 19 below. Support in the desalination areas (within 15km of the desalination plant) was generally lower than in the non-desalination areas of the state. Below are means and standard deviations for each state population on a few key questions.

Table 59: How supportive are you of desalination as a response to domestic water supply shortages?

	Mean*	SD	N
TOTAL	3.13	1.234	3000
WA	3.79	1.064	195
TAS	3.54	1.146	52
ACT	3.36	1.100	42
NT	3.33	1.155	12
QLD	3.24	1.170	388
SA (excluding Port Stanvac)	3.22	1.175	170
Port Stanvac	3.17	1.164	467
NSW	3.09	1.157	605
VIC (excluding Wonthaggi)	3.08	1.246	485
Wonthaggi	2.78	1.369	564

*Higher numbers here indicate a more positive evaluation.

Note: Question on a 1 = strongly disagree to 5 = strongly agree scale; higher scores indicate more favourable evaluations.

In Table 20 mean responses on a Likert scale of 1 (extremely negative) to 5 (extremely postiive) are displayed for the question asking about attitude to desalination if a plant was to be built in one's local area. Not surprisingly, the state distribution of support retains the same pattern as in Table 19 above, but levels of support are lower. For easy comparison in this table and in Table 21 and Table 22 following, the ordinal rankings of states, from highest support for desalination to lower support for desalination are retained from Table 19 for easier comparison.

Table 60: If it was announced that desalination was to be a preferred response to domestic water supply shortages in your local area, how negative or positive would you be?

	Mean*	SD	N
TOTAL	2.94	1.371	3006
WA	3.65	1.251	195
TAS	3.25	1.344	53
ACT	3.05	1.356	41
NT	3.08	1.471	11
QLD	3.04	1.352	388
SA (excluding Port Stanvac)	3.05	1.318	170
Port Stanvac	2.97	1.302	469
NSW	2.93	1.322	608
VIC (excluding Wonthaggi)	2.87	1.383	487
Wonthaggi	2.60	1.418	564

*Higher numbers here indicate a more positive evaluation.

Table 22 displays the mean level of agreement from respondents to the statement "There are cheaper alternatives to desalination…." (strongly disagree = 1, strongly agree = 5). The ordinal ranking of areas in Column 1 is retained from Table 21, thus listed in decreasing level of support for

desalination. Notably, perceptions of cheaper alternatives do not necessarily neatly correspond by state area to overall support for desalination.

Table 61: There are cheaper alternatives to desalination

	Mean*	SD	N
TOTAL	3.78	0.830	3005
WA	3.45	0.745	197
TAS	3.73	0.571	49
ACT	3.39	0.877	40
NT	3.92	0.900	12
QLD	3.74	0.762	391
SA (excluding Port Stanvac)	3.84	0.793	164
Port Stanvac	3.75	0.772	475
NSW	3.69	0.851	608
VIC (excluding Wonthaggi)	3.75	0.844	490

*Higher numbers indicate more support for other cheaper alternatives.

Table 23 displays respondents' replies to the forced choice question about preference for increasing the water supply or decreasing the demand for water. The ordinal ranking of areas in Column 1 is retained from Table 19, thus listed in decreasing level of support for desalination. Notably, preference for increasing the supply of water does not neatly correspond by region to overall acceptance of desalination.

Table 62: Would you prefer to see efforts made to increase the supply of water or decrease the demand?

	Increase supply	Decrease demand	N
TOTAL	52%	48%	2830
WA	54%	46%	183
TAS	48%	52%	50
ACT	43%	57%	42
NT	42%	58%	12
QLD	51%	49%	367
SA (excluding Port Stanvac)	57%	43%	170
Port Stanvac	52%	48%	453
NSW	48%	52%	573
VIC (excluding Wonthaggi)	55%	45%	459
Wonthaggi	51%	49%	515

Table 24 displays the mean level of support for various water supply options by state and target area. The minimum possible score is 1, and the maximum 5, with a higher score indicating more support. The state and target areas are ordered from most support for desalination to the least support, while the support for the other options (building more dams, water recycling of various sources, and rainwater tanks) does not follow the either the same, or inverse pattern to desalinated water.

Table 63: Mean support by state for various water supply augmentation options

Sample group		desalination as a response to domestic water supply shortages	Building / expanding dams	Recycling treated stormwater	Recycling treated sewage	Recycling treated 'greywater' (non-sewage household waste water)	Rainwater tanks in homes
Total	Mean	3.13	3.79	4.03	3.00	3.67	4.36
	N	3000	2989	2982	2963	2967	3005
	Std. Deviation	1.234	1.059	1.016	1.337	1.148	.895
Western Australia	Mean	3.79	3.62	4.10	2.97	3.75	4.31
	N	195	197	195	197	195	196
	Std. Deviation	1.064	1.055	.961	1.351	1.199	.934
Tasmania	Mean	3.54	3.43	3.68	2.71	3.33	4.23
	N	52	53	50	51	52	53
	Std. Deviation	1.146	1.101	1.133	1.154	1.216	.891
ACT	Mean	3.36	3.62	4.12	3.05	3.84	4.14
	N	42	42	43	43	43	43
	Std. Deviation	1.100	.936	.731	1.308	.974	.889
Northern Territory	Mean	3.33	3.50	3.83	3.58	3.92	4.08
	N	12	12	12	12	12	12
	Std. Deviation	1.155	1.382	.577	.793	.793	.515
Queensland	Mean	3.24	3.76	3.94	2.75	3.48	4.41
	N	388	385	388	390	386	392
	Std. Deviation	1.170	1.080	.993	1.333	1.196	.762
South Australia (excluding Port Stanvac)	Mean	3.22	3.82	4.21	3.27	3.82	4.45
	N	170	168	164	163	165	166
	Std. Deviation	1.175	.981	.891	1.291	1.059	.884
Port Stanvac	Mean	3.17	3.87	4.21	3.14	3.80	4.42
	N	467	468	476	467	471	475
	Std. Deviation	1.164	.886	.897	1.248	1.044	.846
New South Wales	Mean	3.09	3.72	4.01	2.96	3.69	4.35
	N	605	604	601	597	597	608
	Std. Deviation	1.157	1.079	1.016	1.363	1.141	.873
Victoria (excluding Wonthaggi)	Mean	3.08	3.84	3.90	2.99	3.64	4.28
	N	485	486	484	483	482	486
	Std. Deviation	1.246	1.080	1.052	1.342	1.146	.947
Wonthaggi	Mean	2.78	3.88	4.04	3.04	3.62	4.37
	N	564	553	548	539	544	553
	Std. Deviation	1.369	1.148	1.122	1.387	1.202	.984

1.3.6.1 'Voice' and Consultation

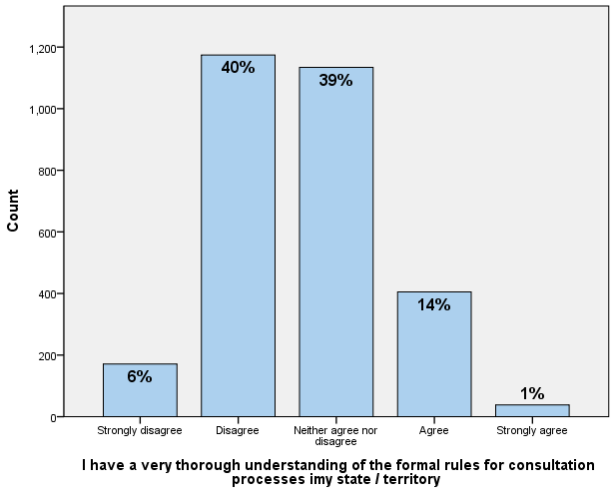
An important component of procedural justice, noted in section 1.3.5.1, is 'voice'. 'Non-instrumental voice' refers to the opportunity for a stakeholder to comment on a decision, albeit in a capacity which has no bearing on the outcome. 'Instrumental voice' refers to the consideration of a stakeholder's opinion during the decision making process. While both are important to procedural justice, stakeholders tend to feel more satisfied when they consider their opinions could have made a difference to the final outcome, even if the ultimate result does not benefit them, personally (Lind and Tyler, 1988).

The term 'consultation' comes up regularly in conflicts over the implementation of large public infrastructure (Cowan, 2003, Dukes, 1996, Ng and Loosemore, 2007). Perhaps surprisingly, consultation has defied clear definition. Brackertz *et al* (2005:16-20) provide an overview of consultation models. Rather than a range of different definitions of 'consultation', these models tend to be in the form of a scale which differs in degree of public participation in the decision-making process. At one end is total government control over decision-making accompanied by the controlled provision of information to publics (the decide-announce-defend, or DAD system). At the other end is a process whereby communities openly face a shared problem or issue and have the freedom to decide on a response, perhaps through a vote, or a series of public forums and decision-making meetings. What one stakeholder might perceive as 'consultation' might differ significantly from the perspective of another.

Research participants involved in earlier studies on attitudes to desalination in Australia (Victoria) have expressed their frustration about the perceived lack of consultation between governments and publics. According to one respondent, 'There was absolutely no consultation with the public about the desalination plant or windfarms – no recognition of protests, no asking residents, no talk at all about other measures' (in King and Murphy, 2012:19). Making a judgement about whether or not 'consultation' occurred in one or another project is meaningless, however, without a clearer sense of what stakeholders mean when they talk about 'consultation'.

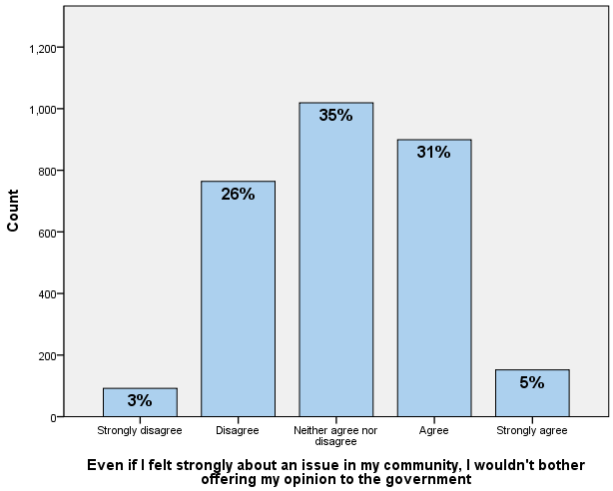
This section of the survey sought to investigate how much the public knows about existing government consultation processes, how they would prefer the government to communicate with them, and how much faith they have in various strategies for having their views heard by their government.

Figure 69: I have a very thorough understanding of the formal rules for consultation processes in my state/territory



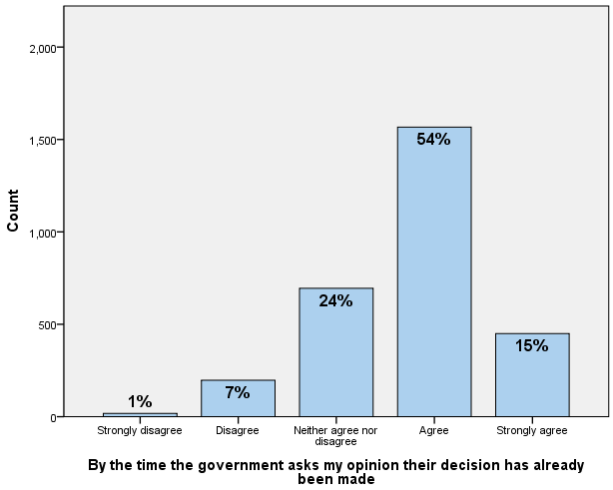
Only 14% of people feel like they have a good understanding of the formal consultation processes with their State/Territory governments.

Figure 70: Even if I felt strongly about an issue in my community, I wouldn't bother offering my opinion to the government



34% of people said that even if they felt strongly about an issue they wouldn't bother talking to the government as they didn't feel it would do any good, which indicates a very high level of apathy, nationally, when it comes to government 'consultation' processes.

Figure 71: By the time the government asks my opinion their decision has already been made

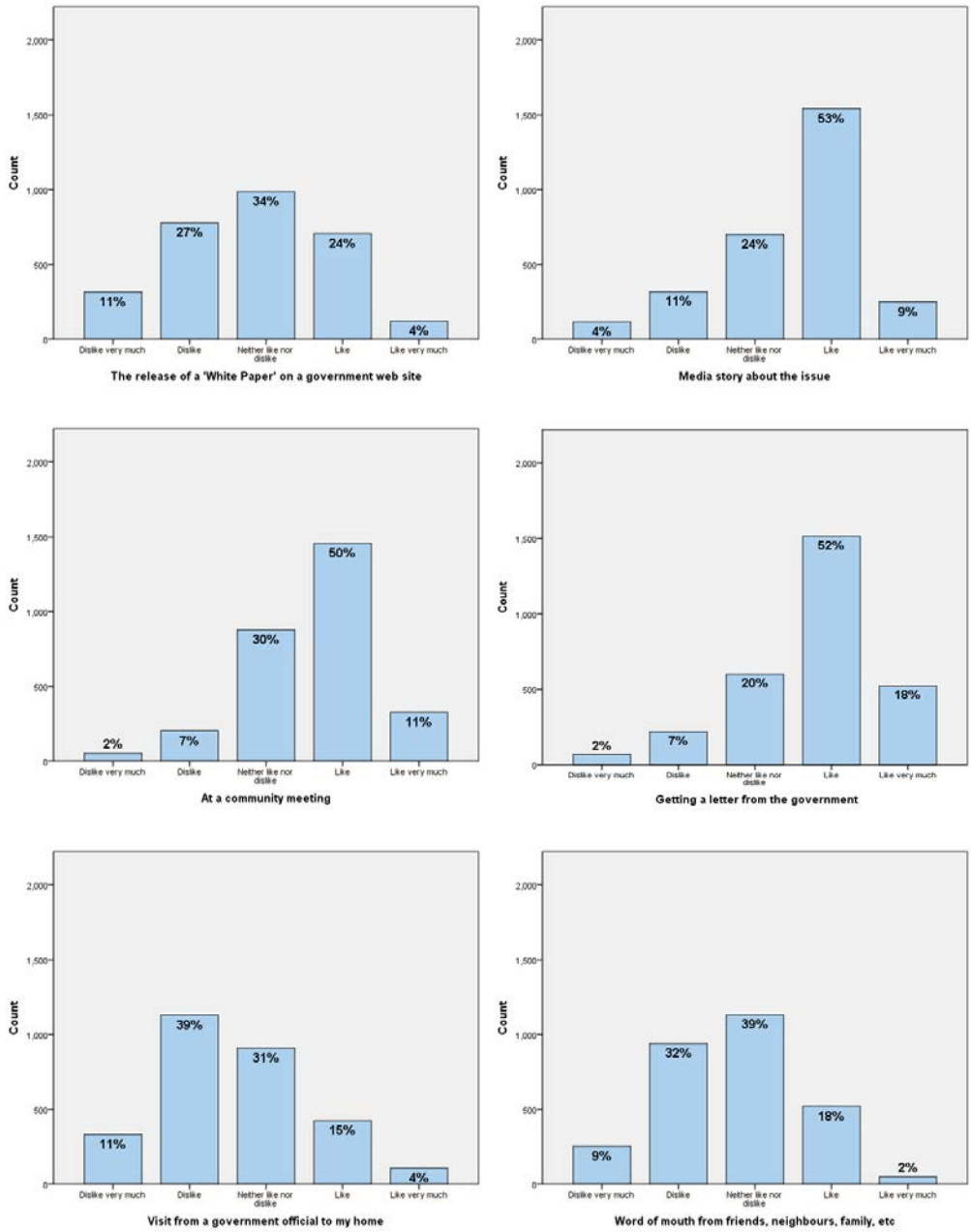


A clue to why publics may express apathy towards 'consultation' processes is that two thirds of people believe that by the time they are consulted about an issue that the government has already made their decision.

While it may, indeed, be the case that governments have already made their decision by the time they 'consult' publics about a particular issue, it does not necessarily follow that they have failed to 'consult'. Rather, a closer investigation of what people know about formal government consultation processes, and the level of faith they have in these processes, suggests that much greater attention needs to be given to reconciling the expectations of governments and publics in regard to 'consultation' processes.

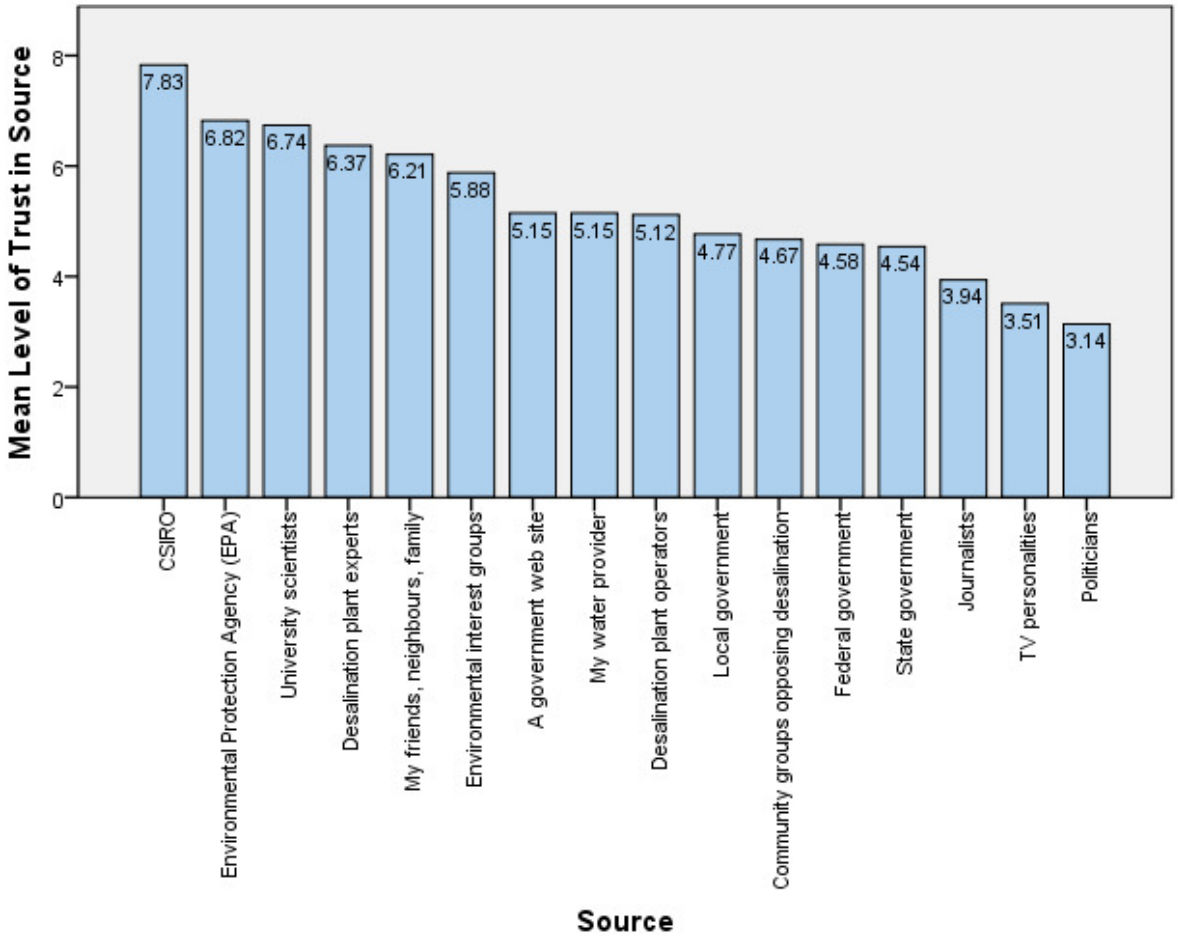
Asking what people actually know about formal consultation processes gives us a better picture of some of the barriers policy makers face when attempting to engage local communities in decisions about public infrastructure. Only 37% know what a Green Paper or a White Paper is. 31% know that Green and White Papers can be found on government websites, while less than a quarter know that consultation periods usually last between 6-12 weeks. Perhaps reflecting an element of cynicism on behalf of respondents, 66% reported that they know governments are not compelled to follow public sentiment when they consult on a matter.

Figure 72: How would you like to find out about a major water decision in your region?



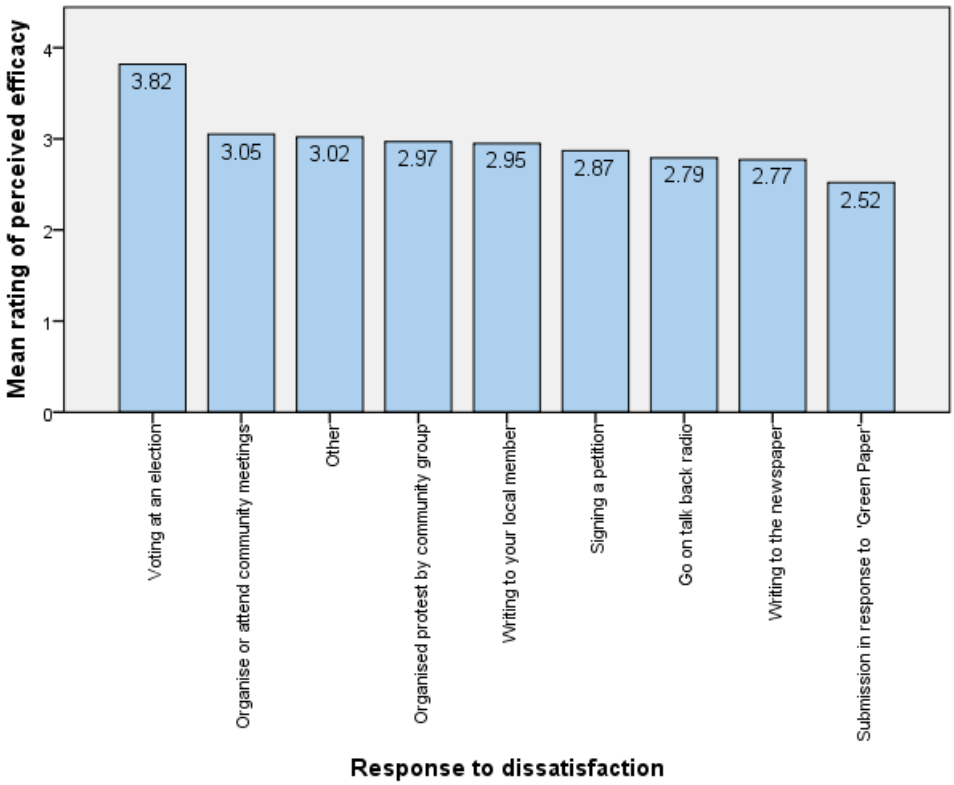
When asked how they would like to find out about major water decision in their region, respondents indicated that they would like a letter from the government (66%), but not a visit from a government official (17%). More than half (58%) of respondents indicated that they would favour hearing about a new project via the media, while the same number of people indicated that they would like to be informed via a community meeting. A little over a quarter indicated that they would prefer to learn about a water policy decision via a government White Paper (27%). Friends and family (19%) were only marginally more preferred as sources of information than a visit from a government official.

Figure 73: Level of Trust in Source



These results should be considered in light of responses to the survey questions about how much trust people place in various sources of information. For example, family and friends are not preferred sources of information about new developments, while government letters and media reports are, despite people being relatively trusting of information from friends and family and being overwhelmingly distrustful of information from journalists and all three tiers of government (including web-sites). 'Other' trusted sources offered by respondents included 'plumbers', 'my Mum' and 'The bloke at the kebab van'.

Figure 74: Response to dissatisfaction



When asked how effective they felt various methods of communicating views to the government were, the responses suggested that only 8% of people thought writing a submission in response to a Green Paper – a formal government process – was highly effective. Indeed, 43% suggested that a submission in response to a Green Paper was *not* effective. Overall, people reported having low confidence in almost all options (offered by the survey) for communicating with the government (offered by the survey). The exception, and by far the most popular avenue of communication, was 'voting', with over two thirds of respondents (67%) of people indicating that this was a very or extremely effective way of communicating with the government. It can be seen from Figure 76 that many respondents selected the 'other' answer option. 'Other' suggestions for communicating effectively with the government included 'go on *A Current Affair*', 'go on a hunger strike' and 'give the government a big hearing aid'.

What is striking about these results is the disjuncture between trust in various sources, knowledge and expectations about consultation, and faith in the effectiveness of different modes of communication. Given the evidence from the national survey of how important issues of consultation are in garnering community support for public infrastructure such as desalination plants, it seems reasonable that greater consideration be given to issues of knowledge of, and faith in, government consultation processes.

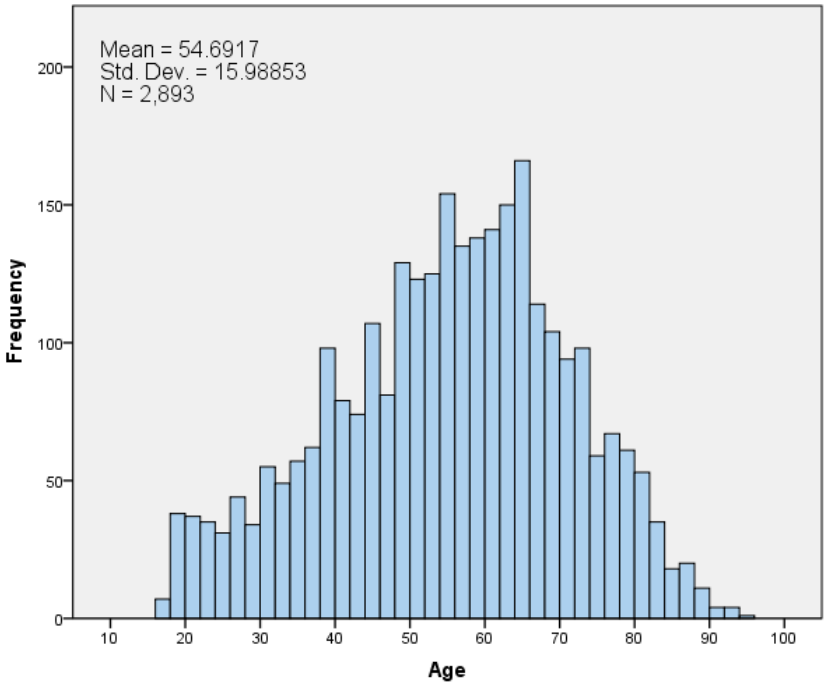
1.3.7 Respondent Background

Displayed in the tables below are the demographic statistics for the survey responses. In cases where the information was left blank or indecipherable, respondent has been placed in the 'missing' category.

Table 64: Sex of respondents

		Frequency	Percent
Valid	Male	1431	46.5
	Female	1516	49.3
	Total	2947	95.8
Missing	System	130	4.2
Total		3077	100.0

Figure 75: Age of respondents



In Figure 75, the distribution of the respondent population by age. In the figure above, the mean age was 54.7 years, indicating a slight bias towards older people in the respondent group. The age range was 19 to 95.

Table 65: Respondents born in Australia?

		Frequency	Percent
Valid	Yes	2212	71.9
	No	685	22.3
	Total	2897	94.2
Missing	System	180	5.8
Total		3077	100.0

Table 66: Respondents and Home ownership

		Frequency	Percent
Valid	Own (including paying off a mortgage)	2403	78.1
	Rent	371	12.1
	Other	166	5.4
	Total Valid	2940	95.5
Missing	System	137	4.5
Total		3077	100.0

Table 67: Employment Status

		Frequency	Percent
Valid	Working full-time	1093	35.5
	Working part-time	468	15.2
	Not employed but looking for work	51	1.7
	Not employed and not looking for work	47	1.5
	Retired	963	31.3
	Studying full-time	49	1.6
	Studying and working part-time	49	1.6
	Home duties	175	5.7
	Multiple Status indicated	43	1.3
	Total	2938	95.5
Missing	System	139	4.5
Total		3077	100.0

Table 68: Respondents with children

		Frequency	Percent
Valid	Have children	2324	75.5
	No children	623	20.2
	Total	2947	95.8
Missing	System	130	4.2
Total		3077	100.0

Table 69: How do you rate your quality of life in your community?

		Frequency	Percent
Valid	Poor	6	.2
	Below average	60	1.9
	Average	513	16.7
	Good	1676	54.5
	Excellent	694	22.6
	Total	2949	95.8
Missing	System	128	4.2
Total		3077	100.0

Table 70: What is the highest level of education you have completed?

		Frequency	Percent
Valid	Little of no formal schooling	22	.7
	Primary School	94	3.1
	Junior Secondary/Year 10	542	17.6
	Senior Secondary /Year 12	526	17.1
	Certificate (Level I,II,III or IV)	254	8.3
	Trade Certificate	345	11.2
	Diploma or Advanced Diploma	388	12.6
	Bachelor Degree	421	13.7
	Graduate Certificate or Graduate Diploma	203	6.6
	Post-graduate Degree	181	5.9
	Total	2976	96.7
Missing	System	101	3.3
Total		3077	100.0

Table 71: Political Affiliation

		Frequency	Percent
Valid	Liberal	893	29.0
	National	96	3.1
	Greens	183	5.9
	Labor	664	21.6
	Other	94	3.1
	Swinging voter	840	27.3
	Total	2770	90.0
Missing		118	3.8
	System	189	6.1
	Total	307	10.0
Total		3077	100.0

1.3.8 Analysis and discussion

Given the wealth of information provided by this large, benchmarking survey, this report has only been able to provide a portion of the possible analysis and discussion. Further analysis and discussion will be forthcoming. For this report on the national survey we will address the related issue of procedural justice, as this has emerged in our analysis as having a significant impact on public perceptions of desalination in Australia. In general, people were not satisfied with their State/Territory Government in terms of perceived legitimacy, their behaviours in relation to water decisions, and their consultation procedures around water issues.

Regression analysis was performed in order to better understand the factors that influenced two, key dependent variables:

- 'attitude to desalination'; and
- 'trust and satisfaction with the government's decisions when handling water issues'

A number of demographic variables were used in the two regression models to predict either 'attitude to desalination' or 'trust'. In addition, several scales measuring perceptions of procedural justice, distributive justice, perceived worry about water availability, knowledge about desalination, (among others), were entered into the regression model.

1.3.8.1 Predictors of attitude to desalination

Composite measures of severakl items were used to measure the constructs of Procedural Justice (PJ) and Distributive Justice (DJ). These constructs were then fitted to a regression model, as shown in Tables 72 and 73. When looking at the attitude to desalination, generally, demographic factors had little influence on attitude, though there were some exceptions. Men are less likely to have favourable views of desalination, as are those who are born in Australia, and those who are more highly educated. Those who feel they are more environmentally aware, and those who think that desalinated water may be dangerous were also less favourable in their attitude to desalination.

Those who reported being satisfied with the consultation process involved in making water decisions – those who feel they have an opportunity to be heard by the government – are more likely to view desalination favourably, as are those who feel like desalination issues, generally, have been handled well by Australian governments.

Those who feel their government has legitimate authority to make decisions about water are more positive about desalination, as are those who are more worried about their future access to water, and those who feel they may benefit personally from desalination.

One of the more interesting findings was that self-rated knowledge of desalination is negatively related to attitude. In other words, those who report that they know more about desalination have a more negative attitude towards the technology.

Before reflecting on this, let's take a look at the strength of these relationships, as they will be of interest to those trying to understand public attitudes to desalination. Note the highlighted Standardized Coefficients column. The bigger the absolute number (regardless of whether the number is positive or negative), the stronger the relationship to attitudes to desalination.

Table 72: Standardized coefficients for regression model for public attitudes to desalination

Model	Standardized Coefficients Beta	t	Sig.
(Constant)		14.236	.000
*SEX	-.052	-2.895	.004
AGE	-.023	-1.219	.223
**COB	-.063	-3.649	.000
COUNTRY	.014	.778	.437
**EDUCAT	-.089	-4.637	.000
INCOME	-.032	-1.651	.099
**CONSULT	.141	6.844	.000
**p11q13s The consultation with affected communities about desalination has been excellent	.181	9.609	.000
**DJ	.062	3.488	.000
**KNOW	-.168	-8.924	.000
**SELF	.121	6.692	.000
**LEGIT	.125	6.187	.000
**WORRY	.085	4.854	.000
**FEAR	-.356	-18.377	.000
**GREENIE	-.077	-4.276	.000

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.589	.346	.342	.86439

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	890.253	15	59.350	79.433	.000[b]
	Residual	1679.655	2248	.747		
	Total	2569.908	2263			

Those variables with statistically significant coefficients are indicated with a single asterisk (0.05 level) or double asterisk (0.01 level). The demographics have relatively small coefficients, as do 'distributive justice', 'concern about future water availability', and 'environmental conscientiousness'. The biggest predictor of people's attitude to desalination was 'fear', though it is important to note that we are drawing on only two items on this scale. Basically, if people think that desalination is unsafe then they are more likely to oppose the technology. This is probably not surprising, although less than 12% of those surveyed said they would not feel safe drinking desalinated water, or that they thought desalinated water would be of a low quality.

After fear, however, the next major predictors of attitudes to desalination was procedural justice. Procedural justice was assessed via 2 items: an aggregated consultation scale (CONSULT); and a one item question that assessed consultation over a desalination project respondents were aware of. Both procedural justice coefficients were positive, indicating that those who felt they had received consultation were more favourably disposed to desalination.

As noted above, self-rated knowledge is another major predictor of support for desalination, in that the more people know about the technology the less likely they are to support it. It is difficult to know what to make of this specific finding without delving into the data in more detail. Given that other studies suggest that information facilitates acceptance (eg. Dolnicar *et al.* 2010, while others show that technical knowledge, alone, is not sufficient to sway public opinion (eg. Marks *et al.,* 2008), further investigation is warranted. What can be said is that when trying to obtain support for projects such as desalination plants, effective 'consultation' – whatever that means to people – is vital, and should be afforded at least as much investment as education campaigns. The suggested shift in focus from 'education' to 'consultation' is particularly relevant in light of the discussion of NIMBY, below.

1.3.8.2 Predictors of trust and satisfaction with the government's decisions when handling water issues

The second regression analysis uses the same variables to predict trust and satisfaction with the government's decisions when handling water issues. Again, while some of the demographic variables explained trust and satisfaction with the government, the coefficients were very small, suggesting that they were not as important as the other variable in the regression model.

Predictors were similar to those noted above for predicting attitude to desalination: gender; country of birth; consultation; distributive justice; self-rated knowledge of water technologies; self-interest; perceived legitimacy of government; concern about future access to water, and fear of desalination. There were some differences found when predicting this dependent variable. Age has a significant impact on government trust on water issues, as does city/country identification, with older Australians, and those who identify as 'rural dwellers', being less trustful of the government on water issues. Further, while self-identified environmental values had an impact on predicting attitudes to desalination, this variable could not be used to predict attitudes to government on water issues, generally.

Again, the strength of these relationships provides even more information to those seeking to understand public responses to government water management decisions.

Table 73: Standardized coefficients for regression model for trust in government management of water issues

	Standardized Coefficients		
Model	Beta	t	Sig.
(Constant)		8.538	.000
**SEX	-.041	-2.751	.006
*AGE	-.031	-1.980	.048
**COB	-.040	-2.748	.006
**COUNTRY	.038	2.633	.009
EDUCAT	-.024	-1.515	.130
INCOME	.003	.159	.874
**CONSULT	.418	24.406	.000
**p11q13s The consultation with affected communities about desalination has been excellent	.069	4.398	.000
DJ	.031	2.102	.036
**KNOW	-.066	-4.196	.000
*SELF	.039	2.552	.011
**LEGIT	**.376**	22.358	.000
**WORRY	-.047	-3.191	.001
*FEAR	-.033	-2.058	.040
GREENIE	-.007	-.445	.656

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.741[b]	.549	.545	.46063

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	579.478	15	38.632	182.071	.000[b]
	Residual	476.983	2248	.212		
	Total	1056.461	2263			

Those variables with statistically significant coefficients are indicated with a single asterisk (0.05 level) or double asterisk (0.01 level). The bold standardized coefficients are the more strongly correlated items. Overwhelmingly, the strongest predictors of whether or not people are satisfied with, and trust, the government to manage water issues in Australia, are: 1) their perception of the government's right to make decisions on behalf of the population (ie. legitimacy), and 2) whether or not people are satisfied with the consultation processes involved in water management decisions. The first relationship is not surprising – those who think the government has a legitimate right to manage water issues also trust the government to do so. The very strongest predictor is attitude to consultation; if people feel the government consults with the community effectively, they are more likely to trust them on matters of water management. Most of the other variables have little predictive capacity.

Interestingly, the findings of the national survey demonstrate the strength of relevance of procedural justice – specifically the component concerned with consultation or 'voice' – on attitudes to desalination, as well as to general government trust and satisfaction in relation to water management issues.

1.3.8.3 Procedural justice and the Not In My Backyard (NIMBY) attitude

NIMBY refers to uninformed and self-interested negativity towards a broadly beneficial social good, directly related to the distance of opponents from the infrastructure in question. As well as denoting an attitude, the acronym 'NIMBY' is used as a name for those people who are unsupportive of a development in their region. Lober (1995) and others have highlighted the role of perceived fairness in the make up of so-called NIMBY responses to large public infrastructure. The findings of the current survey on issues of procedural justice – or perceived fairness – shed some light on the NIMBY phenomenon.

The term is widely used in public discourses around the erection of, for example, wind-farms, airports and recycling centres, and is a cultural label that has been considered at some length by social scientists interested in opposition to public infrastructure (Devine-Wright, 2005, Devine-Wright, 2007, Groothuis and Miller, 1994, Lober, 1995, Lober and Green, 1994). The term also has currency in formal government and industry circles, and is presented as an identifiable challenge to those attempting to implement change; advice to the Australian government explicitly names the NIMBY factor as being an impediment to the introduction of innovations in, for example, municipal water treatment strategies (Commonwealth Scientific and Industrial Research Organisation,

2001:79), renewable energy (Needham, 2008:23) and non-fossil fuel energy technology (Commonwealth of Australia, 2005:80). The cost to governments and industry of opposition to public infrastructure – which might be attributed to so-called NIMBYs – can be temporal (eg. delays in construction due to protesting or injunctions), financial (eg. the expense of these delays, or of legal battles with opponents), and political (eg. compromised legitimacy and negative publicity for governments and industry).

A person supposed to be displaying a NIMBY attitude tends to be characterised as either selfish – preferring to reap the benefits of infrastructure located in someone else's backyard – or as ignorant and irrational about the potential risks of a new technology. Freudenburg and Pastor (1992) explain that NIMBYs are often depicted as a combination of both selfish and ignorant.

The notion that people are selfish has long been contested. The belief that humans will harvest resources selfishly is well entrenched in the natural resource policy literature, thanks in large part to the continued popularity of the Tragedy of the Commons model, published in 1968 by Garret Hardin (1968). Hardin suggests that logical individuals in an open access environment, who are not compelled by social pressures, will harvest natural resources in a way that is detrimental for the group and the resource as a whole. According to the model, tragedy will befall a limited resource because each individual will take as much as they can in the belief that everyone else will do the same. Hardin's original paper discusses a hypothetical set of circumstances in which the resource is: 1) open access (as opposed to common property or communally owned private property), 2) limited or is percieved as being limited and 3) not subject to social pressures compel people to limit their consumption. Such conditions can be easily assembled in a laboratory setting, as has been done extensively by psychologists specialising in game-theory (McCabe *et al.*, 1996, Scharlemann *et al.*, 2001). However, such conditions rarely occur in real life, and proponents of the Tragedy of the Commons theory have attracted much criticism for overstating the predictive capacity of the model (eg. Ciriacy-Wantrup and Bishop, 1975).

The question of human 'selfishness' has been addressed extensively in the common property resource (CPR) literature, notably by recent Nobel Prize winner in Economic Sciences, Elinor Ostrom (Berkes *et al.*, 2003, Committee on the Human Dimensions of Global Change and National Research Council, 2002, Dietz *et al.*, 2003, McGoodwin, 1990, Ostrom, 1990, Ostrom, 2009, Ostrom *et al.*, 1994, Poteete *et al.*, 2010). As noted earlier, through a combination of laboratory based testing and field research Ostrom has, for some decades, demonstrated that the contexts in which people genuinely behave selfishly occur far less often than proposed by theories such as the Tragedy of the Commons model (in which people always behave in order to maximise their personal benefit, regardless of the broader social and environmental impact). People exert social pressure on each other, as do governments, NGOs, environmental and community groups, to name a few, in order to compel cooperative, not self-interested, behaviour; people behave *as if* fairness matters.

The assumption, even if it is a tacit one, that opponents to large public infrastructure are either selfish or ignorant, has tended to be addressed by governments by providing: 1) compensation (to make up for percieved losses), and 2) education (to counter perceived deficiencies in technical information).

The roll-out of education and public relations campaigns assumes that once people in the community understand a project or a new technology like the experts do, they will be more likely to accept it (Lawrence et al., 1997:582, Smith and Free, 1996). While there is certainly some basis for the argument that people are more likely to accept that which they understand (Dolnicar and Hurlimann, 2010, Dolnicar *et al.*, 2010, Hurlimann, 2008, Roseth, 2008), the regressions in the

current study show that self-reported knowledge is negatively related to attitude to desalination, a finding that is contradictory to some previous work. The blanket assumption that public opposition to new technologies is informed by ignorance is a simplistic approach that ignores other factors that inform public support, such as those explored in the current report. For example, Marks *et al.* (2008:97) explain that 'public acceptance of water recycling cannot be achieved simply by reducing the objective level of risk (as assessed by experts) associated with the requisite technologies'. Rather, they note that trust in experts to deliver safe outcomes, as well as more symbolic cultural associations tied to ideas of water 'purity', factor heavily in the support for a range of water augmentation options, including desalination: 'being willing to use seawater for household purposes also requires faith in the capacities of experts' (Marks *et al.* 2008:95). Responding to any opposition to new, or traditionally unpopular, technologies with more, and more simplified, scientific information, may address one source of public uncertainty, but it does not directly confront any (co)existing issues of trust in experts, or indeed in technology itself.

The current survey did not explicitly enquire into NIMBYism, precisely because the concept itself has been widely critiqued as imprecise and masking of other motivations including perceived procedural fairness as well as trust in government (Bullard, 1990, Bullard and Johnson, 2000, Greenberg, 2009, Hunter and Leyden, 1995, Lindell and Earl, 1983, Lober, 1995, Luloff *et al.*, 1998:85, National Academy of Engineering, 1986). The current research adds to the body of literature work that helps us to understand opposition to large public infrastructure, by extending our understanding beyond the vague and uncritical attribution of NIMBYism. The standard two-fold response to public infrastructure opposition – educate and compensate – can occur at the expense of addressing the underlying factors that may be informing such opposition. Our analysis shows that procedural justice – trust in experts and government, perceptions of fairness, legitimacy of authorities, consultation and transparency – is highly significant when it comes to predicting support or opposition for large public infrastructure.

2. FOCUS GROUPS

2.1 Key Findings

The introduction of desalination raises numerous social issues in Australia, in relation to the acceptance of desalinated water as a supply option and desalination plants themselves. In some places, such as Kwinana (WA), the construction of desalination plants has met general community acceptance, while in other places, such as Wonthaggi (VIC), there has been significant community opposition. What perceptions and attitudes underlie these differences, and what are the major concerns of Australians about desalination? Eight focus groups were conducted with 68 people living in the vicinity of three of the six plants currently in operation or under construction.

The focus groups covered areas with plants currently under construction but not yet operational (Wonthaggi, Victoria, and Port Stanvac, South Australia), and an area with a currently existing and operating plant (Kwinana, Western Australia). Three focus groups were conducted in each area (two in Port Stanvac) to identify the perceptions of, and responses to, the introduction of desalination from residents. Key themes explored were customer satisfaction with existing water services, preferred supply options for addressing water shortages, and opinions of desalination as an option for the augmentation of the water supply. Discussion also probed for the key issues and concerns residents had with the local desalination plant in their area. The project was funded with financial support from the National Centre of Excellence in Desalination Australia (NCEDA) and the Federal Government.

The findings provide insights into how some members of these communities perceive desalination and their concerns with the building of desalination plants in their areas. This project has established that many residents in Wonthaggi had significant concerns about plant siting for both environmental and aesthetic reasons. There was also social conflict from the plant construction, from increased rent prices and the influx of out-of-town personnel into local venues.

The key findings of these groups were:

2.1.1 Wonthaggi (VIC)

In Wonthaggi there was significant opposition to the desalination plant in general, while most focus group participants stated that in abstract desalination might be useful under some circumstances.

Key themes to emerge as reasons for community opposition to desalination were:
- Threat to the local environment (both aesthetic and marine)
- Public-private partnerships and a lack of trust in the politics of operation
- Social impacts (conflict, rental prices)
- A questioning of the necessity and scale of plant

There was general acceptance of:
- Water quality produced by desalination
- Water cost as an issue per se
- Water availability: perception that people should reduce water use instead of increasing supply

2.1.2 Post Stanvac (SA)

In Port Stanvac there was a small level of concern about the desalination plant, although much less knowledge and awareness of the plant than in Wonthaggi.

Key themes to emerge as reasons for community opposition to desalination were:
- Effluent into the Gulf
- Cost of water

There was general acceptance of:
- Siting (built on former site of oil refinery)
- A lower general awareness of plant than in Wonthaggi

2.1.3 Kwinana (WA)

In Kwinana, there was a general acceptance of the desalination plant, and the need for water augmentation from this source to provide baseline water supply to the southern suburbs of Perth.

Key themes to emerge from these focus groups were:
- General acceptance of desalination, but limited technical knowledge
- Main concern was with quality of water and system failure
- High perceived need for desalination plant

2.2 Introduction

2.2.1 Project Background

The rationale for the focus groups was to identify the responses and concerns of a number of residents of areas in which desalination plants were being constructed. These focus groups provided a naturalistic setting in which interaction between participants provided insight into how these attitudes towards desalinated water formed in the context of a dialogue. This was complementary to a national survey conducted by the Deakin University wing of the project for which a lengthy (25 page) survey was sent out to a sample of the Australian population (n=10,000) with a return rate of 31%. In a sense then, the focus groups were an addendum to the national survey, whose primary aim was not to provide a representative sample of opinions, but illustrate some of the types of concerns that lay behind answers within the survey. To this end, some significant quotations from focus group participants have been included, to give a feel for the perspectives behind the survey responses.

2.2.2 Project Objectives and Scope

The project had four main objectives:

1. To determine the attitudes of Australians toward desalination, from the perspective of water consumers and citizens.
2. To understand the relative satisfaction with desalination as an option for water supply augmentation, in relation to water saving measures and other water supply possibilities.
3. To view these in a naturalistic setting in which participants may share ideas.

4. To determine the attitudes and concerns of residents living in areas near desalination plants, in terms of possible negative impacts.

2.2.3 Project Partners

This project was jointly conducted by researchers from Victoria University and Deakin University, and support was provided by funding from the National Centre of Excellence in Desalination (NCED).

2.3 Public Perceptions of Desalination

Studies based on survey technique have examined the level of public support for both desalinated and recycled water. These surveys captured broad levels of public opinion well, but have not focused on desalination areas themselves.

Most importantly, as attitudes towards desalination as an unknown and novel technology are often based on participant's limited knowledge, interactive settings such as focus groups allow these attitudes to be tested in a setting of dialogue. Such transactional research is more valid representation of the social context in which opinions about desalination issues are framed. One part of the rationale for focus groups was the ability to reflect and deliberate on why participants supported or opposed desalination, and to qualify the circumstances under which this would take place. There is a growing need for focus groups to determine what the major public perception issues are with respect to desalination, and to establish in a naturalistic setting whether interaction with other members of the community leads to change in opinion, polarisation, or synthesis of opinions.

By the very nature of recruitment, self-selection took place, and for the most part it was those who were most vocal on the issue of desalination who participated. Informed consent was obtained from all participants and the study was approved by the Victoria University Human Research Ethics Committee.

The groups followed the focus group methodology espoused by Krueger and Morgan (1998), where interviews start with one open question followed by a few transition questions and end with a key question. Interview protocol for the focus groups was identical in every case, with prompts structuring participants to start discussions with the following themes.

An interview protocol was developed for the focus groups. The discussions followed a typical pattern of eliciting:

1. Satisfaction with water service, what are the most important things to you in terms of security/regularity, safety, aesthetic quality, cost
   - Ever had a problem with your water?
   - Do you use bottled, tank, tap water?
   - Cost issues, is the price of water fair?

2. Water conservation
   - Water saving campaigns, do you participate?
   - What are alternative focuses?
   - Options to pay for water security.

3. Desalination
   - How do you feel about desalination?
   - Other alternatives, pipeline, water recycling.

4. The desalination plant
   - Consultation, who should make decisions?
   - Good/bad decision, why?
   - What makes good/bad locations for desalination plants?
   - Biggest concerns?

Conversation between participants was allowed to run until discussion was exhausted. The duration of groups was between 60 minutes and 90 minutes. Those in Wonthaggi and Inverloch typically were at the upper end of this time range, as participants had significantly more concerns about the process of desalination.

2.4 Method

2.4.1 Recruitment

Participants were recruited from the national survey conducted as part of this project. A question at the end of the survey asked participants if they would be happy to participate in focus groups if held in their area. In the desalination areas, approximately 10% of returned surveys indicated willingness. These participants were then contacted by phone, and about one-third agreed to participate in focus groups, for token remuneration only (a supermarket voucher).

2.4.2 Locations

Focus groups were held in the following locations in each area:

Wonthaggi, Victoria: Wonthaggi Union Community Arts Centre, and Inverloch Community Hub

Port Stanvac, South Australia: Noarlunga Library, Woodcroft-Morphett Vale Neighbourhood Centre

Kwinana, Western Australia: Rockingham Campus Community Library

2.4.3 Analysis

Focus groups were recorded onto digital audio recorder, and complete transcriptions were made. These were then analysed thematically for content.

2.5 Results

2.5.1. Wonthaggi Focus groups

Three focus groups were held with residents living within 15km of the Wonthaggi desalination plant. Recruitment occurred via the question at the end of the survey asking whether participants would be willing to participate in focus groups, and was thus not representative with a self-selection bias. The issues varied between participants, with a range of perspectives including a variety of the

community: those living within and outside the townships, those who were politically active on the issue of desalination, to those whose relatives worked as labourers on the construction of the desalination plant.

There was a general feeling that the plant was either unnecessary or that it was of a scale that was much greater than needed. Alternatives given by participants revolved around the need to focus more on water saving, and the fact that many other water users should be reducing their water consumption.

Many participants stated that they felt the desalination plant was unnecessary, and there was significant community opposition to the plant based on:

- The threat posed to the local environment (both aesthetic concerns and concerns about brine outflows)
- The public-private partnership and the politics of operation
- The social impacts stemming from construction (conflicts with out of town labourers, rental prices increasing because of housing pressure)
- Questioning necessity and scale of plant

In contrast to what might be expected outside the area, there was little concern about:

- Water quality
- Water cost
- Water availability, with the perception that people should reduce water use instead of increasing supply

2.5.1.1 Water usage and conservation

A large proportion of focus group participants in the Wonthaggi area, who opposed the plant, provided the justification that augmenting the water supply was unnecessary, and shortages could be countered by reducing demand through residential and agricultural water saving. The idea of regulation through pricing (i.e. making water more expensive to reduce demand) was common amongst local opponents. Furthermore those who opposed the plant often argued for the augmentation of supply with tank water, citing little concern about health as a major worry with self-regulated water.

> Wonthaggi resident #1: I think there needs to be greater incentive for people to be more water self-sufficient, like most people here have water tanks, and one of the things that is obvious is the fact that most of us still have to pay water rates is a disincentive for a more sustainable water policy and, you know, up until a few years ago, in Melbourne, many areas, it was impossible to put a water tank in. The health authorities, or whoever it is that's so terrified of us getting sick from drinking tank water, and you know, there's no real evidence that I'm aware of to show that that's a real risk, and a significant risk. But that fear of that is over-riding sustainable water policy and the excessive cost that we pay for our water.

2.5.1.2 Alternatives to Desalination

Desalination in the case of Wonthaggi was looked upon negatively, for both environmental and political reasons. While desalination per se was not seen badly, it was seen in the context of Wonthaggi as unnecessary and ill-sited. Desalination was seen as high in environmental costs, energy intensive, and a potential source of pollution for the coast with saline brine.

> Facilitator: What are some of the alternatives that you were talking about?
>
> Wonthaggi resident #2: Some of the alternatives are desalination plants, definitely not dams because I gave a reason that dams destroy the environment in my opinion, and up to 40% of the water can be lost in evaporation, so it's not all that efficient, especially when there's a scarcity of water. And, particularly in Australia, we're mainly a coastal nation population-wise. There's very little water that can be held for that purpose in dams, so I'm looking at desalination becoming a supplement to the water supply, I suppose, but I have other reasons for that when we come to it. But one thing I want to say is our politicians are only interested in getting in at the next election, so we don't seem to have, you know, long term, we're not thinking long term into the future. As the population increases we're going to have to find these alternatives, you know, both in our electricity and water, alternative supplies, after what we're doing at the moment.
>
> Wonthaggi resident #3: I think that's valid except where recycling still is cheaper than desalination, largely because water recycling, you know we can't pump our raw sewage into our oceans; it needs to be cleaned up in some way, and removing the residual pollutants if you like from that water is far easier and cheaper via reverse osmosis than it is to remove salt from sea water and boron and things like that. So I strongly feel that even though it's expensive to recycle water, it's still way cheaper than desalination.

In all Wonthaggi groups, there was significant discussion about alternatives to desalination, including recycled water:

> Wonthaggi resident #4: I think it's (recycled water) brilliant. I don't actually like the sort of government attitude that Australians don't want to drink recycled water. I would be very happy to drink recycled water; any water that's been deemed safe for me to drink, because someone's got to. I'm happy to drink, regardless of where it's come from.
>
> Wonthaggi resident #5: That's a political football isn't it, you know; one political party will use that as ammunition against the opposition party; if they threaten to bring water recycling in there's massive campaign scaring the people that if you vote this party that you'll be voting for drinking sewage, that's how they always put it. It's a political football and people swallow it up, unfortunately, so we need a bipartisan political approach to water recycling because there's a massive potential for it. Even with the upgrades to the eastern treatment plant, there's still 100-150 billion litres just running out into the ocean of treated water, and it doesn't need much more treatment to get to half acceptable standards for drinking. Governments just, for whatever reason, well I think I know the reason that they're not doing that.

2.5.1.3 Public-private partnership concerns

There were significant concerns about the desalination plant as a public-private partnership. In particular, there was concern about how planning decisions in relation to the plant were economically motivated, and that private interests affected its politics of operation. For example:

> Wonthaggi resident #6: Yeah, I think it's been a political decision driven by political self-interest and big business. The water industry's a massive international industry, and I think they've suckered our government in to thinking that this is a solution. And I think desalination is fine in its place, but that is when all of the environmentally and economically and socially cheap alternatives have been exhausted first, and in Victoria, in Melbourne, we haven't even come close to that. So, I think a small desalination plant as an augmentation might be considered reasonable after they've done something about the 600 billion litres of water a year that Melbourne wastes through stormwater, recycled water going out into the ocean, and through saving. So, desalination is ridiculously expensive, it's ridiculously polluting to the ocean, to the marine environment and, most importantly, probably, it takes away our value of water. Of course, financially we pay for it, but we think there's an endless supply of water out in the ocean there, so we're never going to have a problem, you know, there's no incentive to save. So, desalination is actually a disincentive to water conservation and it takes us away from that understanding of the importance of the resource.

2.5.1.4 The desalination plant in Wonthaggi

As expected from the ongoing community campaign against the Wonthaggi desalination plant, there were significant concerns about both the planning and operation of the desalination plant. Of the 27 informants, 22 were significantly against the plant (note however that the sampling meant that there was a significant self-selection bias of activists who had volunteered). A number of people in the focus groups had moved to Wonthaggi in the last ten years, mostly from Melbourne. There were also significant concerns about the process of consultation.

> Facilitator: Where were the consultations held?

> Wonthaggi resident #7: They had a few actually in this building didn't they, and they've had a few at the town hall and various areas around here. I don't like calling them consultations because they weren't. They came to speak to us, and as soon as anyone raised a few issues there was, you know, a palpable feel of anger's not the word, but you know the people selling this to us were speaking down to us, and you know, almost saying, 'Hey look, don't question it, it's happening'. So I think their consultation was really a bit of a sham process. And it still is. I mean my property has the pipeline coming through it and, you know, in dealing with the construction firm there, and the amount of emotional energy and time that we put into trying to get answers and getting some better outcomes for our property is extraordinary, and the outcomes that we get are virtually zero, so I think it's an atrocious consultation process.

2.5.2 Port Stanvac focus groups

Two focus groups were conducted with residents living within 15km of the under-construction Port Stanvac desalination plant. These groups were held at Noarlunga Library and the Woodcroft – Morphett Vale Community Centre, on a weeknight. Both venues were in the Southern suburbs of Adelaide. The major concerns were about the level of effluent flowing into the Gulf, and the cost of water. There was little concern about siting as the plant was built on the former site of an oil refinery. There was also a lower general awareness of the plant than in Wonthaggi.

On water shortages, one resident said:

> Port Stanvac resident #1: What's changed? This was the driest state of the driest continent on the earth. What's changed? Just the government. Since Don Dunstan's days, when he said we'll get you Chowilla and… [inaudible] to fix all your water problems, we got that: the salt-pan Chowilla, we also got the Murray River levy, we also had all the rhetoric of the federal

governments and the state governments working towards water conservation. We also grow rice and cotton, which is absolutely ludicrous wastage; in the driest continent growing those two very, very water-hungry commodities. It's ridiculous. In the meantime, our river's drying up, our population has gone up; I don't know how much it's gone up since 1975 to today, but had we not grown those other commodities, had we managed it properly, had the federal government and the state governments done the right thing, we wouldn't be forced to now pay triple for desal plants, because while we're doing that, they're still allowing all the other stuff. This trying to get back the licences we had, what's her name, Penny Wong and others, the water resourcing minister or something, rhetoric again. Where have they got, they've got one or two. They're buying them back now for hundreds of thousands of dollars, which they gave out for political gain to get into power and now everyone in Australia's paying for it. So I'm really annoyed about that. I'm so angry; I expect the government to fix it, but to show some common sense on a real big stage scene, you know, on the federal scene, and then down here in the driest state of the continent we may be able to get the water that we've earnt. It's their right I suppose, that's what they say, to use the water; it's their resource and what they don't use we get. Well, it never used to be that way and I think intervention from the federal government should be there, and if all the governments got together, South Australia would be in a better position, and maybe Western Australia and maybe Queensland in particular, which has got a huge rainfall and hasn't built dams for so, so long, and when you talk to Queenslanders they're mad at the Queensland government. It's the same mismanagement theme. South Australians managed it from Don Dunstan's days up to today; we're paying the Murray River levy and we're going to pay triple. Where's it got us? Millions of dollars spent.

Port Stanvac resident #2: I think I'd be happy if there was an allocation per person or per household. I would be happy if it met basic needs. I would then be happy with a higher water price to discourage use. Along with that, I'd like rebates for things like rainwater tanks and water saving devices, and that would keep me reasonably happy.

Some examples of the object to cost, and the agreement between members of one focus group in this:

Facilitator: Moving the focus to desalinated water, a number of you have expressed concern about desalination. What are your major concerns, because there are a number of potential issues in the different desal plants around the country, but what are your major concerns about desal?

Port Stanvac resident #2: Cost.

Port Stanvac resident #3: Cost…

Port Stanvac resident #2: That's number one and probably all... Just very, very costly.

Port Stanvac resident #4: My other issue is the environmental aspect because of the brine that goes out. I'm not quite sure that Adelaide's had seagrass problems with seagrasses being decimated and that has a big impact on the marine life, and I'm not sure what they've done with this desal plant. The Olympic dam one is a classic wherein, I can't remember, I heard some pollie on it, I can't remember who it was, saying: 'Oh, the desal plant we're looking at for Olympic dam is going to dilute the brine from the outflow twice what is recommended', and that's supposed to make us feel good, but [inaudible].

Port Stanvac resident #2: Mmm.

Port Stanvac resident #4: And the cuttlefish is a big issue but I just don't think we, I don't know whether they monitor or they have to monitor, and once they monitor and find out they're causing problems it's too late; the damage is done. So that's my issue. The other thing is cost

and infrastructure that has to go with that pipeline that's now going to go to somewhere where they can store the desal water. Do I have any more issues from that?

Facilitator: Do you have issues with the brine? (to other participants who had not spoken)

Port Stanvac resident #5: No, I missed that one but I have heard about that and it does have an impact on the marine environment, you know, out there because it comes back concentrated; salt content is very, very salty.

Port Stanvac resident #4: The other side of the cost, I mean we talk about the cost which is, you know, it's a problem, but it's also the energy consumption. So it's just, you know, we're pumping out… ot's costing us more but we're pumping out more greenhouse gases or using it in some way and South Australia does, we do dirty coal, so it's not very good.

Some indicative statements regarding local attitudes to the desalination plant itself from another focus group held in Port Stanvac:

Facilitator: First, just to kick you off, overall what's your informed position on the desal plant in Port Stanvac? Do you think it's a good thing, do you think it's a bad thing? What are your major concerns about it? Are they end usage, consultation, environmental, political, governance, ownership?

Port Stanvac resident #6: Port Stanvac resident #6: My concerns with it are some of the environmental issues and the power. They are enormously power hungry. Here we have gas-fired and coal-fired power stations and, sure, some of it's supposed to be supplied from wind farms and what not, but I have a suspicion that the majority of the power is coming from dirty power sources and so that's my concern for the desal plant, mostly. I'd like to see the evidence if putting the saline water back into the Gulf is actually going to be a real issue.

Port Stanvac resident #7: It was on the news last night.

Port Stanvac resident #8: Further up the Gulf up at Port Augusta yes maybe, I think, but I'm not too convinced, or I haven't seen the evidence to convince me yet that Port Stanvac is going to be an environmental issue from the sea point of view. I think it's a good backup but I think it needs to be other sources that need to be worked up properly before we start using really expensive desal'ed water; recycling of storm water, storage of more water that currently runs out into the sea.

Port Stanvac resident #9: Yeah, I agree with all of what you said. The fact that the thing is built and it's there at an enormous cost, so it's 'all over Red Rover' as far as whether you're going to have it or not. It's a done deal and at that per se I don't have a problem. I do agree that it should not be used unless it's necessary and, to me, it's a good investment for future and, perhaps, hopefully in the future the power sources will become greener and cleaner and more available and cheaper. That's something that we really don't know; we haven't got a handle on at this time except to say that if they do use it now it's going to be using dirty power. I know it's expensive, but I think it's a good long-term investment for this city which is in the driest state in the world.

Facilitator: So cost is not a major concern because … ?

Port Stanvac resident #8: Well cost is a concern, obviously. It's a huge cost. I mean you've got the cost of the Adelaide Oval which, to me, is just a joke and we're all bitching about whether we shouldn't have a decent hospital or not. You know, to me, the economics of those three projects are all wrong. The only sensible two are the hospital and the desal plant, in my opinion, which would cost them a lot of money. But, we're going to pay for it, no doubt about that, and so will

> our children. It's there, it's a good asset to have in the back block, but I agree that it should only be used if it's necessary and the other avenues of water resource should be developed.

Overall however, the majority of participants accepted the desalination plant, despite its negatives. This was significantly different from Wonthaggi, where there was broad opposition.

> Port Stanvac resident #9: I do [agree with the need for the plant]. I think it is a great standby in case of, call it an emergency, call it what you like, in the case of where we've had the problem with the Murray over the last few years, getting water out of it. And, whilst the drought has finished and everything's nice and full of water at the moment, there's no guarantees; in fact there's almost a guarantee that we will have another drought. There's no question about that. Cyclical droughts have been in the history of Australia since the white man first landed here and even beyond that. You know, it's going to happen again. To have a desal plant there to top up the reservoirs to me is the way to go.
>
> Port Stanvac resident #10: I agree that we need to have it there as a backup system. I'd like to see the costings for having it there and just ticking over as opposed to having it there and using it to its capacity. It's going to cost money just to have it sitting there. Presumably you can't have it idle because the processes it uses will need to be kept ticking over. What are those costs? Would it be more economical to have the thing running at capacity?

2.5.3 Kwinana focus groups

Three focus groups were held with residents living within 15km of the Kwinana desalination plant. Groups were held after-hours on a weekday at the Rockingham Community Library. This area is on the Southern fringe of the Perth suburban sprawl, 44km from the Perth CBD. Participants were a mix of those recruited from the survey lists and supplemental participants recruited through a corporate services company called Research Panel.

In general, the level of acceptance of the desalination plant was much higher than in Wonthaggi or Port Stanvac. A major reason stipulated for this was simply the lack of alternative, and the fact that the plant was needed to provide baseline water supply for the southern outer suburban sprawl of Perth. There was thus a high perceived need for desalination, as a rainfall independent source of water.

2.5.3.1 Very little concern in Kwinana, generally positive about desalination

There are two possible reasons for this, both of which are informed by the survey data. Firstly, the more positive attitude may be correlated to lower dam levels, and an increased awareness that baseline water supply comes from desalination. Secondly, the industrial area in which the plant is located means that there is lower concern about the aesthetics, siting, and local environmental effects, as desalination is viewed as less environmentally taxing than the former industries sited there.

On desalination as an alternative:

> Facilitator: What would you do if you were in government?
>
> Kwinana resident #1: Personally, desalinisation. I don't know a lot about recycling, like sewage apart from what I have seen in documentaries on TV. I believe they are safe. I would like it to be proven to me and it was proven that it was completely safe and the water was pure, then I have no problems with recycling. I do support the need to bring pipeline down from our north west

regardless of cost, having listened to the broadcasts and so forth, Western Australian is going to become drier and drier and drier. Our rainfall will be in the next 50 - 100 years negligible according to the pundits, so I think a pipeline is a priority and it should be put in as soon as possible.
Facilitator: Your opinions on it?

Kwinana resident #2: Yes. Just thinking about WA conditions. I am not clear. Where would the water come from?

Kwinana resident #1: Kununurra.

Kwinana resident #3: Kununurra. So again this should be an integrated approach because of the dry conditions, we probably would need water desalination plant and recycling. The only thing personally I am not very comfortable with the recycling sewage water. But then again if the option is to kind of differentiate between potable or drinking water and water meant for garden or agriculture and with the way then the water is going. So if the rainwater and desalination plant water could be used for drinking and potable purposes, and what's being obtained from sewage, recycled water from there could go into agriculture, farming or gardening. I don't think that is a viable alternative, but it's worth looking into. Because definitely in a few years from now, maybe another few decades, we will probably be faced with severe water crisis. Another thing would be, I don't know why are we getting drier. Maybe research into that could be done further. Is it global warming or is it deforestation in WA. A lot of development is making the bush-land area scarce. There is a lot of vegetation being chopped down, is that affecting WA climate. Deforestation is mostly in Perth, so what is happening there for water resources. There's a lot of questions unanswered there and perhaps if those are explored further. That's another option that could be researched further.

Facilitator: Can I ask you about your understanding of the process of desalination and water recycling. Would you feel comfortable to explain how they were done, or do you know how they're done?

Kwinana resident #2: I couldn't explain it any detail.

Kwinana resident #1: Yes.

Kwinana resident #3: I have seen when they primarily opened the Kwinana desalination plant, they went through the process of how it's filtered and so forth but I couldn't go into any detailed explanation as to how they do it.

Kwinana resident #4: I wouldn't have an idea of the process either. The only thing I heard was an argument, that the amount that went into setting up the whole process, it doesn't give matching output considering the expenditure, but that something to do with economics.

There was little concern about cost, however there was some acknowledgement of the unpleasant taste of chlorine in the water supply. Residents commonly agreed that this was a major issue, with the possibility of different tastes with new water sources. On the issue of taste;

Facilitator: Okay. So (desalinated water) it's noticeably a different taste to other…?

Kwinana resident #5: Noticeably, noticeably sweeter, much sweeter.

Kwinana resident #6: I think it is because we come, part of our water comes from the southwest, one of the southwest dams there and gets blended in with other water from the city as opposed to the north of the river where they get it out of the mountain. There is a noticeable difference in taste.

Facilitator: Yep, and do you boil your water before drinking or just straight out?

Kwinana resident #3: No, no, straight out.

Kwinana resident #1: I'd like to come back with another comment. There is a high chlorine content sometimes, and sometimes when it's been dosed or flushed, then I might, you know, instead of drinking it straight out of the tap I'll leave it up on the sill for an hour or so to let the chlorine break down.

Facilitator: And the chlorine taste is basically is not aesthetically pleasing to you then?

Kwinana resident #3: Oh well, it's necessary, but you know, I know the difference between when I can't taste the chlorine in water and when I can, and as far as I'm concerned without the chlorine taste, again, it stands up as probably as some of the best water in Perth.

Facilitator: Does anyone else have problems with chlorination taste? It's a real problem for water authorities because the way it diffuses sometimes you've got to put a lot in a certain place so you get over-chlorination.

Kwinana resident #6: Yep.

Kwinana resident #7: A lot of the water I drink I put in, I fill up my jug and put it in the fridge, and by the time I drink it, it tastes, I really like the taste of it. But, straight out of the tap sometimes it can taste a bit funny but I'm happy after a while.

Regarding desalination, a participant from an environmental science background said:

Kwinana resident #8: In Western Australia, I mean we have got very little rivers left we can dam and what rivers we do have are salinating very quickly so we are losing benefit. They are still likely to flush out the Serpentine Dam because it has a heavy salt load, they could flush it out and then use the fresh overlay, they are still arguing about that because the dairy farmers are using it and they don't want it messed up and there has been a proposal to put in a desalination plant down on the plains because it has got something like 200 to 300 M of head so it has more than enough pressure to drive gravity without the heavy use of the Rockingham or Myalup I think it is, the heavy power usage of membrane desalination. Recovery I think, you know storm recovery, drain water recovery, because we know that up in Gnangara it can filter through the sand and by the time it reaches the aqua flow all your metals and bacterial load have all been filtered out by the sand and you have perfectly drinkable water and yet a lot of that is still going to Point Perone here where one of the major sewage plants are and it is just getting pumped off shore.

Facilitator: So you are talking about through natural barriers filtering, not so many reversals mostly through....

Kwinana resident #9: No, well I mean you could not do it in Sydney or Melbourne so much because your country and your soils and everything but we have a perfectly natural sand filter all in all it is one coastal plain and we are not using it except what escapes the storm system and actually falls on the ground and permeates back through but even the storm system could be directed to sumps instead of going to the ocean and then ok you might have bitumen and heavy metal loads off highways and things, you could always isolate those elements you know where you have got your heavy, say down the Kwinana Freeway, where you have got your storm drains there, put them into an isolated area so you are not running the risk of contaminating put the rest of it away from those heavy loads whether it be the toxins or metals or whatever just let it sink back into the country, recharge our alkalines.

Unlike in the other focus groups, there was no opposition to the operation of the specific plants in the Perth area, and no local concern about Kwinana. However, there was awareness that other options existed, and that desalination was energy intensive:

> Kwinana resident #9: The only thing I would have against anything is increase in the amount of desalination plants, because they are just so power hungry, I mean we have enough issues with global warming and other things and with more demand power towards desalinators than we would get spread out amongst the communities and our power rates would go up and everything like that, but the bottom line is do it as naturally as possible so it you've got yourself your settling ponds and your wetlands and then your sand beds to allow the water to percolate through, recycling is the way to go big time, both storm and house. Or commercial and domestic I would say. Some commercial I would be a bit sus(picious) about, mainly because of metal loads and other issues like that, so maybe you would keep that as an isolated area and just continue to reclaim ....

2.6 Conclusion

The most notable feature to emerge from these focus groups is that support for desalination as an option for water supply augmentation varies significantly between places. The underlying concerns of residents in different areas also varies significantly, with concerns about the local environment and energy usage dominating in Wonthaggi, while these issues were of less concern in Port Stanvac and Kwinana where both desalination plants were zoned in former industrial areas.

These indicate that an understanding of local conditions is very important in any decision about the introduction of desalinated water. Understanding where local residents stand on issues of water supply augmentation, water conservation, water quality, siting issues, and consultation are critical factors to consider in planning.

3. SCIENCE COMMUNICATION

In this phase of the project, we investigated Australian water professionals' views about communication with 'interested publics'.

3.1 The context: scientists and science communication

The complexity of science communication and its relationship to evolving technologies has been firmly established in areas such as biotechnology (Schibeci and Harwood, 2007; Besley & and Shanahan, 2005) and nanotechnology (Harwood and Schibeci, 2008; Lewenstein, 2008). Internationally, this complexity is also elaborated in major reports by the European Union (EU) (Felt et al., 2007) and in the USA by the National Research Council of the National Academies (Bell et al., 2009).

There is some research on scientists' conception of communication and engagement overseas, especially in the UK, where interviews with a group of scientists found that '"lay publics" emerged … less as social actors in need of reassurance about science through science education, but increasingly as legitimate and capable stakeholders or citizen partners' (Burchell et al., 2009:7). Davies (2008a) explored scientists 'talk', including their views about public involvement in science. Finally, Searle (2011) conducted a Web-based survey of 1,521 Australian scientists. Among the findings were:

> a large majority of the survey respondents agreed that scientists have a responsibility to communicate with the general public. Such communication was also found to be personally important to most scientists. These feelings of professional responsibility and personal importance existed in spite of scientists' workplace cultures where communication with the public was not, in general, formally included as part of their jobs, or recognised or rewarded when it occurred. Nearly three-quarters of the scientists surveyed said that it was not a part of their job description/duty statement or project requirement. (p. 307)

This online survey provides valuable data; however, no Australian studies could be located where scientists were interviewed face-to-face as in Davies' (2008a) study.

The importance of communication is also highlighted in the report to the Australian Minister for Innovation, Industry, Science and Research, *Inspiring Australia: A national strategy for engagement with the sciences* (2009). However, research focussing on the role of scientists in communication has been relatively sparse. Recent Australian studies have focussed on community attitudes to science and technology and on activities aimed at producing a scientifically literate population (eg. Department of Innovation Industry Science and Research 2009; Quantum Market Research 2007), but not on the views of scientists themselves.

Understanding scientists' views is important. A European Union commissioned report had amongst its mandates (Felt et al., 2007:9), 'How to further the stated EU commitment to improve the involvement of diverse elements of democratic civil society in European science and governance'. The report (p. 55), noted that one important trend has been that 'the PUS "paradigm of science dissemination" has been partially translated into what could be termed a "paradigm of dialogue and participation" or Public Engagement with Science (PES)'.

Despite this activity, little is known about scientists' beliefs regarding the role for 'interested publics' in government desalination policies. In this project, we investigated Australian technical experts' views of communication processes.

3.2 Method

Thirteen individual interviews and one group interview with three technical experts were conducted: that is, 16 participants in all. Interviews were carried out and audio-recorded at various times throughout 2010-2011.

Interviewees included individuals from a variety of backgrounds – both academic and non-academic, research and industry professionals.

The following four themes were explored in the interviews:

- *Engagement*. Participants were asked questions relating to the range of 'publics' with whom they engage as well as the purpose and experiences of this engagement.

- *Knowledge Production*. This section explored who should participate in the production of knowledge and why. Participants were also asked who should decide what 'the community' should know as well as their thoughts on the role that non-academics (as understood by the participants) should have in knowledge production.

- *Communication*. This section asked if participants felt that 'the public' (as understood by the participant) lacked understanding.

- *Research Practice and Personal Praxis.* This section related to the participants' perceptions of their roles in contributing to desalination and how their research will contribute to community action on desalination and the obstacles they face in conducting research in this field.

Summary of findings

Interviewees have been numbered P1, P2, P3 (Participant 1, 2, 3 and so on…) in the findings summarized below. Where comments from the interviewer are required in order to add context, the Interviewer will be labelled as 'I:'.

3.2.1 Engagement

This section explored participants' conceptions of engagement, as well as the purpose and experiences of this engagement.

Two interviewees suggested that engagement with 'the public' is an obligation resulting from funding more than an actual belief, on the part of the interviewee, that this kind of engagement is beneficial or essential to the development of a project or research.

> P7: we have to make sure that we do communicate the ideas because of that government funding. It's just I suppose, from my point of view an ethical requirement. If you get public funding, the information you gather is public.

> P8: Ah, well we usually have to find a funder for research so that's one of the (slight laugh), one of the groups we work with and that could be organisations like the smart water fund or the National Centre of Excellence for Desalination etc, so those types of organisations.

Some participants commented on their overall experience and ease of engaging with 'the public'.

> P7: They don't necessarily know everything that's been presented to them but the bits they understand um, there is always a bit of back and forth over whether we agree about what's being said and how, whether they're getting the information they actually need from it.

3.2.2 Knowledge production

Participants were asked to tell us their views about knowledge production. One had a holistic view of this issue:

> P1: we're all involved in the production of knowledge. Universities, industry, um, government, everybody.

Others viewed this issue as one of 'collaboration'; they saw collaboration as being integral to the production of knowledge but with no obvious suggestion as to who should be collaborating. One said:

> P7: I've always been one who looks for applications um and, research that will have a defined and definite impact on society. So I very strongly believe in having a collaboration. Getting, talking with the government bodies, the water authorities, industry. And where it's possible the general public.

This same participant used a specific example that clearly demonstrated who/what can affect decisions about the production of knowledge, in this case, local councils.

> P7: So it's useful to have that industrial and that non-academic component to I suppose ground a researcher and let them know what is actually being done and while their research might be valuable and useful and give about, answer some questions they need to remember that there is then the application of that. And that often gets missed so the research gets done, sometimes it's communicated sometimes it's not but it doesn't ever get applied or it won't get applied straight away. There's that lag time between research and industry. I mean, um and as I said at the beginning, also the questions that get asked….
>
> …I mean, one of the things that came up in the sports field irrigation project, everyone knows in the southern half of Australia you want to change your cool season turf to a warm season turf, because that uses less water but the water authorities just keep telling the councils to do it. The councils do it, only to find they have all sorts of problems 'cause no one had ever understood what changing that turf meant to sport. So they'd go out and try and play AFL and try and bounce the ball and the ball wouldn't bounce anymore. So getting that sort of feedback from the councils was incredibly important because it ended up changing part of the project to try and answer those questions so that there was some resource available for councils telling them what changing the turf would mean to them and to the people who used it.

Participants were also asked to comment on who decides what the community should know. Two participants offered the following views.

P3: obviously the concern is that people feel that the corporate knowledge is giving them a competitive advantage and therefore they wanna keep that close to their chest... I think it should be a completely transparent process and I think if those that want more information um, they need to be able to get it

P7: too often scientists shy away from communicating their ideas. Um, they will communicate with their peers but they won't necessarily get the idea out there to the general public. Maybe it's for fear that they'll be branded as, I don't know, um uninspired, or there's that general, general belief by the public that scientists sort of do their own thing and don't do anything relevant. Maybe they're worried that people won't understand what they're doing or have the ability to effectively communicate what they're doing. But I think it's important for a range of people to understand what is happening. Um, and it's very useful for the ideas that scientists have had to be communicated with different groups and to make sure that those groups are targeted.

3.2.3 Communication

One issue about which views were sought was about 'communication', 'the public' and 'public understanding'.

P1: Um, I think that that's an inherent human trait. Um, I think scientists lack an understanding of politics. I think the general public have a lack of understanding of science.

P2: even desal is not that complicated. I think If it's put in good slides and good presentations by a good presenter in a nice, simple format people can understand it without there being much issue.

P3: Really, it needs to be written and presented in a format that is digestible and you know, obviously some of these concepts are technical but still, I mean people understand. You have to make an assumption that people you know, people understand entry-level science..

P8: And sometimes they begin to believe you when you work with them rather than just be told by you at a meeting.

Participants commented on the responsibility of communicating information/ knowledge in these terms:

P1: researchers have a fundamental requirement to um, communicate what they have learnt but not to make the, the public in general familiar or confident in that particular piece of research.

P3: I think that the production of knowledge, there's a responsibility on the person doing the development to get that information out there into the public and scientific arenas.

This was elaborated by one of the participants when asked if they agree with the opinion that one of the reasons there's a reaction against some scientific endeavours is that "the public" lacks understanding, they replied:

P2: Yes I 100% agree, a 100% agree. We've just got to provide them with information and articulate it in such a way that they understand it.

P7: community opposition does come about, not just from a lack of scientific understanding but also a range of other factors. And, education is not necessarily the way that that will be overcome. There are some who will always just have a strong opposition and it won't necessarily

> be a logical opposition. Um and even using the term 'we just need to educate the public', always frightens me a little because we're saying the public isn't smart enough to understand on their own.

The following response was to an interviewer question about challenges that could be faced when trying to communicate possibly very technical information and concepts to "the public" or "the community":

> P12: I think people have got the understanding, you know, before we got the first desal plant they said 'well you're gonna take the salt out, what are you going to do with it?', you know. So they didn't get that we didn't end up with a pile of salt sitting on the um, site down there. And that's a question that we haven't seen for a long time.

The participants generally demonstrated a 'deficit' model of communication, although there were signs that some of them had begun to go beyond this view of communication.

3.2.4 Research practice and professional practice

The final section explored research practice, personal practice and how these practices might influence participants' perceptions of their role in contributing to desalination. We asked; 'Does the fact that your research is about desalination make you question or reflect on how your research will contribute to action on desalination?'

> P6: Yeah definitely. My undergraduate degree was in environmental management, um, ah, um I have a strong understanding of, of many environmental issues and one of the big ones is waste management and um so, what concerns me is what happens to the thousands of membranes at the end of their life um, and so I would hope that the research that we're doing is going to contribute to that and make, yeah I think make the whole cycle of desalination a little bit more closed. A bit of a closed loop so that the public can see and um, that we're trying to do something rather than just making water (laugh).
>
> I: And would you say um, the question of how your research contributes to environmental sustainability in this case was a major impetus for taking on that research? Ah, obviously there's always a balance between funding, what's interesting and what's good for society and trying to balance those up but we need to eat, but we need to do stuff that's interesting but what's the kind of proportions of how you came to your research?
>
> P6: Um, generally the research has really been um, just finding its way to me (laughs).

Another participant reflected on how practices influenced 'the public good'.

> P7: Um, I always, I suppose I always think through that. Ah but I suppose you, I haven't specified what my NCED project was, but it is far more controversial than desalination um, because it relies on coal seam gas-which is an even more highly controversial topic. And the ethics behind that always has me a little concerned.

The influence of desalination research on government policy was described in these terms by another participant:

> P8: No, have water, can be limited by water availability. In some of our projects would look to be directly influencing government policy. So in the past we've done projects where we've looked at ah, guidelines for industrial use of recycled water and one of the outcomes from that would be

> to get that report taken up by some of the policy um, writers and regulators. Um, so then it gets distributed quite broadly in some of the ah, ah, the guidance manual goes out with those policies and we're putting in a proposal on that for desalination as well, which is more about guidelines around brine management.

Finally, one participant was not very positive about the basis of the actions of legislators:

> P4: And then when you start talking about what you have to do to the environment to build another dam, what is happening to forests, what is happening to the whole area where this dam is, is created and then you find out that actually your rain is mostly eh, 3-5 kilometers offshore and everything goes straight to the sea and there is no way you can catch it. If you start talking about those things suddenly you know people start to understand. I found out that those who I talk to they understood that it's not that easy that when I walk out my door and it's raining I'm against desalination and when it doesn't give a drop from the sky for two months I'm suddenly after desalination. And then quite often this is the politicians' way. You know, they, they are very populist. If it's raining you have plenty of those guys saying catch the bloody rain.

3.3 Discussion

Many handbooks, websites and reports provide suggestions to scientists on how-to and with whom-to engage. These are produced by the water supply bodies, public and private, and affiliated businesses such as PR firms. Whilst these do not express what the scientists feel or think, they do represent the issues of public engagement that are deemed important by these organizations (California Desalination Planning Handbook, 2008; CariSal Corporation, 2006; SKM Consulting, 2012; TECHNEAU Executive Summary, 2010; WATERLAB, 2012). These sources generally advise 'stakeholder' involvement or empathy with 'consumers'. Similarly, for professionals in the chemical industry the advice is that 'the public' require reassurances (Burningham et al, 2007).

More broadly, a House of Commons report (2008-9) in the UK included a summary of a 2006 survey into the attitude of scientists towards public engagement. The results show that scientists see 'informing the public' as their primary duty (and they are frequently committed and skilful at this). Yet whilst 'the public' trust scientists, they demand a two-way conversation.

Wilsdon and Willis (2004) in their book, *See-Through Science: Why Public Engagement needs to move upstream*, claim that whilst dialogue and understanding between scientists and publics has been strongly encouraged in more recent years, some false assumptions persist, including the views that 'the public' focus on the consequences of technology rather than what drives innovation in the first place, and that important decisions should fall to experts.

In considering all these exhortations, we have to consider seriously the question, do these communication approaches 'work'? Sless and Shrensky (2001) suggest strongly that there is little evidence that it does; indeed: 'We think that science communication activities in our society are like rainmaking ceremonies in nonscientific societies' (p. 97). They urge that communication be viewed as a conversation.

What did we learn from what the technical experts told us? Overall, we can say that the participants seemed to believe in a 'deficit' model of communication. However, there were signs in their responses that some of them had begun to go beyond this view of communication. This finding is consistent with that reported by Davies (2008b) in the UK:

> scientists' talk … is constantly modified, negotiated and switched to create a spectrum of different kinds of depictions. … there is diversity and disjunction, indicating that, though some discourses may be more accessible and fully formed than others, scientists have access to a repertoire of discourses which they can use for particular discursive purposes. (p. 32)

These signs of thinking beyond the 'deficit' model are encouraging, because they suggest that productive communication between science and other experts may be possible in areas such as desalination.

4. REFERENCES

Ajzen, I. 1988 *Attitudes, personality, and behavior* Milton Keynes: Open University Press.

Ajzen, I. 1991 The theory of planned behaviour, *Organizational Behavior and Human Decision Processes* 50(2)**,** pp. 179-211.

Anderson, J. M. 1996 The potential for water recycling in Australia — expanding our horizons. *Desalination* 106(1-3): 151-156.

Anderson, J. 1999 *One Nation or Two? Securing a Future for Rural and Regional Australia*. Address to the National Press Club, Canberra.

Austin, P. 1999 City-country divide still challenging. *Stock Journal*. Adelaide.

Australian Water Association 2010 *Attitudes towards water in the Australian community - Summary report,* Australian Water Association: 1-11.

Berkes, F., Colding, J. & Folke, C. (eds.) 2003 *Navigating Social- Ecological Systems: Building Resilience for Complexity and Change,* Cambridge: Cambridge University Press.

Besley, J.C., & and Shanahan, J. 2005 Media Attention and Exposure in Relation to Support for Agricultural Biotechnology, *Science Communication*, 26(4) 347-367.

Bessant, B. 1978 Rural Schooling and the Rural Myth in Australia. *Comparative Education* 14(2): 121-132.

Blainey, G. 2001 *The Great Divide*. Boyer Lectures. Australia, Australian Broadcasting Corporation.

Botterill, L. C. 2006 Soap Operas, Cenotaphs and Sacred Cows - Countrymindedness and rural policy debate in Australia. *Public Policy* 1(1): 23-36.

Botterill, L. C. and M. Fisher, Eds. 2003 *Beyond drought – People, policy and perspectives*. Melbourne, CSIRO Publishing.

Brackertz, N., I. Zwart, Meredyth Denise and L. Ralston 2005 *Community Consultation and the 'Hard to Reach' - Concepts and Practice in Victorian Local Government.* Melbourne, Swinburne Institute for Social Research.

Bullard, R. D. 1990 *Race, Class, and the Politics of Place. Dumping in Dixie: Race, Class, and Environmental Quality*. Boulder, CO, Westview Press.

Bullard, R. D. and G. S. Johnson 2000 Environmental Justice: Grassroots Activism and Its Impact on Public Policy Decision Making. Journal of Social Issues 56(3): 555-578.

Burn, S., DeSilva, D., Eiswirth, M., Hunaidi, O., Speers, A. & Thornton, J. 1999. Pipe leakage - Future challenges and solutions. Wagga Wagga: CSIRO.

Burningham, K., Barnett, J., Carr, A., Clift, R. and Whermeyer, W. 2007 'Industrial constructions of publics and public knowledge: a qualitative investigation of practice in the UK chemicals industry' Public Understandings of Science, 16, 23-43.

California Desalination Handbook 2008 Gregory Bourne, Managing Senior Mediator, Center for Collaborative Policy (CCP), California State University Sacramento

www.water.ca.gov/desalination/pud_pdf/Desal_Handbook.pdf

CariSal Corportation 2006 8 Community engagement, stakeholder consultation, and involvement ... idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2084904

Cheers, B. 1990 Rural Disadvantage in Australia. *Australian Social Work* 43(1): 5-13.

Christen, K. 2005 Water Reuse: Getting Past the 'Yuck Factor', *Water Environment and Technology* 17(11), pp. 11-15.

Chu, P.-Y. & Chui, J.-F. 2006 Factors Influencing Household Waste Recycling Behavior - Test of an integrated Model, *Journal of Applied Social Psychology* 33(3), pp. 604–626.

Ciriacy-Wantrup, S. V. and R. C. Bishop 1975 Common Property as a Concept in Natural Resources Policy. *Natural Resources Journal* 15: 713-727.

Clarke, J. M. & Brown, R. R. 2006 Understanding the Factors that Influence Domestic Water Consumption within Melbourne, *Australian Journal of Water Resources* 10(3), pp. 261-268.

Committee on the Human Dimensions of Global Change & National Research Council 2002 New Tools for Environmental Protection: Education, Information, and Voluntary Measures. *In:* Dietz, T. & Stern, P. C. (eds.). Washington DC: National Academy Press.

Commonwealth of Australia 2005 Public hearing evidence of Keith Alder. Standing Committee on Industry and Resources: Developing Australia's non-fossil fuel energy industry. Official Committee Hansard, House of Representatives. Sydney.

Commonwealth Scientific and Industrial Research Organisation 2001 Submission to the Australian Senate Inquiry into Australia's Urban Water Management. Canberra.

Corraliza, J. A. 2000 Environmental Values, Beliefs, and Actions - A Situational Approach, *Environmental and Behaviour* 32(6), pp. 832-848.

Cowan, G. and A. Arsenault 2008 Moving from Monologue to Dialogue to Collaboration: The Three Layers of Public Diplomacy. *The Annals of the American Academy of Political and Social Science* 616: 10-21.

Davies, S. R. 2008a Constructing Communication: Talking to Scientists About Talking to the Public. *Science Communication*, 29: 413 - 434.

Davies, S. R. 2008b 'A bit more cautious, a bit more critical': Science and the public in scientists' talk. In Bell, A., Davies, S., and Mellor, F., (Eds.), *Science and its Publics: Following Scientists into Popular Culture*. Cambridge, UK: Cambridge Scholars Publishing.

Devine-Wright, P. 2005 Beyond NIMBYism: Towards an integrated framework for understanding public perceptions of wind energy. *Wind Energy* 7: 125-139.

Devine-Wright, P. 2007 Reconsidering public attitudes and public acceptance of renewable energy technologies: A critical review. Beyond Nimbyism: a multidisciplinary investigation of public engagement with renewable energy technologies. Manchester, ESRC. Working Paper 1.4.

Dietz, T., Ostrom, E. & Stern, P. C. 2003 The Struggle to Govern the Commons, *Science* 302**,** pp.

Dolnicar, S. and A. Hurlimann 2010 Desalinated Versus Recycled Water - What Does the Public Think? *Sustainable Water for the Future - Water Recycling Versus Desalination*. Escobar I and A. Schafer. (eds) Amsterdam, Elsevier. 91:1288-1293.

Dolnicar, S., Hurlimann, A. & Nghiem, L. 2010 The Effect of Information on Public Acceptance - The Case of Water from Alternative Sources, *Journal of Environmental Management* 91(6)**,** pp. 1288-1293.

Dolnicar, S. & Leisch, F. 2008 An Investigation of Tourists' Patterns of Obligation to Protect the Environment, *Journal of Travel Research* 46(4)**,** pp. 381-391.

Dolnicar, S., A. Hurlimann and B. Grun 2012. Water Conservation Behaviour in Australia. *Journal of Environmental Management* 105: 44-52.

Dukes, E. F. 1996 *Resolving public conflict - Transforming community and governance*. Manchester, Manchester University Press.

Ebreo, A., N. Linn and J. Vining 1996 The Impact of Procedural Justice on Opinions of Public Policy: Solid Waste Management as an Example1. *Journal of Applied Social Psychology* 26(14): 1259-1285.

Evans, C. A., Coombes, P. J. & Dunstan, R. H. 2006 Wind, rain and bacteria: The effect of weather on the microbial composition of roof-harvested rainwater, *Water Research* 40(1)**,** pp. 37-44.

Finkelstein, J. and L. Bourke 2001 The Rural as Urban Myth - Snack foods and country life. *Rurality Bites - The social and environmental transformation of rural Australia.* S. Lockie and L. Bourke. Annandale, NSW, Pluto Press.

Fletcher, T. H. 2003 *From Love Canal to Environmental Justice: The politics of hazardous waste on the Canada-U.S. Border.* Peterborough, ON, Broadview Press.

Flinn, W. L. and D. E. Johnson 1974 Agrarianism Among Wisconsin Farmers. *Rural Sociology* 39(2): 187–204.

Freudenburg, W. R. and S. K. Pastor 1992 NIMBYs and LULUs: Stalking the Syndromes. *Journal of Social Issues* 48(4): 39-61.

Gilg, A. & Barr, S. 2006 Behavioural attitudes towards water saving? Evidence from a study of environmental actions, *Ecological Economics* 57**,** pp. 400-414.

Golding, B. & Campbell, C. 2009 Learning to be drier in the southern Murray-Darling Basin - Setting the scene for this research volume, *Australian Journal of Adult Learning* 49(3)**,** pp. 423-450.

Graymore, M. L. & Wallis, A. M. 2010 Water savings or water efficiency? Water-use attitudes and behaviour in rural and regional areas, *International Journal of Sustainable Development & World Ecology* 17(1)**,** pp. 84-93.

Greenberg, J. 1990 Organizational Justice - Yesterday, Today, and Tomorrow. *Journal of Management* 16(2): 399-432.

Greenberg, M. R. 2009 NIMBY, CLAMP, and the location of new nuclear-related facilities: U.S. national and 11 site-specific surveys. *Risk Analysis: An Official Publication Of The Society For Risk Analysis* 29(9): 1242-1254.

Groothuis, P. A. and G. Miller 1994 Locating hazardous waste facilities: The influence of NIMBY beliefs. *American Journal of Economics and Sociology* 53(3): 335-347.

Gross, C. 2007 Community perspectives of wind energy in Australia - The application of a justice and community fairness framework to increase social acceptance, *Energy Policy* 35(5)**,** pp. 2727-2736.

Hamilton, L. C. 1987 Self-Reported and Actual Savings in a Water Conservation Campaign, *Environment and Behavior* 17(3)**,** pp. 315-326.

Hardin, G. 1968 The Tragedy of the Commons, *Science* 162(3859)**,** pp. 1243-1248.

Hoang, M., Bolto, B., Haskard, C., Barron, O., Gray, S. & Leslie, G. 2009. *Desalination in Australia*. Melbourne: CSIRO - Water for a Healthy Country National Research Flagship.

House of Commons: Innovation, Universities, Science and Skills Committee (2008-9) Putting Science and Engineering at the Heart of Government Policy. Eighth report. Great Britain: Parliament: http://books.google.com/books?id=zar8jxaO8sYC&pg=PA98&dq=scientists+public+engagement&hl=en&ei=l2DwTbaOKoOqvQPp-_y9BA&sa=X&oi=book_result&ct=result&resnum=5&ved=0CEAQ6AEwBA#v=onepage&q=scientists%20public%20engagement&f=false

Hunter, S. and K. M. Leyden 1995 Beyond NIMBY: explaining opposition to hazardous waste facilities. *Policy Studies Journal* v23(n4): p601(619).

Hurlimann, A. 2008 *Community Attitudes to Recycled Water Use: an Urban Australian Case Study – Part 2*, The Cooperative Research Centre for Water Quality and Treatment. Project number 201307.

Hurlimann, A. and S. Dolnicar 2010 When public opposition defeats alternative water projects – The case of Toowoomba Australia. *Water Research* 44: 287–297.

Inspiring Australia: A national strategy for engagement with the sciences (2009) A report to the Minister for Innovation, Industry, Science and Research. Canberra: Commonwealth of Australia.

Kaiser, F. G., Wolfing, S. & Fuhrer, U. 1999 Environmental attitude and ecological behaviour, *Journal of Environmental Psychology* 19, pp. 1-19.

Kariuki, J. G., K. J. Magambo, M. F. Njeruh, E. M. Muchiri, S. M. Nzioka and S. Kariuki 2012 Effects of Hygiene and Sanitation Interventions on Reducing Diarrhoea Prevalence Among Children in Resource Constrained Communities: Case Study of Turkana District, Kenya. *Journal of Community Health* DOI 10.1007/s10900-012-9560-1.

King, T. J. 2008. Domestic Water-saving Techniques and the Wonthaggi Desalination Plant: A survey of Local Residents' Attitudes. *Postal survey.* Waurn Ponds: Deakin University.

King, T. J. 2010 Damming the Flow - Cultural Barriers to Perceived 'Procedural Justice' in Wonthaggi, Victoria, *Cultural Studies* 16(1)**,** pp. 119-130.

King, T. J. & Murphy, K. 2009 Procedural Justice and the Australian Environment - The case of the Wonthaggi Water Desalination Plant, *Public Policy* 4(2)**,** pp. 105-121.

King, T. J. & Murphy, K. 2012 Procedural Justice as a component of the Not In My Backyard (NIMBY) syndrome - Understanding opposition to the building of a deslaination plant in Victoria, Australia, *Alfred Deakin Working Paper Series* 27**,** pp. 1-27.

Krogh, C. M. E. 2011 Industrial Wind Turbine Development and Loss of Social Justice? *Bulletin of Science, Technology & Society* 31(4): 321-333.

Lam, S.-P. 1999 Predicting Intentions to Conserve Water from the Theory of Planned Behavior, Percieved Moral Obligation, and Perceived Water Right, *Journal of Applied Social Psychology* 29(5), pp. 1058-1071.

Lawrence, R. L., S. E. Daniels and G. H. Stankey 1997 Procedural Justice and Public Involvement in Natural Resources Decision-Making. *Society and Natural Resources* 10: 577-589.

Leong, C. (2010) Eliminating 'Yuck': A Simple Exposition of Media and Social Change in Water Reuse Policies, *Water Resources Development* 26(1)**,** pp. 113-126.

Lewenstein, B. V., 2008. Science, the Public, and Power in Nanotechnology. *Nanotechnology: Ethics and Society.* Debra Bennett-Woods (ed.), CRC Press, Boca Raton, FL, pp. 237-239.

Lind, E. and T. Tyler 1988 *The Social Psychology of Procedural Justice.* New York, Plenum Press.

Lindell, M. and T. C. Earl 1983 How close is close enough: Public perceptions of the risks of industrial facilities. *Risk Analysis* 3(4): 245-253.

Lober, D. J. 1995 Why Protest? Public Behavioral and Attitudinal Response to Siting a Waste Disposal Facility. *Policy Studies Journal* 23(3): 499-518.

Lober, D. J. and D. P. Green 1994 NIMBY or NIABY - A Logit Model of Opposition to Solid-waste-disposal Facility Siting. *Journal of Environmental Management* 40(1): 33-50.

Luloff, A. E., S. L. Albrecht and L. Bourke 1998 NIMBY and the hazardous and toxic waste siting dilemma: The need for concept clarification. *Society & Natural Resources* 11(1): 81-89.

Lye, D. J. (2009) Rooftop runoff as a source of contamination - A review, *Science of the total environment* 407(21)**,** pp. 5429–5434.

Magyar, M. I., Mitchell, V. G., Ladson, A. R. & Diaper, C. 2008. Lead and other heavy metals: common contaminants of rainwater tanks in Melbourne. *In:* CSIRO (ed.) *Water Down Under.* Adelaide.

Marks, J. S. 2003 California Dreaming: Public Accep-tance of Potable Water Reuse. *The Austrlaian Sociology Association Conference*. University of New England: 1-10.

Marks, J. S., N. Cromar, H. Fallowfield and D. Oemcke 2003 Community experience and perceptions of water reuse. *Water science and technology - Water supply* 3(3): 9-16.

Marks, J. S., B. Martin and M. Zadoroznyj 2008 How Australians order acceptance of recycled water - National baseline data. *Journal of Sociology* 44(1): 83-99.

McCabe, K. A., S. J. Rassenti and V. L. Smith 1996 Game theory and reciprocity in some extensive form experimental games *Proceedings of the National Academy of Sciences of the United States of America* 93(23): 13421–13428.

McGoodwin, J. R. (1990) The Tragicomedy of the Commons, in: McGoodwin, J. (ed.) *Crisis in the World's Fisheries - People, Problems, and Policies*. (Stanford: Stanford University Press).

Minnegal, M., T. J. King, R. Just and P. D. Dwyer 2003 Deep Identity, Shallow Time: Sustaining a Future in Victorian Fishing Communities. *The Australian Journal of Anthropology* 14(1): 53-71.

Moore, S., Murphy, M. & Watson, R. (1994) A longitudinal study of domestic water conservation behavior, *Population and Environment* 16(2)**,** pp. 175-189.

Murphy, K. 2003 Procedural Justice and Tax Compliance. *Australian Journal of Social Issues* 38(3): 379-408.

Murphy, K. 2004 The role of trust in nurturing compliance: A study of accused tax avoiders. *Law and Human Behavior* 28(2): 187-209.

Murphy, K. and A. Cherney 2011 Fostering cooperation with the police - How do ethnic minorities in Australia respond to procedural justice-based policing? *Australian and New Zealand Journal of Criminology* 44(2): 235-257.

Murphy, K., T. J. King, Murphy, B. & J. Barkworth (in press). The 2010 Victorian environmental sustainability and water conservation survey - Survey methodology and preliminary findings. *Alfred Deakin Working Paper Series.*

National Academy of Engineering, Ed. 1986 *Hazards: Technology and Fairness*. Washington DC, National Acadamy Press.

National Health and Medical Research Council & Natural Resource Mangement Ministerial Council 2011. Australian Drinking Water Guidelines 6. *In:* National Water Quality Management Strategy. Canberra: Commonwealth of Australia.

Needham, S. 2008 *The potential for renewable energy to provide baseload power in Australia.* Parliament of Australia Department of Parliamentary Services Parliamentary Library: Information, analysis and advice for the Parliament Research Paper 9.

New Scientist 2012 Doubts raised over UN drinking water claim (http://www.newscientist.com/article/dn21550-doubts-raised-over-un-drinking-water-claim.html).

Ng, A. and M. Loosemore 2007 Risk allocation in the private provision of public infrastructure. *International Journal of Project Management* 25(1): 66–76.

Ormerod, K. J. & and Scott, C. A. 2012 Drinking Wastewater: Public Trust in Potable Reuse. Science, Technology & Human Values, doi:10.1177/0162243912444736

Ostrom, E. 1990 *Governing the Commons - The Evolution of Institutions for Collective Action* (Cambridge: Cambridge University Press).

Ostrom, E. 2009 A General Framework for Analyzing Sustainability of Social-Ecological Systems, *Science* 325**,** pp. 419-422.

Ostrom, E., Gardner, R. & Walker, J. (eds.) 1994 *Rules, Games, and Common Pool Resources,* Ann Arbor: University of Michigan Press.

Po, M., Kaercher, J. D. & Nancarrow, B. E. 2003 Literature Review of Factors Influencing Public Perceptions of Water Reuse. Canberra: CSIRO Land and Water.

Porter, N., B. E. Nancarrow & Syme, G. 2004. Drinking water aesthetics - An evaluation of the introduction of improved scheme waters, Wanneroo Groundwater Treatment Plant. A confidential final report to the Water Corporation, WA [restricted access], CSIRO Land and Water Client Report.

Poteete, A. R., Janssen, M. A. & Ostrom, E. 2010 *Working Together - Collective Action, the Commons, and Multiple Methods in Practice* (Princeton University Press: Princeton).

Price, J., Fielding, K., Leviston, Z., Bishop, B., Nicol, S., Greenhill, M. & Tucker, D. 2010. Community Acceptability of the Indirect Potable Use of Purified Recycled Water in South East Queensland: Final Report of Monitoring Surveys. Brisbane: CSIRO - Urban Water Security Research Alliance

Pricea, J., Fielding, K. & Levistona, Z. (2012) Supporters and Opponents of Potable Recycled Water: Culture and Cognition in the Toowoomba Referendum, *Society & Natural Resources: An International Journal***,** pp.

Roseth, N. 2006. Community Views on Water Shortages and Conservation. Salsbury, SA: The Cooperative Research Centre for Water Quality and Treatment.

Roseth, N. 2008. Community Views on Recycled water – the impact of information. Salisbury, SA: The Cooperative Research Centre for Water Quality and Treatment.

Roy, A. H., Wenger, S. J., Fletcher, T. D., Walsh, C. J., Ladson, A. R., Shuster, W. D., Thurston, H. W. & Brown, R. R. 2008 Impediments and Solutions to Sustainable, Watershed-Scale Urban Stormwater Management: Lessons from Australia and the United States, *Environmental Management* 42**,** pp. 344-359.

Russell, S. & Lux, C. 2009 Getting over yuck: moving from psychological to cultural and sociotechnical analyses of responses to water recycling, *Water Policy* 11(1)**,** pp. 21-35.

Scharlemann, J. P. W., C. C. Eckel, A. Kacelnik and R. K. Wilson 2001 The value of a smile: Game theory with a human face. *Journal of Economic Psychology* 22(5): 617-640.

Searle, S. D. 2011 Scientists' communication with the general public — an Australian survey. Unpublished doctoral dissertation, The Australian National University.

Simpson, J. 2012 Plain speaking about water - Experience from the trenches, in: HOWE, C. & MITCHELL, C. (eds.) *Water Sensitiive Cities*. (London: IWA Publishing).

Sless, D., & Shrensky, R. 2001 Conversations in a landscape of science and magic: thinking about science communication (pp. 97-105). In Stocklmayer, S.M., Gore, M.M., & Bryant, C. (Eds.). (2001) Science communication in theory and practice. Dordrecht: Kluwer.

Smith, S. 2004 The future of water supply. *Briefing Paper 4/2004.* Sydney: NSW Parliamentary library research service.

Smith, L. and J. Free 1996 *Developing a communications campaign for marine parks*. Melbourne, Victorian National Parks Association.

Stein, P. L. 2000 The Great Sydney Water Crisis of 1998, *Water, Air and Soil Pollution* 123(1-4)**,** pp. 419-436.

Syme, G. J., Nancarrow, B. E. & McCreddin, J. A. 1999 Defining the components of fairness in the allocation of water to environmental and human uses, *Journal of Environmental Management* 57(1)**,** pp. 51-70.

Syme, G. J., Nancarrow, B. E. & Seligman, C. 2000 The Evaluation of Information Campaigns to Promote Voluntary Household Water Conservation, *Evaluation Review* 24(6)**,** pp. 539-578.

TECHNEAU Executive Summary (2010) Executive summary Introduction Importance Approach Overview of ...www.techneau.org/.../Publications/Publications/.../D6.3.1-2._exec_summary. pdf

Trumbo, C. W. & O'Keefe, G. J. 2001 Intention to Conserve Water - Environmental Values, Planned Behavior, and Information Effects. A Comparison of Three Communities Sharing a Watershed, *Society and Natural Resources - An International Journal* 14(10)**,** pp. 889-899.

Truss, T. H., Warren, MP, 2005 *Speech to the Rural Press Club of Victoria.* Speech by the Federal Minister for Agriculture, Fisheries and Forestry, Melbourne.

Tyler, T. 1989 The psychology of procedural justice: A test of the group value model. *Journal of Personality and Social Psychology* 57.

Tyler, T. 1990 *Why People Obey the Law*. New Haven, Connecticut., Yale University Press.

Tyler, T. 1997 The psychology of legitimacy - A relational perspective on voluntary deference to authorities. *Personality and Social Psychology Review* 1(4).

Tyler, T. 2000 Social Justice: Outcome and Procedure. *International Journal of Psychology* 35(2): 117-125.

Upham, P. and S. Shackley 2006 Stakeholder opinion of a proposed 21.5MWe biomass gasifier in Winkleigh, Devon: Implications for bioenergy planning and policy. *Journal of Environmental Policy and Planning* 8(1): 45-66.

Victorian Government 2008. *Our Water Our Future–Fact Sheet–Desalination–Keystone of Victoria's Water Plan*. Melbourne.

Voutchkov, N. 2012 Overview of desalination status & future trends http://www.w-e-x.com/downloads/Nikolay%20Voutchkov.pdf

Walker, G. & Bulkeley, H. 2006 Geographies of environmental justice, *Geoforum* 37(5)**,** pp. 655-659.

WaterLab 2012 Projects – Center for Integrated Water Research, University of California, Santa Cruz. ciwr.ucsc.edu/projects.html

Zoellner, J., P. Schweizer-Ries and C. Wemheuer 2008 Public acceptance of renewable energies: Results from case studies in Germany. *Energy Policy* 36(11): 4136-4141.