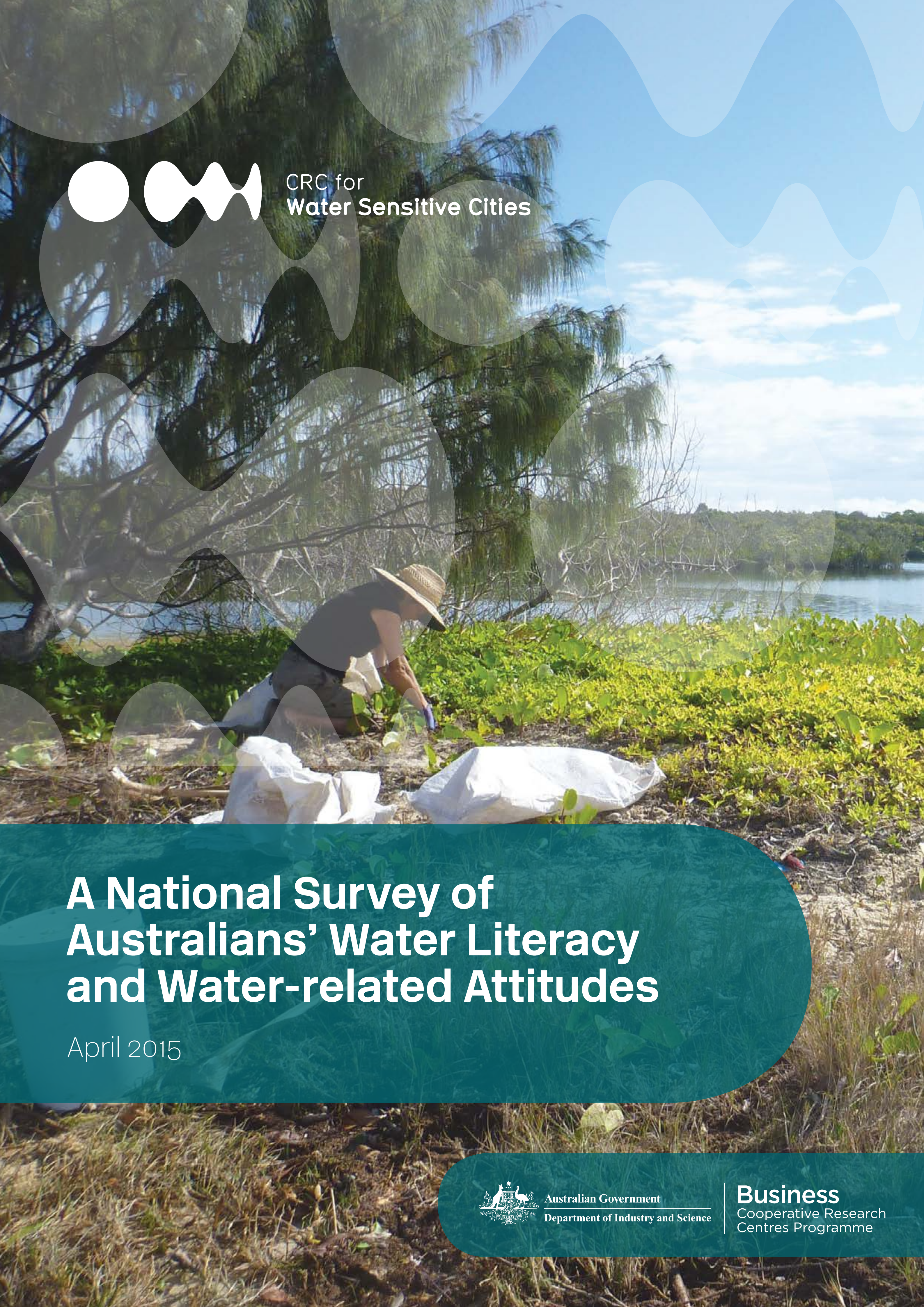

CRC for
Water Sensitive Cities

A National Survey of Australians' Water Literacy and Water-related Attitudes

April 2015

Australian Government
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Business
Cooperative Research
Centres Programme

A National Survey of Australians' Water Literacy and Water-related Attitudes
Engaging communities with Water Sensitive Cities (Project A2.3)
A2.3-1-2015

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Executive Summary

The current report describes research conducted as part of "Engaging communities with Water Sensitive Cities" (Project A2.3) within the CRC for Water Sensitive Cities. The aim of the present research was to establish a baseline understanding of Australians' knowledge of water and water-related issues. In the current report we use the term 'water literacy' to describe this water-related knowledge.

A national online survey of Australians 18 years and over was conducted from February to March 2014. The final sample comprised 5,172 respondents with approximately even numbers of males and females from across all states and the ACT (note Northern Territory respondents were excluded due to the small number and the inability to compare with other states). The sample was generally representative of the Australian population in terms of the gender, age, state of residence and education.

The survey asked a broad range of questions relating to demographic and cultural background, water conservation and pollution prevention behaviours, and knowledge of water and water management issues. The focus of the current report is on the sections of the survey that focused on respondents' knowledge and understanding of water issues, attitudes and acceptance of alternative water sources, extent of engagement in water-related activities, and sources of information about water.

The following key findings emerged from the survey:

- A majority of Australians demonstrated good knowledge of some water issues. These included that:
  - Fertilisers and pesticides used on gardens, large amounts of sediment, and soil erosion can negatively impact on waterway health (68%, 59%, 54%, 62% understand this respectively)
  - 69% understand that waterways can be damaged by storm water flows
  - 73% understand that the actions of households have consequences for waterway health
  - 74% understand that individual water conservation can significantly reduce water demand
  - 68% understand that planting native vegetation along waterway banks can improve the health of waterways
  - A majority (74%) have a clear or general sense of how the water cycle works and 56% know where their drinking water comes from.
- There were some aspects of water issues that were less well understood. Only a minority of the sample had good knowledge of the following:
  - 27% understand that domestic wastewater receives treatment before entering waterways
  - 32% of respondents understand that stormwater from roofs and roads does not get treated before entering waterways
  - 30% understand that wastewater and stormwater are carried through different pipes to get to waterways
  - 39% of respondents know what catchment their household is part of
  - 46% understand the definition of a catchment
  - 41% understand that the amount of water available for use is finite.

- In relation to the costs and complexity of water treatment, a minority (37%) disagree that delivering clean, safe drinking water to households is a simple, low cost process, and a minority (42%) agree that the costs of managing water infrastructure are high. Overall, a minority (42%) of respondents think that the cost of water is too high with 23% disagreeing and 24% providing a neutral response.

- The overwhelming majority of respondents (between 80% and 90%) believe that a range of behaviours and policies (e.g. reducing litter, upgrading sewage treatment plants, reducing industrial pollution, building raingardens, installing rainwater tanks) can positively impact on waterway health. Three behaviours/policies garnered lower beliefs: less than 72% of respondents believe that covering exposed dirt, 65% believe that reducing commercial fishing, and 72% believe that reducing car usage will have a positive impact on waterway health.

- Attitudes to recycled wastewater mirror past research in that there is greater acceptance of its use for non-drinking than drinking purposes. More people are unwilling to use recycled water for drinking than are willing. In relation to support for desalinated water, the dominant response is support for non-drinking purposes and neutral for drinking purposes. Most people support the use of stormwater for public space irrigation but only a minority support the use of treated stormwater for drinking. A majority of people are not willing to install a raingarden in their property but a majority support the installation of raingardens in their street.

- Respondent activities undertaken near local waterways include passive bystander activities (enjoying scenery/photography/native animals and plants/bird watching); physical activities (walking, hiking or cycling); meal-related activities (picnics and barbeques); water-based activities (swimming, surfing, going to the beach).

- In the national sample, the majority of respondents (51%) had not seen or heard any information about water in the last six months. Amongst those who had seen or heard information, the three most frequently cited sources of information (in order of frequency) were: water utility bill (26%), TV (24%), and newspapers (18%).

- Statistical analyses to compare responses for selected questions across states, education level and home ownership revealed significant but very small differences. The general pattern is that Western Australian and Queensland respondents had higher levels of knowledge and Victorian respondents lower levels; respondents with higher education (e.g., university degree) had higher levels of knowledge and home owners had higher levels of knowledge than renters. Western Australians, home owners, and more educated respondents were also more likely to have seen information about water in the last six months from a range of sources.

1. Introduction

The move toward water sensitive cities will require substantial changes to the current urban water management paradigm. According to Brown, Keath and Wong (2009), water sensitive cities will "integrate the normative values of environmental repair and protection, supply security, flood control, public health, amenity, liveability and economic sustainability, amongst others" (p. 854). This transition represents a significant departure from the status quo and requires "a sophisticated and engaged community" who prioritise sustainability and resilience to climate change (Brown & Farrelly, 2009, p. 854). Broad community acceptance of changes in practice and technology are fundamental to the implementation of more sustainable forms of urban water management (Wong & Brown, 2009). This raises important questions of how to engage the community in ways that create knowledge and readiness for the policy and practice changes required to transition to water sensitive cities. A critical first step in the engagement process is establishing an understanding of the community's current understanding and knowledge of sustainable urban water management. Through this process a more targeted engagement strategy can be devised that channels resources to the places and tasks where they are most needed. The aim of the current research is to establish a baseline understanding of Australians' knowledge of water and water-related issues. In addition, the research examines the extent to which Australians engage in activities that bring them into contact with water and also assesses Australian's attitudes to alternative water sources.

1.1. Past research on water literacy

It is clear that very little is known about Australians' knowledge of water and water-related issues. In the current report we will use the term 'water literacy' to refer to Australians' water-related knowledge. Past research has demonstrated that Australians are concerned about water: For example, 90% of Australians reported that water was a somewhat or very important issue in the 2010 Federal Election and one in four expressed high levels of concern about running out of water (OgilvyEarth, 2010). Despite this level of concern, the same survey reported that fewer than one in five Australians thought that they were very informed about alternative water sources such as recycled water and desalinated water. A recent Australian Academy of Science study of science literacy had two questions that pertained to water (Wyatt, 2013). The first question showed that 39% knew that the Earth's surface was covered by 70% water and an additional 34% reported the coverage as between 71 – 80%. The results also showed that a quarter of Australians are not sure of the percentage of the Earth's water that is fresh with only 9% correctly giving the answer as 3% of the Earth's water, down from 13% who gave the correct answer in 2010 (Wyatt, 2013).

To our knowledge there has only been one study conducted in Australia that has specifically focused on assessing water literacy among community members. The study was commissioned by the Healthy Waterways Partnership of Southeast Queensland, a non-governmental organisation tasked with improving the health of waterways in the region. The Healthy Waterways study involved 3,700 residents of South East Queensland and was designed to benchmark awareness of, and attitudes toward, waterway health in the region. The findings in relation to knowledge were mixed. For example, 70% of respondents knew that waterways can be damaged by stormwater flows and 80% were aware that preventing oils from being poured down drains could positively impact waterway health. On the other hand, 35% of sampled respondents believed that the use of riverbanks for camping, fishing, and swimming had no impact on waterway health. Moreover, 39% of respondents either incorrectly thought that domestic wastewater receives little or no treatment before entering waterways or they did not know whether it receives treatment. Finally, one in four respondents did not know where their drinking water comes from.

Notwithstanding the limited Australian data, there have been a number of American studies that have attempted to gauge public knowledge of various water issues and concepts (Bartlett, n.d.; Giacalone et al., 2010; Hoppe, n.d.). For example, in an effort to determine willingness to pay for water and related infrastructure, researchers from

Colorado State University surveyed 6250 respondents across 17 Western US states (Pritchett et al., 2009). In that study, participants' familiarity with 14 water related terms (e.g., groundwater, water reuse) was used to assess water literacy. The results showed that less than half of the respondents were very familiar with the listed terms. Interestingly, a significant positive relationship was identified between knowledge and willingness to pay for water related infrastructure.

Another study conducted as part of Clemson University's 'Carolina Clear' program in mid-2009 assessed residents' attitudes, behaviours, intentions, and knowledge related to watershed issues in four different geographical areas of South Carolina (Giacalone et al., 2010). Another study, conducted as part of Clemson University's 'Carolina Clear' program in mid-2009, assessed residents' attitudes, behaviours, intentions, and knowledge related to watershed issues in four different geographical areas of South Carolina (Giacalone et al., 2010). The survey of 1,599 residents showed that 78% of respondents correctly identified that stormwater was not treated prior to waterway discharge in their region, however, only 28% of respondents correctly chose the definition of a watershed as 'all of the land area that drains to a specific river or lake.' Moreover, when asked about sources of pollution, many respondents incorrectly believed that industrial sites had the greatest impact on waterways and that parking lot runoff had much lower impact. Further research conducted in North Carolina also sought to gather baseline data about participants' stormwater knowledge, as well as practices that impact stormwater runoff and perceptions about water quality (Baggett, Jefferson, & Jeffrey, 2008). Responses from a sample of 1,000 participants demonstrated that only 38% of respondents knew that stormwater flows to the nearest waterway. In contrast to the findings of the previous study, almost 30% of respondents incorrectly thought that stormwater is treated prior to discharge (Baggett, Jefferson, & Jeffrey, 2008). Finally, a study conducted annually in Maine from 1996-1999 included a question that asked about "What common practices and activities in homes and communities, other than factories, are you aware of that contribute to water pollution in Maine?" (Hoppe, n.d.). The most common answer (31% average for all four years) was "don't know." The second most common response (17% average for all four years) was "septic systems."

Taken together, past research suggests that there may be significant gaps in peoples' knowledge of water-related issues. It is also clear, however, that little is known about Australians' knowledge and awareness of water and water management outside of the study conducted in South East Queensland in 2010. The purpose of the current report is to therefore provide a baseline understanding of Australians' water literacy. The findings presented within this report are part of Project A2.3 within the CRC for Water Sensitive Cities.

The aim of the current research is to:

- establish a baseline understanding of Australians' water literacy
- assess attitudes to alternative water sources
- assess whether Australians are receiving information about water and where this information comes from
- assess the extent to which Australians' engage in activities that bring them into contact with their waterways

To achieve these aims, a national survey was conducted of 5,194 Australians aged 18 years and over. The current report is a presentation of the descriptive statistics related to the questions that assess water literacy, attitudes and behavioural experience. Inferential statistics are also conducted for selected questions to test for differences in responses across state, education level, and home ownership. These comparisons were chosen as they were thought to be most likely to be associated with differences in water literacy. Future reports will describe analyses that explore whether there are significant relationships between the knowledge, attitudinal, and behavioural variables measured in the national survey.

2. Methodology

2.1. Participants and recruitment

The current sample comprised a total of 5,194 respondents who were recruited via a social research company permission-based online panel. As part of the recruitment process, all eligible panel members were contacted via email and asked if they were willing to participate in the current project. Participants received the standard compensation provided by the social research company for their participation (i.e., points and entry into a bi-monthly cash draw). The sampling frame was designed to ensure representativeness in terms of gender, age, education, and state of residence. However, the small sample of Northern Territory residents (N = 22) precluded comparisons with other states and therefore these respondents were excluded from the final sample. Thus, the findings presented in this report are based on the remaining 5172 respondents from all states and the ACT. A breakdown of the sample across states is shown in Table 1. As Table 1 shows, the breakdown of the sample across states is generally equivalent to the ABS data.

Table 1. Australian States and Territories Breakdown (2011 Census Data in Parentheses)

	N = 5172	%
NSW+ACT	1883	36.3 (33.86)
VIC	1248	24.0 (24.89)
TAS	118	2.3 (2.30)
SA	395	7.6 (7.41)
QLD	1036	19.9 (20.15)
WA	492	9.5 (10.41)

Attempts were made to match the current sample with the population characteristics of the Australian Bureau of Statistics 2011 Census in terms of age, gender, education background, and housing tenure (see Table 2). As Table 2 shows, the sample was representative in terms of gender and housing tenure. Respondents' ages ranged from 18 to 96 years (M= 47.11; SD = 16.59) (note that two respondents indicated their age as 114 years, however, as their responses to other questions did not fit with this age profile, this suggests an error in their responses and we excluded their ages from the age range). Overall, the sample was somewhat over-represented in age categories but not markedly so.

This over-representation was because our sample did not include participants under 18 years of age whereas the ABS data do. As the education levels we used in the survey differed from the ABS categories, we were only able to compare the proportion of our sample with university degrees to the proportion of the Australian population with university degrees. As Table 2 shows, there is a very small over-representation of university degree holders in our sample.

Table 2. Individual Characteristics as a Percentage of the Sample (2011 Census Data in Parentheses)

Characteristics	Proportion of survey sample (ABS %)	
Gender		
Males	49.1	(49.4)
Females	50.9	(50.6)
Age		
18 to 24	9.2	(9.96)
25 to 34	18.2	(14.3)
35 to 44	19.5	(14.15)
45 to 54	18.5	(13.59)
55 to 64	15.7	(11.47)
64 +	18.9	(14.0)*
Education		
Up to Year 12	30.9	
Trades/TAFE/Diploma	33.9	
University Degree	35.1	(33.69)**
Housing Tenure		
Owned Property	69.6	(67.0)
Rented Property	30.4	(29.6)*

**Note that the ABS data does not add to 100% because there are other categories in their data (e.g., 0 – 14 years, other forms of housing tenure).*
***Note that we only provide ABS data for university-level education as the ABS education categories do not map on to how education was measured in the current study*

2.2. Procedures and measures

Respondents agreed to take part in a survey of householders' associations with water, water behaviours and knowledge. The online questionnaire was administered over a period of 5 weeks in February-March 2014. The approximate time to complete the survey was 20-25 minutes. The questionnaire covered a broad range of demographic variables including cultural background, current residential status, current employment status, as well as water-related concepts (e.g., behaviours related to water conservation and water quality protection).

The focus of the current report is on the questions that relate to knowledge of water and water management, understanding of the impact of specific behaviour on water quality, the extent in which people engage in activities that relate to water, and people's attitudes toward alternative sources of water and water treatment.

2.2.1. Water knowledge

Participants' awareness of water and water management issues was assessed with 17 items (see Appendix A for the list of questions). These questions assessed knowledge of factors that impact on water quality, knowledge of water treatment and management, and general knowledge of catchments and the water cycle. A number of these items were modelled on a previous survey conducted by Healthy Waterways (James, Kelly, Brown, & Laffan, 2010). In keeping with the approach taken in the Healthy Waterways survey, most items were assessed using a 7-point Likert type scale where 1 = 'strongly disagree', 4 = 'neither agree nor disagree' and 7 = 'strongly agree'. There was also a "don't know" option. This approach was chosen over true or false response options as survey respondents often resist the notion that they are being 'tested'. For ease of presentation, the 'strongly disagree' and 'disagree' response options were aggregated into a new variable ("Disagree"). Similarly, the 'strongly agree' and 'agree' responses were also aggregated for form a new variable 'Agree'. The scale mid-point ('neither agree nor disagree') has been interpreted as a neutral response, although this response may also reflect a lack of certainty.

The responses to the water literacy questions reflecting these four response options (i.e., disagree, neutral, agree, don't know) are presented in the Appendices (e.g., Figures 1 to 17). For ease of presentation we also recoded the responses to these questions as accurate or inaccurate responses. If respondents gave an accurate agree or disagree response (depending on the wording of the question) they were coded as 1 whereas a neutral, don't know or incorrect agree or disagree responses was coded as 0.
To provide an example, respondents who agreed or strongly agreed that the fertilisers that householders use on their garden can have a negative impact on the health of waterways were considered to have given a correct response and were coded as 1; all other responses were coded as 0. All survey respondents were provided with the following two definitions prior to completing the knowledge based items.

(i) a waterway is a passage for water or a body of water, including all types of permanent and short term streams, rivers, wetlands and bays. This includes all estuaries, foreshores, bays, coastal and marine waters.

(ii) "stormwater is a sudden excessive run-off of water following moderate to heavy rainfall" were provided to respondents prior to them answering the knowledge questions.

2.2.2. Impact of actions on the health of waterways

Fourteen items assessed respondents' understanding of the impact of a range of actions on the health of waterways. Responses were made on a 5-point Likert type scale where 1 = 'very negative impact', 3 = 'no impact' and 5 = 'very positive impact'. The behavioral actions assessed ranged from individual actions such as placing cigarette butts in bins and reducing car usage through to institutional changes such as upgrading sewage treatment plants and designing urban areas to be more water sensitive. These items were adapted from the Healthy Waterways survey (James et al., 2010) and the specific questions are outlined in Appendix A.

2.2.3. Attitudes to alternative water sources and water management approaches

In terms of water-reuse, survey respondents were asked to rate their willingness to use recycled water for drinking and non-drinking purposes on a 5-point Likert type scale where 1 = 'not willing', 3 = 'neither unwilling or willing', and 5 = 'very willing'. Respondents were also asked how much they support the use of desalinated water for drinking and nondrinking purposes (1 =' do not support at all', 3 = 'neither unsupportive or supportive', 5 = 'completely supportive'). Attitudes towards the use of stormwater harvesting to irrigate public spaces and for drinking purposes were also assessed on a 5-point scale (1 = 'strongly disagree', 3 = 'neither disagree or agree', and 5 = 'strongly agree').

Prior to responding to a series of items about rain gardens, respondents were provided with the following explanation: "A rain garden is a water saving garden that is similar to a regular garden bed, but is designed specifically to capture stormwater from hard surfaces such as driveways, patios and roofs after it rains". Respondents were then asked whether they would be willing to install a rain garden on their property (yes, no), their level of support for installing a rain garden in their street (yes, no), or whether they are not interested (yes, no).

2.2.4. Engagement in water-related activities

To gauge the extent to which respondents came into contact with waterways they were asked how often they used their local waterways (defined as creeks, rivers, beaches in your region) to engage in 14 activities. All activities were rated on a 5-point Likert type scale where 1 = 'never', 2 = 'rarely', 3 = 'sometimes', 4 = 'often', 5 = 'very often'. The specific activities are outlined in Appendix A.

2.2.5. Sources of information about water

Respondents were asked whether they had seen or heard any information about water from a range of sources in the last six months (they could nominate as many sources as were applicable). There was also an option to say that they had not seen any information about water. The specific sources are shown in Appendix A.

3. Results

The following sections present the descriptive statistics for the questions related to knowledge, awareness of impacts of actions on water quality, attitudes to alternative water sources and management approaches, engagement in activities near waterways, and sources of information about water. We first provide the descriptive statistics for the full national sample. We then provide the results broken down by State for all questions except those related to waterway related activities as it was not thought that responses on these questions would differ markedly across states (and preliminary analysis did not show any differences). We also provide a breakdown across level of education for the knowledge questions, attitudes to alternative water sources, and sources of information. A breakdown across home ownership categories is also presented for the knowledge questions and source of information questions as these were the questions deemed to be most likely influence by home ownership. Inferential statistics are conducted to assess whether there are significant differences in responses depending on state, education level, and home ownership. A large sample size increases the power of statistical tests resulting in even small differences being statistically significant. Because of this we compute effect sizes for each analysis so that we can assess the meaningfulness of the difference. In addition, conducting a large number of analyses increases the chances of a Type 1 error (i.e., finding a significant difference when none actually exists). We counter this by adopting a more stringent alpha level of $p<.001$.

3.1. National Sample

3.1.1. Water knowledge

Responses are shown in Figures 1-4 (see also Appendix B, Figures 1-17 for more detailed responses). In general, the national sample demonstrates reasonably good knowledge of some aspects of water. As Figure 1 shows, a majority of respondents correctly identified that garden-related fertilisers and pesticides can affect the health of waterways, and that soil erosion, large amounts of sediment and stormwater flows can negatively impact waterway health. Knowledge was highest about the negative effects of fertiliser and stormwater flows and lowest about the effects of sediment.

Figure 2 shows that there were high levels of knowledge about the positive impacts of riparian planting on waterway health and that household water conservation preserves water. There was also a high degree of understanding that the actions of individual households can impact on the health of waterways.

Figure 3 shows that knowledge about water treatment was low with only a minority of respondents correctly understanding that domestic wastewater receives treatment before entering waterways, that stormwater does not receive treatment prior to entering waterways, and that wastewater and stormwater are not carried through the same pipes.

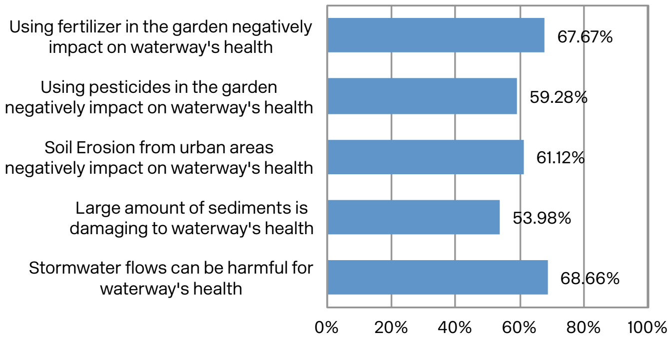


Figure 1. Knowledge of factors that can negatively impact on the waterway's health

Percentages represent the proportion of respondents who correctly agreed/strongly agreed or correctly disagreed/strongly disagreed (depending on the wording of the question). See Appendix 1 for more detail

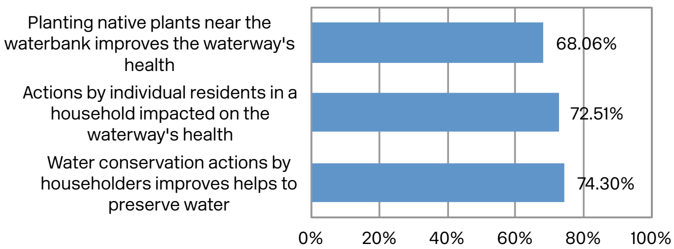


Figure 2. Knowledge of factors that can positively impact on the waterway's health

Percentages represent the proportion of respondents who correctly agreed/strongly agreed or correctly disagreed/strongly disagreed (depending on the wording of the question). See Appendix 1 for more detail

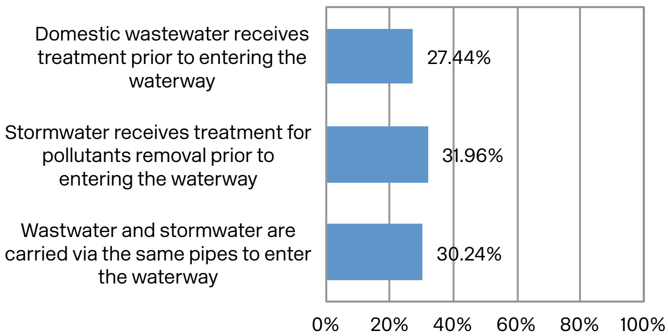


Figure 3. Knowledge of sources of water treatment

Percentages represent the proportion of respondents who correctly agreed/strongly agreed or correctly disagreed/strongly disagreed (depending on the wording of the question). See Appendix 1 for more detail

Finally, Figure 4 shows mixed levels of knowledge about the costs and sources of drinking water. A majority of respondents (although only just over 50%) say that they know where their household drinking water comes from but only a minority know what catchment their household is part or recognise that the amount of water available for use is finite. A majority of respondents understand that the costs of maintaining water infrastructure are high but only a minority of respondents understand that delivering safe, clean drinking water to households is not low cost and, overall, only a very small proportion of respondents (less than 10%) disagree that the costs of water are too high.

Figure 5 shows that somewhat more respondents were incorrect than correct in their definition of a catchment. On the other hand, Figure 6 shows that the majority (74%) say that they have a general or clear sense of what the water cycle involves. Note that knowledge of the definition of a catchment was assessed objectively (i.e., respondents had to choose the correct option from a list) whereas knowledge about the water cycle was self-reported.

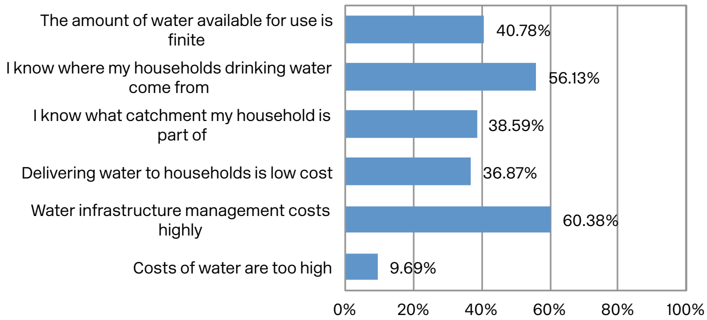


Figure 4. Knowledge of costs and sources of drinking water

Percentages represent the proportion of respondents who correctly agreed/strongly agreed or correctly disagreed/strongly disagreed (depending on the wording of the question). See Appendix 1 for more detail

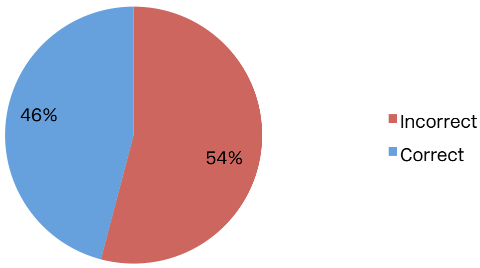


Figure 5. Percentage of respondents who correctly and incorrectly identified the definition of a catchment

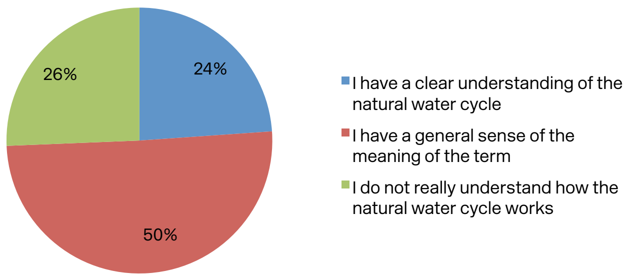
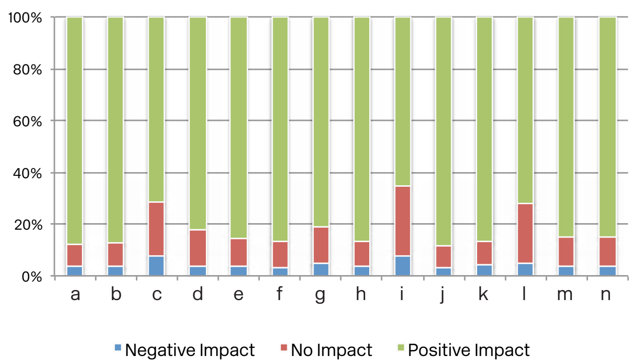


Figure 6. How much do you understand how the water cycle works?

3.1.2. Awareness of impact of behaviour/policy on water quality

As Figure 7 shows, the overwhelming majority of respondents were aware of the positive impacts of each of the surveyed behaviours and policies pertaining to water quality. In all but three instances, 80-90% of respondents judged the impact of the listed behaviours and policies to be positive. The three exceptions were as follows: (i) 71.7% respondents believed that covering exposed dirt has a positive impact on waterway health; (ii) 65.4% believed that reducing commercial fishing would have a positive impact on waterway health; and (iii) 71.8% believed that reducing car usage will have a positive impact on waterway health.



3.1.3. Attitudes to alternative water sources and treatment

Consistent with past findings, the data outlined in Figure 8 indicates that there is much a greater willingness to use recycled water for non-drinking water purposes than for drinking purposes. Specifically, the proportion of respondents not willing or somewhat unwilling (41.8%) to drink recycled water outweighed the proportion who were either willing or somewhat willing to engage in this action (35.6%). However, approximately 8 in 10 (80.92%) of the sampled respondents were either very willing or willing to use recycled water for non-drinking purposes.

Consumer attitude towards drinking desalinated water differed to that of drinking recycled water (see Figure 9). Specifically, 44.11% of the sampled respondents were somewhat or completely supportive of drinking desalinated water compared to only 35.56 being somewhat or very willing to drink recycled water. The majority of respondents (66.87%) were somewhat or completely supportive of the use of desalinated water for non-drinking purposes.

Respondent reactions towards stormwater reuse differed by purpose of use (see Figure 10). Specifically, approximately 8 in 10 respondents (78.3%) either agreed or strongly agreed that stormwater harvesting should be used as a source to water public spaces. However, just under one in two (47.5%) agreed/strongly agreed that treated stormwater was suitable for drinking purposes.

Finally, respondents were asked about their preparedness to install a rain garden. While less than 4 in 10 respondents (37.20%) were not willing to install a rain garden on their own property, more than 5 in 10 (56.00%) were willing for one to be installed in their street (see Figure 23).

Figure 7. Awareness of impact of behaviour/policy on water quality

←
a. Reducing litter
b. Cigarette butts in bins
c. Covering exposed dirt
d. Participation in environmental groups
e. Cooperation industry – government
f. Upgrading sewage treatment plants
g. Limiting residential development
h. Water sensitive urban areas
i. Reducing commercial fishing
j. Reducing industrial pollution
k. Recycling through council transfer stations
l. Reducing car usage
m. Building raingardens
n. Installing rainwater tanks

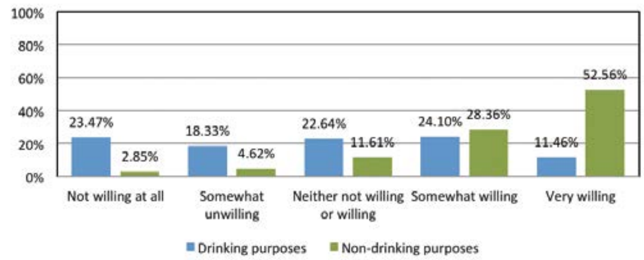


Figure 8. Willingness to use recycled water for drinking and non-drinking purposes

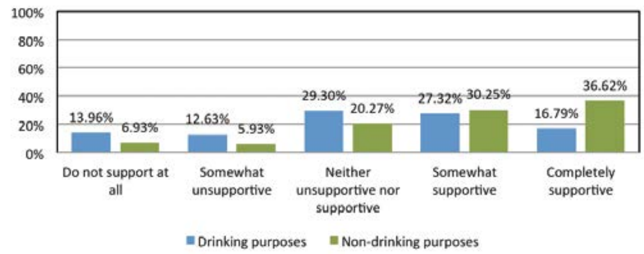


Figure 9. Support for using desalinated water for drinking and non-drinking purposes

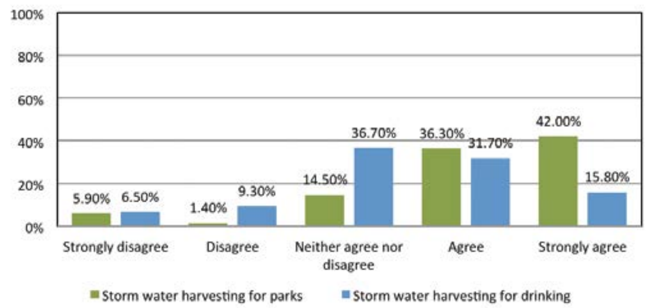


Figure 10. Attitudes toward the use of stormwater harvesting for water public spaces and for drinking purposes

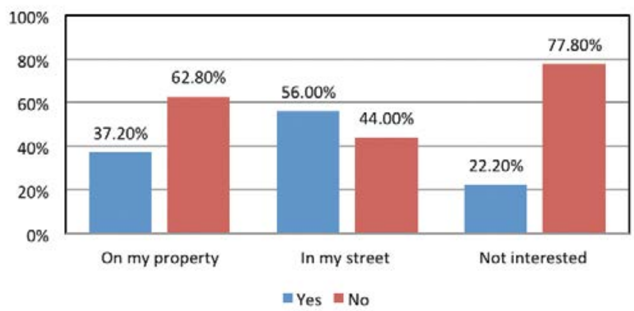


Figure 11. Interest in installing a raingarden in the property surroundings.

3.1.4. Engagement in activities near waterways

Figure 12 provides an overview of the most frequently cited water related activities that respondents reported engaging in. Just under 6 in10 respondents (59.5%) reported engaging (at least sometimes or more often) in passive bystander activities such as enjoying scenery/photography/native animals and plants, or bird watching. In terms of land-based physical activities undertaken near water, around 5 in 10 (52.8%) respondents reported sometimes, often or very often walking, hiking, or cycling. Similarly, around 5 in 10 (51.2%) respondents reported sometime, often or very often engaging in meal-related activities adjacent to waterways (e.g., picnics and barbeques). Likewise, around 5 in 10 respondents (50.4% reported sometimes, often or very often) engaging in water-based activities such as swimming, surfing, going to the beach

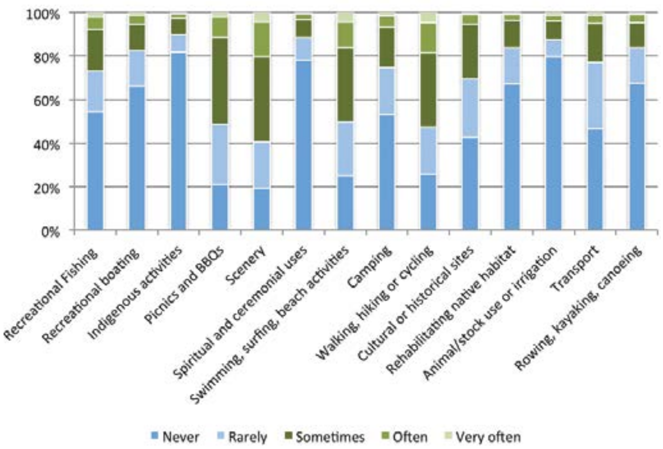


Figure 12. The extent to which participants engaged in activities near waterways

3.1.5. Sources of information about water

Figure 13 provides an overview of where the sampled respondents had seen and/or heard information about water. It is clear that a majority of respondents (51.3%) had not seen or heard any information about water in the last six months. The three most frequently cited sources of information (in order of frequency) were: water utility bills (26.0%), TV (24.4%), and newspapers (18.3%).

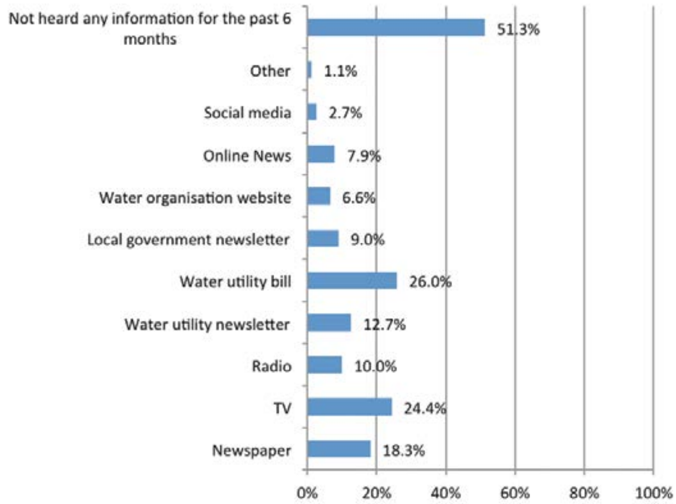


Figure 13. Information about water based on a variety of resources (by national sample)

3.2. Results broken down by State

NSW + ACT
VIC
TAS
SA
QLD
WA
National

3.2.1. Water knowledge

Responses broken down across States are shown in Figures 14 to 17 (see also Figures 18-34 in Appendix C for more detail of responses). To examine whether there were significant differences between states in terms of correct responses we conducted a series of Pearson chi-square tests of independence to analyse associations between State and accurate & in accurate responses. Significant differences were followed up through adjusted standardised residuals (Agresti & Finlay, 1997).

For the questions shown in figures 14 – 17, significant differences emerged, although in all cases the effect sizes were small indicating that the differences between states were not large (see Appendix F for the statistics & Pallant, 2007 for a discussion of effect sizes in relation to Chi-square analyses). The follow-up analyses showed that, in general, Victorian respondents had less accurate responses and Queensland and Western Australian respondents had more accurate responses.

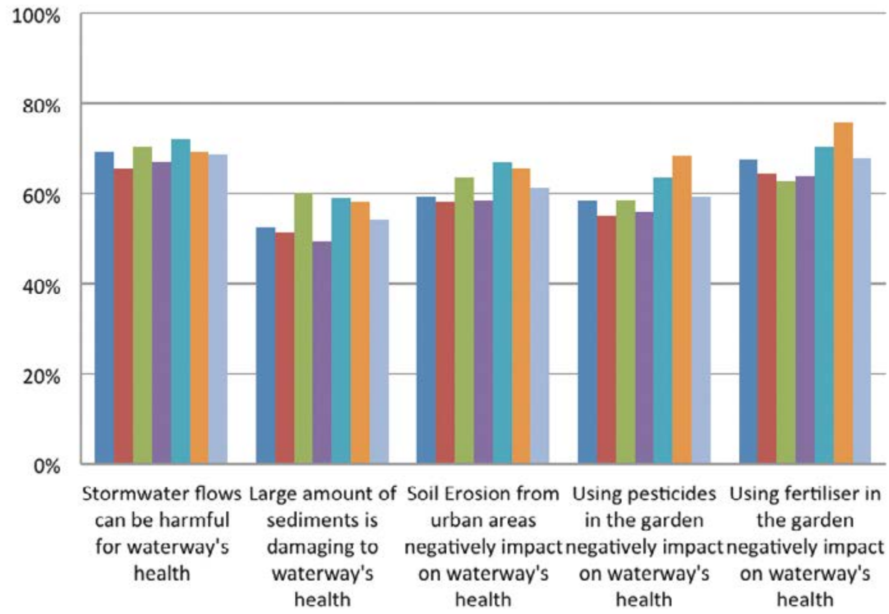


Figure 14. Knowledge of factors that can negatively impact on the waterway's health

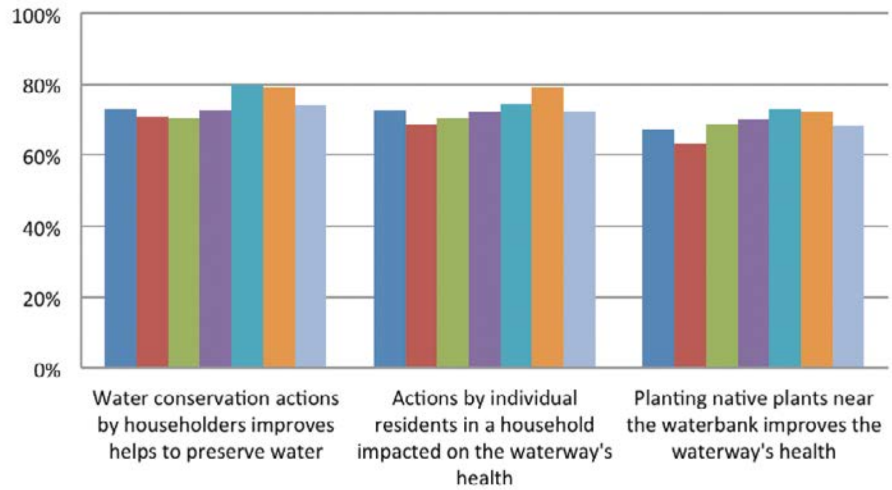


Figure 15. Knowledge of factors that can positively impact on the waterway's health

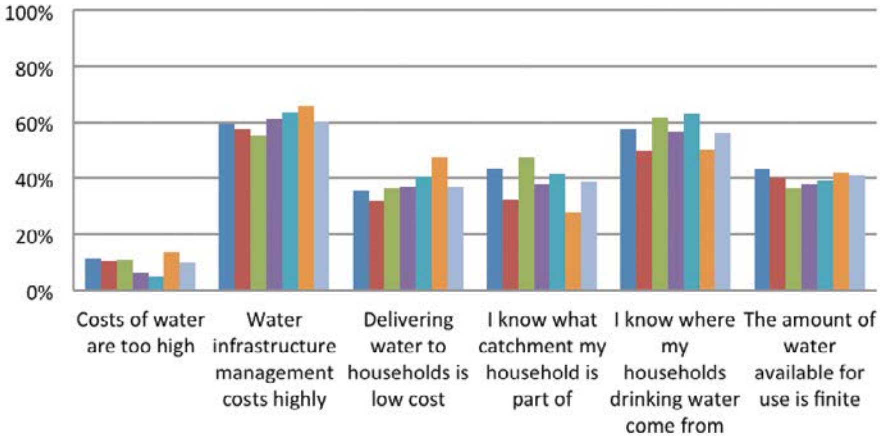


Figure 16. Knowledge of sources of water treatment

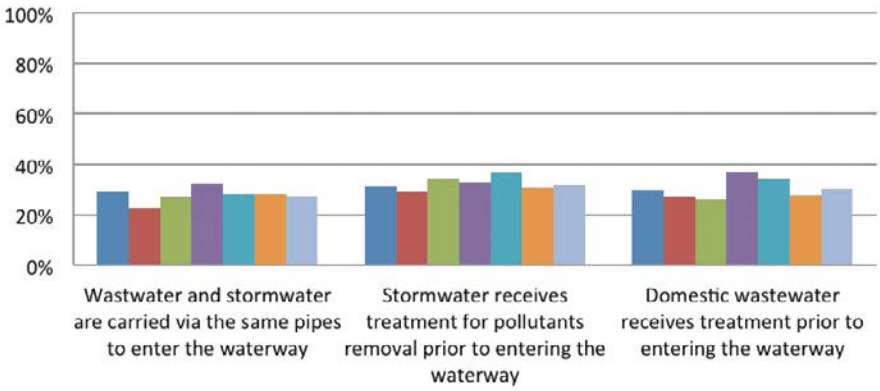


Figure 17. Knowledge of costs and sources of drinking water

A Chi-square analysis showed significant differences between states on understanding what a catchment is (see Appendix I for the statistics). Follow up analyses using adjusted standardised residuals showed that Victorian respondents were significantly more likely to provide an incorrect than a correct answer and Queensland respondents were more likely to give a correct than an incorrect response.

A chi-square analysis shows a significant effect of state on understanding of the water cycle (see Appendix L for statistics). Follow-up analyses show that NSW/ACT respondents are more likely to have a clearly understanding and less likely to have a general sense of the water cycle and South Australians are more likely to have a general sense of the water cycle.

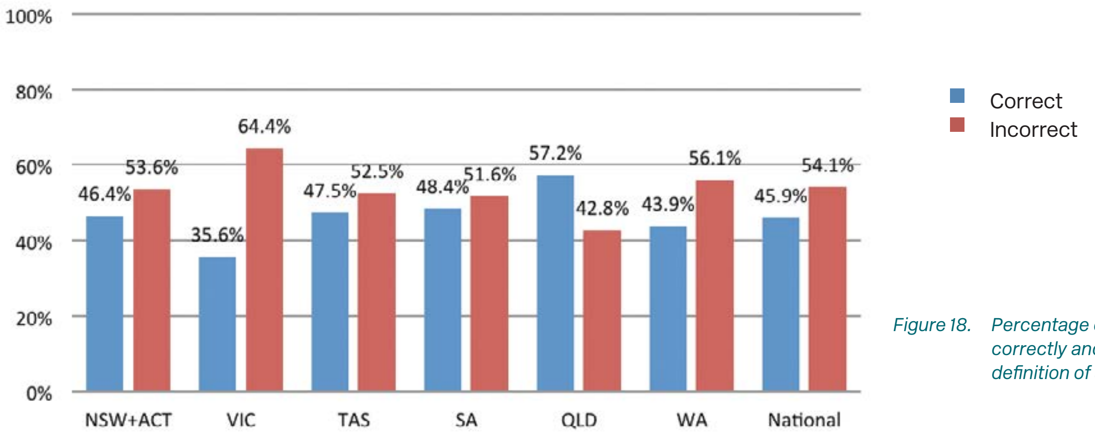


Figure 18. Percentage of respondents who correctly and incorrectly identified the definition of a catchment

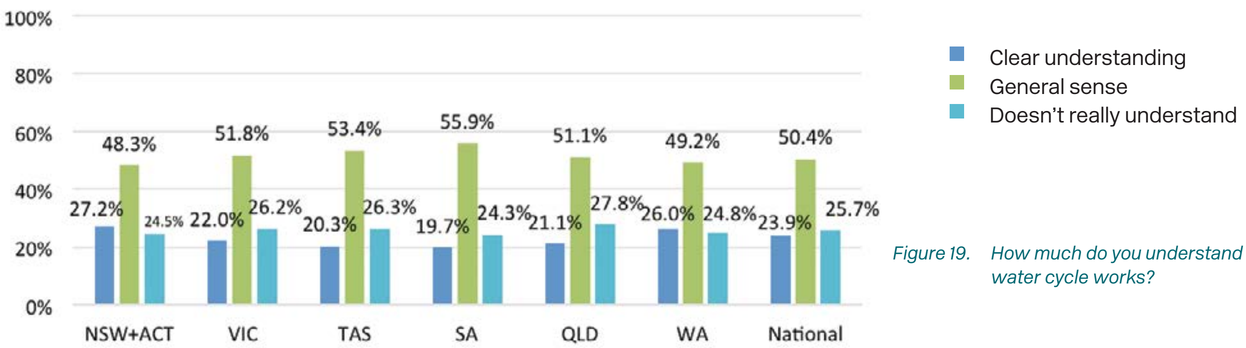


Figure 19. How much do you understand how the water cycle works?

3.2.2. Perceived impact of behaviour/policy on water quality

Similar to the national sample data, the majority of respondents across states perceived that the range of behaviours/ policies can impact positively on water quality (see Table 3 below). A series of one-way Analysis of Variance (ANOVAs) were conducted to investigate whether there were differences in responses between states. Because of the increased power associated with such a large sample, a statistically significant effect of State emerged on nearly all of the behaviours/policies with the exception of limiting residential development, reducing commercial fishing, and reducing car usage. It must be noted, however, that even where significant effects of State emerged, the effect sizes (i.e., partial eta squared which is represented by the symbol: η^2) were extremely small (for all but one item $\eta^2 < .01$)

Types of behaviours	(N = 5172)	NSW+ ACT	VIC	TAS	SA	QLD	WA	National
1. Reducing litter	Negative Impact	4.5	3.5	5.1	1.8	2.7	3	3.6
	No Impact	9.9	10.3	5.1	7.6	6.1	8.7	8.8
	Positive Impact	85.7	86.1	89.8	90.6	91.2	88.2	87.6
2. Putting cigarette butts in bins	Negative Impact	4.7	3.9	2.5	2.3	2.7	3.7	3.8
	No Impact	9.5	11	8.5	7.3	6.3	9.8	9
	Positive Impact	85.9	85.1	89	90.4	91	86.6	87.2
3. Covering exposed dirt	Negative Impact	6.9	8.7	9.3	8.4	6.3	8.1	7.5
	No Impact	19.7	24.8	20.3	22.3	16.8	22.6	20.8
	Positive Impact	73.4	66.5	70.3	69.4	76.9	69.3	71.7
4. Participating in environmental groups	Negative Impact	5.1	3.4	3.4	3.5	3.5	2.2	3.9
	No Impact	14	16.4	13.6	11.4	11	13.2	13.7
	Positive Impact	80.9	80.1	83.1	85.1	85.5	84.6	82.4
5. Cooperation between government and industry	Negative Impact	5	3.4	3.4	2.5	3.4	2	3.8
	No Impact	11.4	11.9	10.2	9.6	8	9.1	10.5
	Positive Impact	83.6	84.7	86.4	87.8	88.6	88.8	85.8
6. Upgrading sewerage treatment plants	Negative Impact	4.6	3.8	1.7	1.5	2.3	2.6	3.4
	No Impact	10.7	11.1	6.8	8.4	8.5	8.7	9.9
	Positive Impact	84.8	85.1	91.5	90.1	89.2	88.6	86.7
7. Limiting residential development	Negative Impact	5.8	4.6	7.6	3	4.5	3.5	4.9
	No Impact	14.6	16.3	13.6	13.4	11.5	13.6	14.1
	Positive Impact	79.7	79.1	78.8	83.5	84	82.9	81

(see Cohen, 1988 for a discussion of effect sizes in the behavioural sciences). Because these effects were so small, we did not conduct posthoc tests to follow up the differences between states.

Table 3. Percentage of respondents on the perceived impact of each behaviour/ policy on water quality.

Types of behaviours	(N = 5172)	NSW+ ACT	VIC	TAS	SA	QLD	WA	National
8. Water sensitive urban areas	Negative Impact	4.2	3.6	2.5	2.3	3.1	3	3.6
	No Impact	10.5	11.4	11	8.1	7.1	7.5	9.6
	Positive Impact	85.2	85	86.4	89.6	89.8	89.4	86.9
9. Reducing commercial fishing	Negative Impact	8.1	7.5	9.3	5.6	8.7	6.3	7.7
	No Impact	25.7	30.3	28	28.9	25.4	24.8	26.9
	Positive Impact	66.3	62.2	62.7	65.6	65.9	68.9	65.4
10. Reducing industrial pollution	Negative Impact	3.8	4	3.4	2	2.7	2.4	3.4
	No Impact	9.4	9.9	8.5	7.1	6.1	6.5	8.4
	Positive Impact	86.8	86.1	88.1	90.9	91.2	91.1	88.2
11. Recycling through council refuse stations	Negative Impact	5.7	5	2.5	2.3	3.2	2.8	4.4
	No Impact	9.3	10.8	6.8	8.9	6.9	8.5	9
	Positive Impact	85	84.2	90.7	88.9	89.9	88.6	86.6
12. Reducing car usage	Negative Impact	5.5	5	8.5	3	4.6	3.9	5
	No Impact	23	25.5	21.2	20.8	23.6	20.7	23.2
	Positive Impact	71.4	69.6	70.3	76.2	71.8	75.4	71.8
13. Building rain water gardens	Negative Impact	4.2	3.5	3.4	1.5	3.2	2.4	3.5
	No Impact	11.9	13.7	11	9.6	10	8.9	11.5
	Positive Impact	83.9	82.8	85.6	88.9	86.8	88.6	85.1
14. Installing rainwater tanks	Negative Impact	4.7	5.1	0.8	1.5	3.1	1.8	3.9
	No Impact	11.2	12.3	16.9	7.6	10.5	10.4	11.1
	Positive Impact	84.1	82.6	82.2	90.9	86.4	87.8	85

3.2.2. Perceived impact of behaviour/policy on water quality

Similar to the national sample data, the majority of respondents across states perceived that the range of behaviours/ policies can impact positively on water quality (see Table 3 – previous spread). A series of one-way Analysis of Variance (ANOVAs) were conducted to investigate whether there were differences in responses between states. Because of the increased power associated with such a large sample, a statistically significant effect of State emerged on nearly all of the behaviours/policies with the exception of limiting residential development, reducing commercial fishing, and reducing car usage. It must be noted, however, that even where significant effects of State emerged, the effect sizes (i.e., partial eta squared which is represented by the symbol: η^2) were extremely small (for all but one item η^2 <.01) (see Cohen, 1988 for a discussion of effect sizes in the behavioural sciences). Because these effects were so small, we did not conduct posthoc tests to follow up the differences between states.

3.2.3. Attitudes to alternative water sources and treatment

A series of one-way ANOVAs were conducted to examine whether there were differences between states in responses to alternative water sources. Although significant effects emerged on attitudes to recycled water for drinking, attitudes to desalinated for drinking and non-drinking purposes, and attitudes to stormwater for drinking, it was clear that the effect sizes were very small (η^2 < .01; see Appendix O for statistics). We therefore do not report these results here. One point worth noting is that posthoc statistical tests to follow up the significant effects that emerged confirm the impression gained from inspection of the graph that Western Australian respondents were more willing to use recycled water for drinking and more supportive of desalinated for drinking and non-drinking purposes than respondents in other states. Descriptive statistics for these questions broken across states are shown in Figures 20 to 27.

Figure 20. Willingness to use recycled water for drinking purpose

Figure 21. Willingness to use recycled water for non-drinking purpose

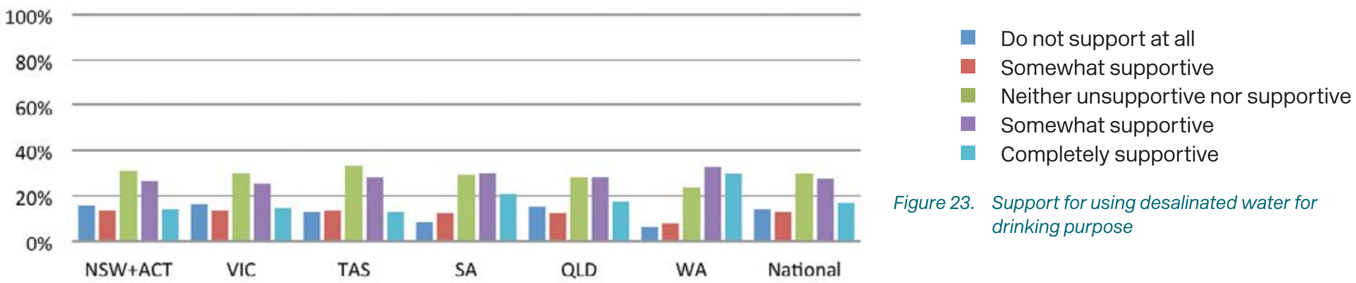


Figure 23. Support for using desalinated water for drinking purpose

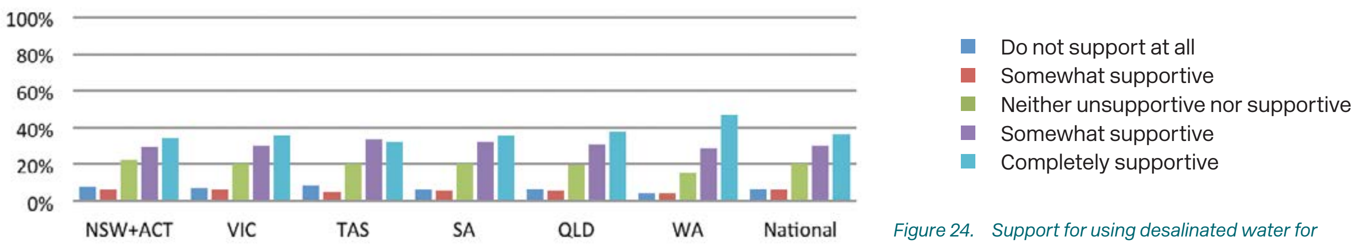


Figure 24. Support for using desalinated water for non-drinking purpose

Figure 25. Attitudes toward the use of stormwater harvesting for drinking purpose

Figure 26. Attitudes toward the use of stormwater harvesting water public spaces

Chi-square analyses revealed no significant effect of State on respondents’ willingness to install a raingarden on their property but there was a significant difference between States in terms of their willingness to install a raingarden in their street: Tasmanian respondents were more unwilling than willing to have a raingarden installed in their street whereas the pattern was reversed in other states (see Appendix Q for statistics).

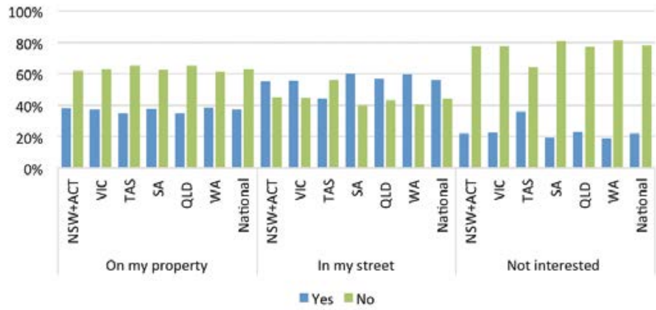
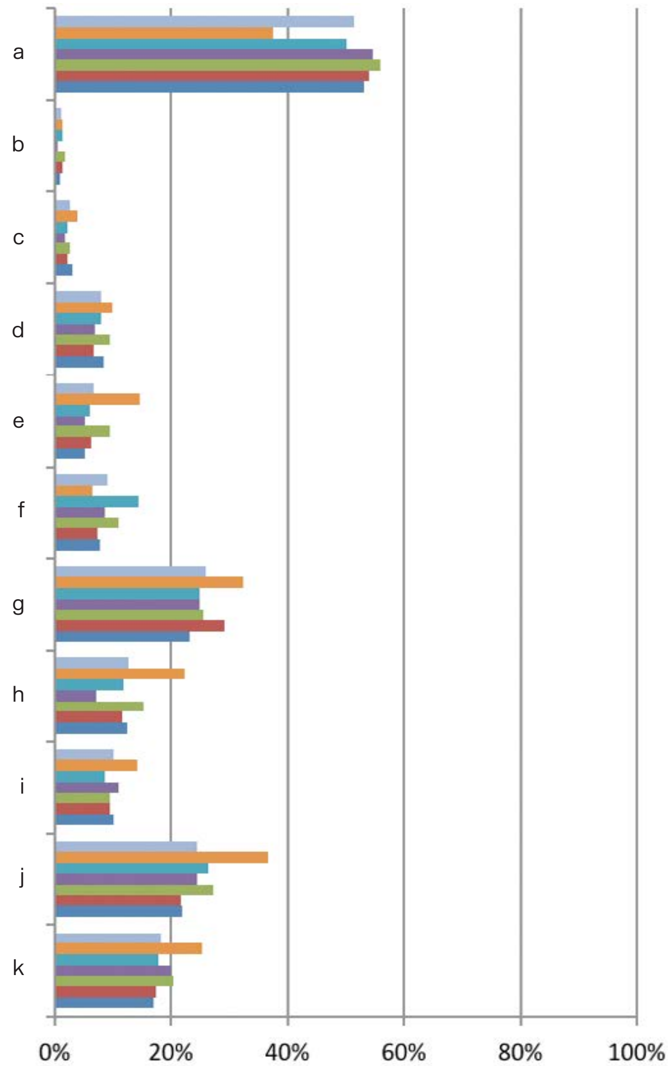


Figure 27. Level of interest in installing a raingarden in the property surroundings (by States breakdown)

3.2.4. Sources of information about water

As shown in Figure 28 below, the pattern of results is similar across states except for Western Australia. Chi-square analyses showed a significant effect of State on most sources and, follow-up tests showed that in most cases (the exceptions are ‘other’, social media, and online news sources) Western Australian respondents were more likely to have heard information about water from the sources (see Appendix S for statistics).



NSW + ACT
VIC
TAS
SA
QLD
WA
National

Figure 28. Information about water based on a variety of resources (by States breakdown)

a. No information for the past 6 months
b. Other
c. Social media
d. Online news
e. Water organisation website
f. Local government newsletter
g. Water utility bill
h. Water utility newsletter
i. Radio
j. TV
k. Newspaper

3.3. Results broken down by Education level

3.3.1. Water knowledge

Responses are shown in Figures 29 to 34 (see also Figures 35 – 51 in Appendix D for more detail of responses). A series of Chi-square tests of independence were conducted to investigate whether accuracy of responses differed depending on level of education (see Appendix G for statistics). In nearly all cases accuracy did differ depending on education and follow-up tests showed that the clearest pattern was that respondents who were educated up to Year 12 or below had lower levels of knowledge whereas those with post-school qualifications (i.e., Trade/TAFE, university degree) had higher levels of knowledge. In the majority of cases the effect sizes were small suggesting that the differences according to education level were not large.

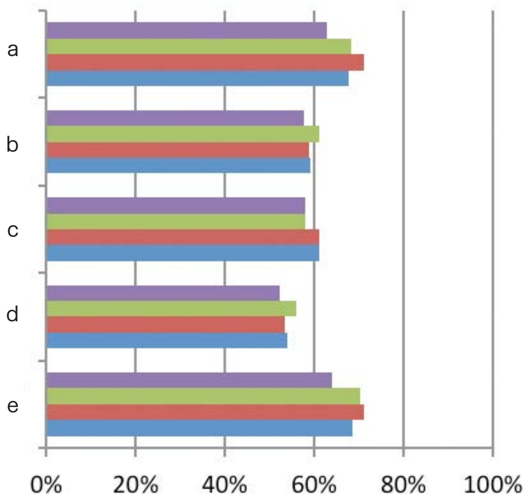


Figure 29. Knowledge of factors that can negatively impact on the waterway's health

a. Using fertiliser in the garden negatively impacts on waterway's health
b. Using pesticides in the garden negatively impacts on waterway's health
c. Soil Erosion from urban areas negatively impacts on waterway's health
d. Large amount of sediments is damaging to waterway's health
e. Stormwater flows can be harmful for waterway's health

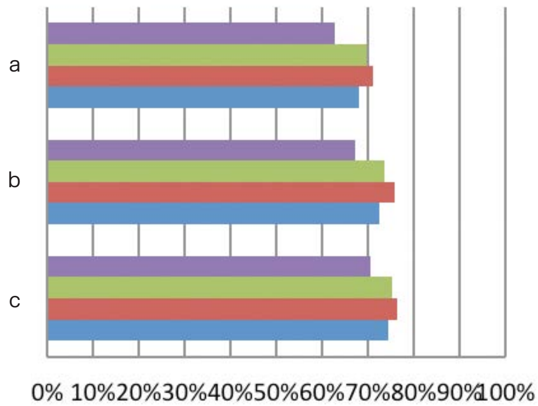


Figure 30. Knowledge of factors that can positively impact on the waterway's health

a. Planting native plants near the waterbank improves the waterway's health
b. Actions by individual residents in a household impacted on the wateway's health
c. Water conservation actions by householders helps to preserve water

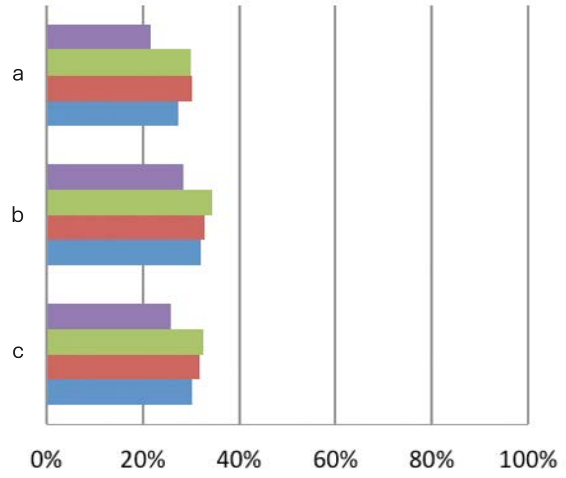


Figure 31. Knowledge of sources of water treatment

a. Domestic wastewater receives treatment prior to entering the waterway
b. Stormwater receives treatment for pollutants removal prior to entering the waterway
c. Wastewater and stormwater are carried via the same pipe to enter the waterway

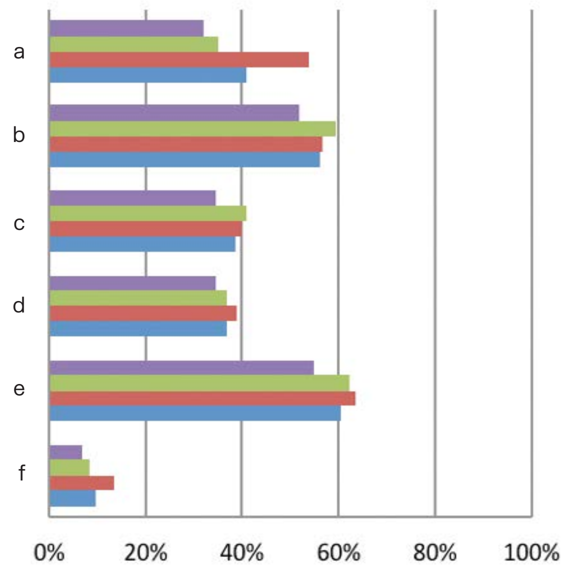


Figure 32. Knowledge of costs and sources of drinking water

a. The amount of water available for use is infinite
b. I know where my households' drinking water comes from
c. I know what catchment my household is part of
d. Delivering water to households is low cost
e. Water infrastructure management costs highly
f. Costs of water are too high

A chi-square analysis shows that knowledge of what a catchment is differed significantly according to education level (see Figure 33 below and Appendix Jfor statistics). Respondents with up to Year 12 education were less likely to correctly identify the definition of a catchment and those with a university degree were more likely to correctly identify the definition.

A chi-square analysis conducted on the understanding of the water cycle showed a significant effect of level of education (see Figure 34). Follow-up tests showed that having post-school education was associated with a greater likelihood of reporting a good understanding of the water cycle and having education up to year 12 was associated with a greater likelihood of reporting a lack of understanding of what constitutes the water cycle (see Appendix M for statistics).

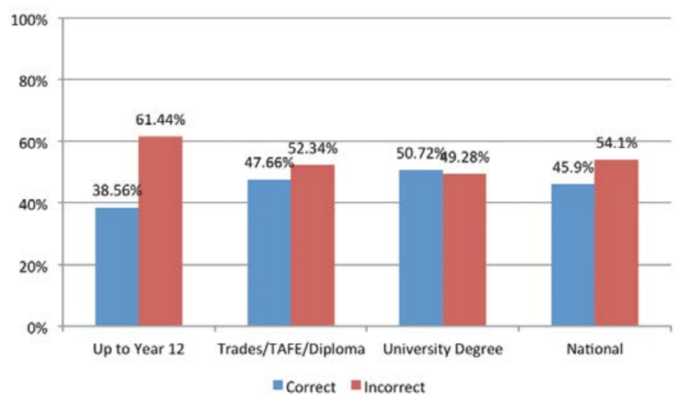


Figure 33 Percentage of respondents who correctly and incorrectly identified the definition of a catchment

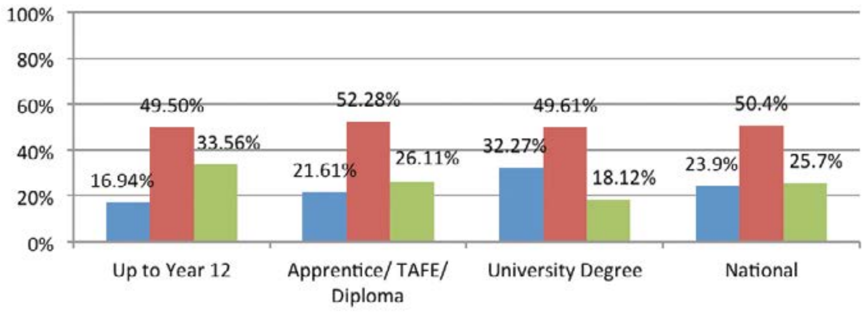


Figure 34. How much do you understand how the water cycle works?

3.3.2. Attitudes to alternative water sources and treatment

A series of one-way ANOVAs were conducted to compare responses to alternative water sources depending on level of education. Similar to the state analyses, significant differences emerged on attitudes to recycled water for drinking and non-drinking purposes, desalinated for drinking purposes and stormwater harvesting for drinking and non-drinking purposes. Again, as with the state analyses, the effect sizes were very small ($\eta^2 < .01$) and given the size of these effects we do not report the statistics here (although see Appendix P for statistics). It is worth noting that the posthoc tests to follow up the significant ANOVAs confirm what we might expect, that is, more positive attitudes for respondent who are better educated. See figures 35 and 41 for the descriptive statistics of the breakdown of attitudes across education level.

Similarly, the pattern of support for the use of desalinated water for drinking and non-drinking purposes is similar regardless of education level (see Figures 36 and 37).

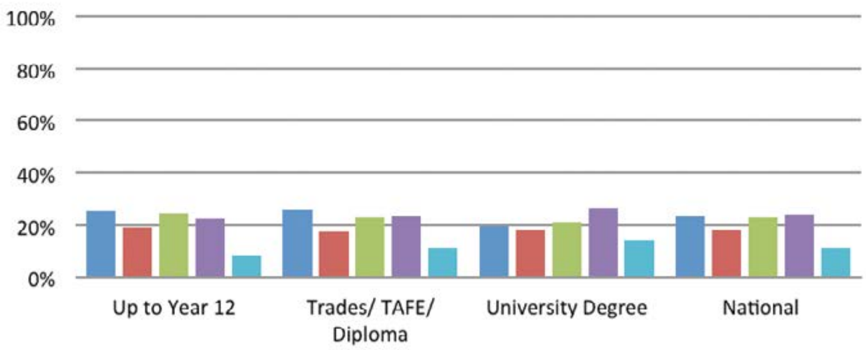


Figure 35. Willingness to use recycled water for drinking purpose

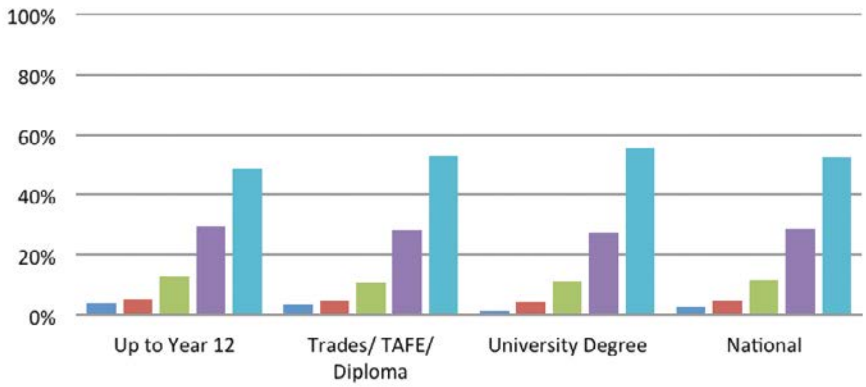


Figure 36. Willingness to use recycled water for non-drinking purpose

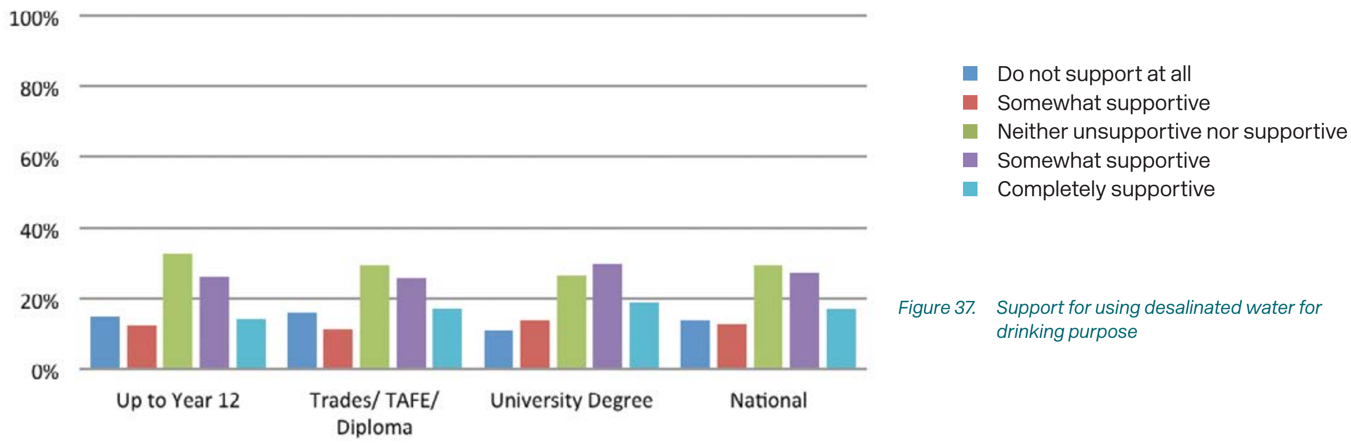


Figure 37. Support for using desalinated water for drinking purpose

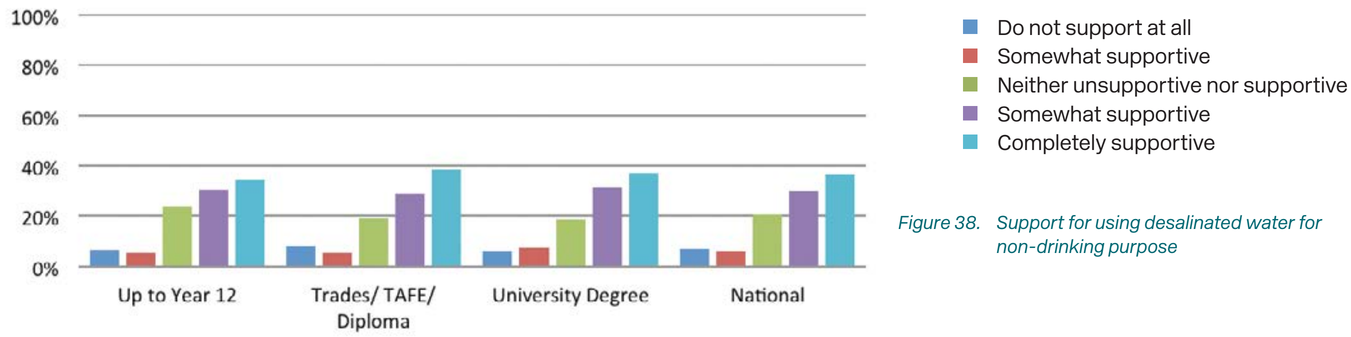


Figure 38. Support for using desalinated water for non-drinking purpose

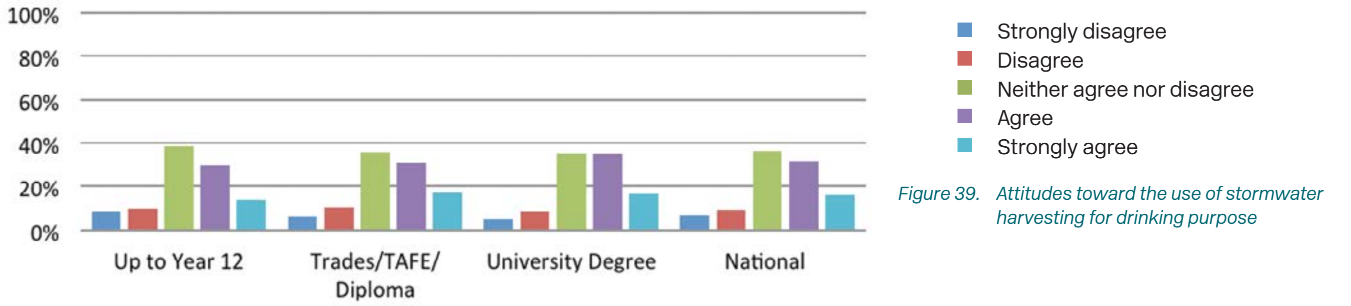


Figure 39. Attitudes toward the use of stormwater harvesting for drinking purpose

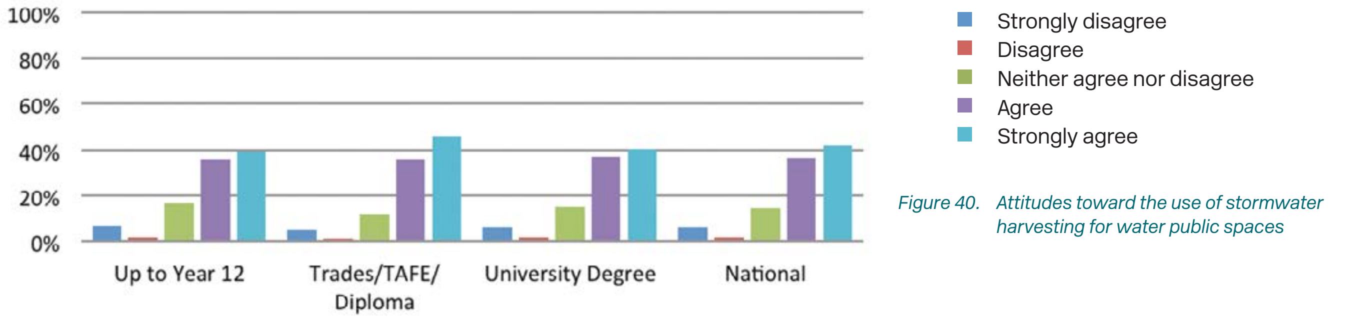


Figure 40. Attitudes toward the use of stormwater harvesting for water public spaces

Chi-square analysis of the attitudes to raingardens revealed a significant effect of education level such that those with university degrees were more willing to have a raingarden installed on their property and those with up to Year 12 were less willing. Similarly, those with a university degree were more willing to have a raingarden installed in their street and those with up to Year 12 were less willing. Note that the effects of education level are small (see Appendix R for statistics).

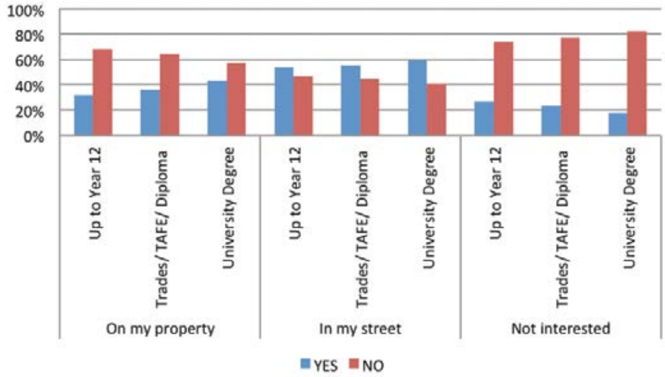


Figure 41. Level of interest in installing a raingarden in the property surroundings (by education background)

3.3.3. Sources of information about water

Chi-square analysis revealed a significant effect of education level on most of the sources of information, although the effect of education level was small (see Appendix T for statistics). The general pattern revealed by the follow-up tests was that respondents with up to Year 12 education were more likely to not have heard any information in the last 6 months about water whereas those with university education were less likely to not have heard any information. In addition, respondents with university education were more likely to have seen or heard information from most sources and those with up to Year 12 were less likely to have seen or heard information from the range of sources.

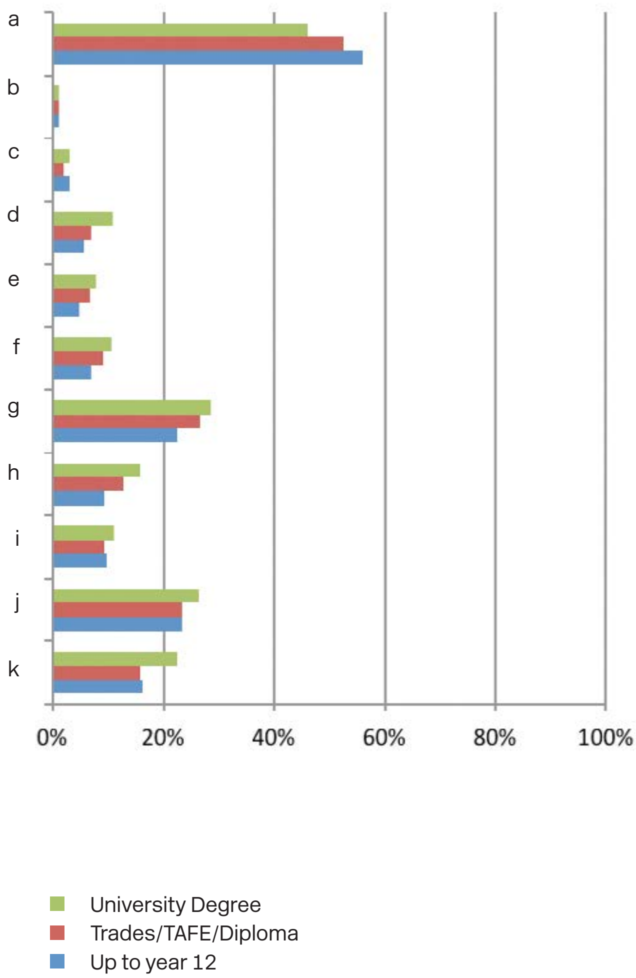


Figure 42. Information about water based on a variety of resources (by education breakdown)

a. No information for the past 6 months
b. Other
c. Social media
d. Online news
e. Water organisation website
f. Local government newsletter
g. Water utility bill
h. Water utility newsletter
i. Radio
j. TV
k. Newspaper

3.4. Results broken down by Household ownership

Owned property
Rented property
National

3.4.1. Water knowledge

Responses broken down by home ownership (i.e., owners and renters) are shown in Figures 42 – 47 (see also Figures 52 – 68 in Appendix E for more detailed responses). To examine whether there were significant differences between home owners and renters we conducted a series of Pearson chi-square tests of independence to analyse associations between ownership and accurate responses.

Home ownership had significant effect on all questions except for the item about the cost of water being too high (see Appendix H for statistics). Follow-up tests show a very clear and consistent pattern: home owners demonstrate higher levels of knowledge and renters show lower levels of knowledge. The size of these effects is still small but in general larger than those for State or education.

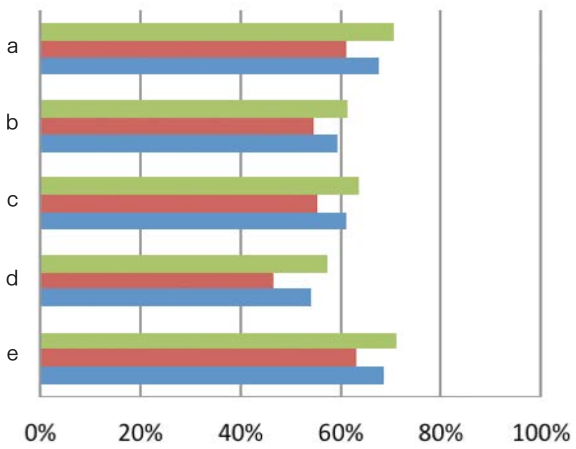


Figure 43. Knowledge of factors that can negatively impact on the waterway's health

a. Using fertiliser in the garden negatively impacts on waterway's health
b. Using pesticides in the garden negatively impacts on waterway's health
c. Soil Erosion from urban areas negatively impacts on waterway's health
d. Large amount of sediments is damaging to waterway's health
e. Stormwater flows can be harmful for waterway's health

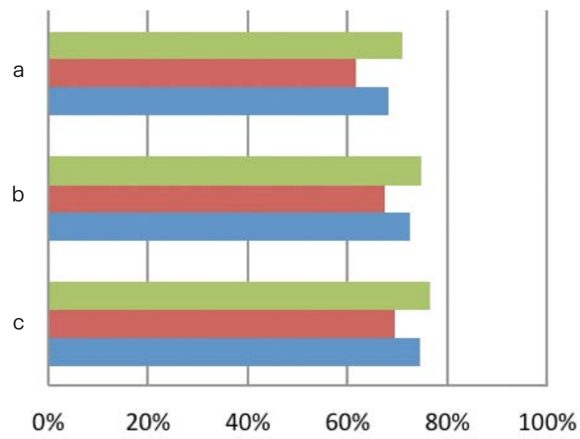


Figure 44. Knowledge of factors that can positively impact on the waterway's health

a. Planting native plants near the waterbank improves the waterway's health
b. Actions by individual residents in a household impacted on the wateway's health
c. Water conservation actions by householders helps to preserve water

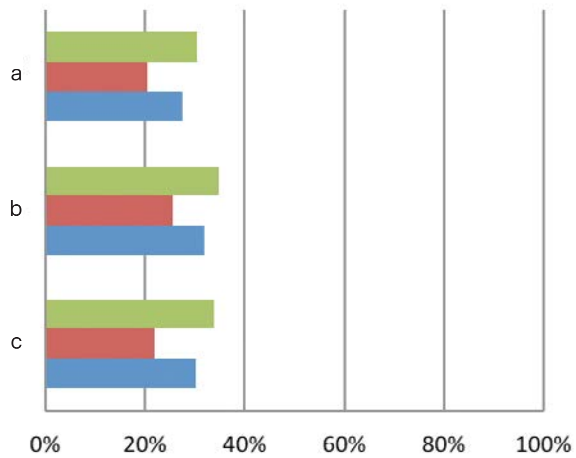


Figure 45. Knowledge of sources of water treatment

a. Domestic wastewater receives treatment prior to entering the waterway
b. Stormwater receives treatment for pollutants removal prior to entering the waterway
c. Wastewater and stormwater are carried via the same pipe to enter the waterway

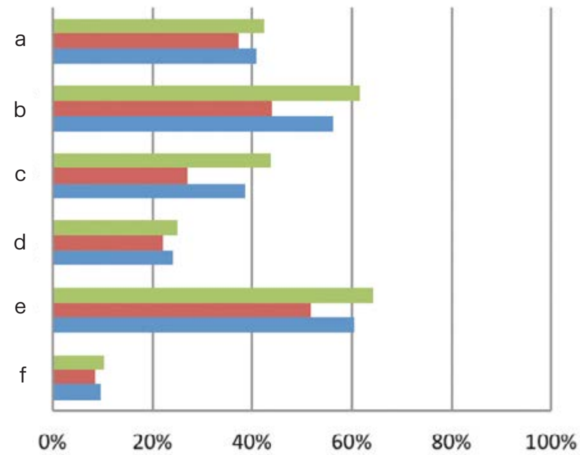


Figure 46. Knowledge of costs and sources of drinking water

a. The amount of water available for use is infinite
b. I know where my households' drinking water comes from
c. I know what catchment my household is part of
d. Delivering water to households is low cost
e. Water infrastructure management costs highly
f. Costs of water are too high

Chi-square analysis also shows that owners were significantly more likely to correctly identify the definition of a catchment and renters were less likely (see Appendix K for statistics).

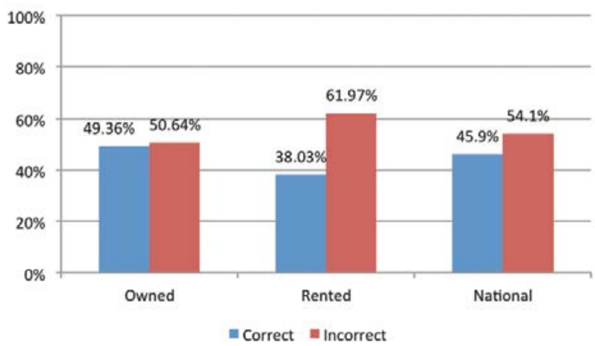


Figure 47. Percentage of respondents who answered correctly and incorrectly on the knowledge of catchment

Chi-square analysis on the question about knowledge of the water cycle revealed a significant effect of home ownership (see Appendix N for statistics). Owners were more likely to have a clear understanding or general sense and less likely to not understand, whereas renters were less likely to have a clear understanding or general sense and more likely to not understand.

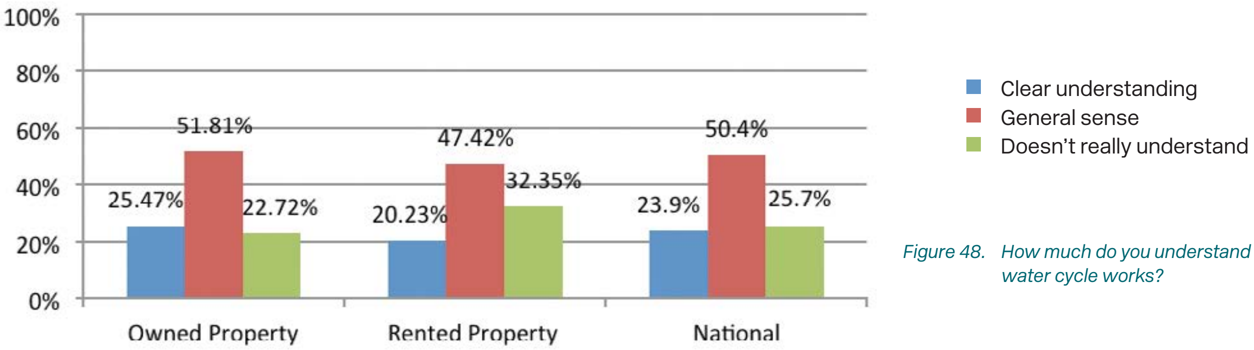


Figure 48. How much do you understand how the water cycle works?

3.4.2. Sources of information about water

The breakdown of sources of information across home ownership is shown in Figure 48. Chi-square analyses to investigate the effect of home ownership show an effect of this variable for all sources except 'other' and online news (see Appendix U for statistics). Follow-up analyses show that renters were more likely to have not heard any information about water in the last 6 months whereas owners were less likely to not have heard any information. The pattern was clear and consistent for all sources: owners were more likely to have heard information about water from the sources and the renters were less likely.

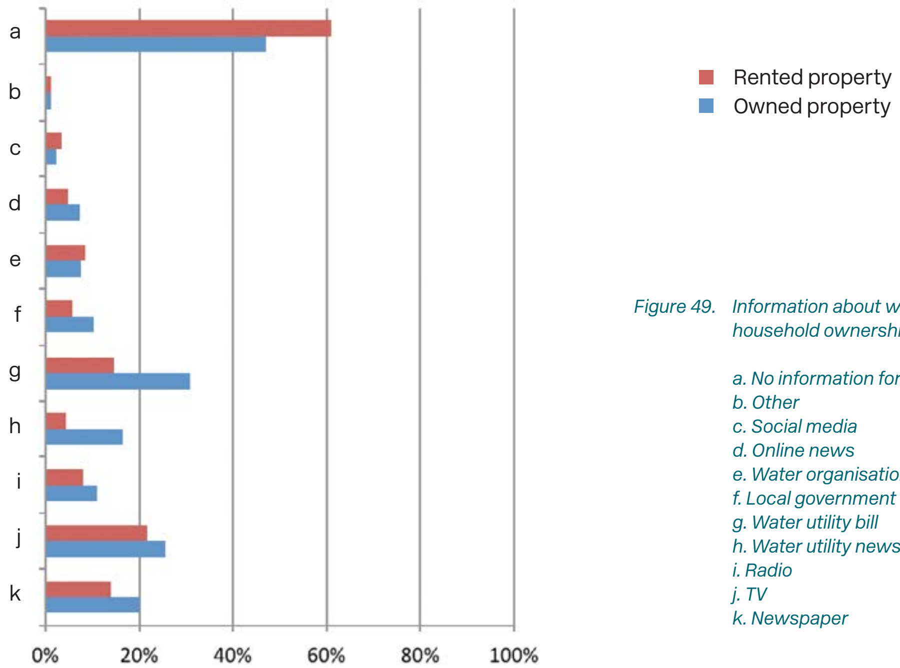


Figure 49. Information about water based on a variety of resources (by household ownership)

a. No information for the past 6 months
b. Other
c. Social media
d. Online news
e. Water organisation website
f. Local government newsletter
g. Water utility bill
h. Water utility newsletter
i. Radio
j. TV
k. Newspaper

4. Discussion

4.1. Australian Water Literacy

Our findings show that there are relatively high levels of knowledge about some aspects of water including understanding of the factors that can negatively or positively impact on water quality. For example, respondents understand that the fertilisers and pesticides that are used on gardens can negatively impact on water quality, and more generally that the actions of householders can influence waterway health and that water conservation by householders can reduce the amount of water used in urban areas. A majority also understand the damage that can be done by stormwater and soil erosion, and that actions such as riparian planting of native vegetation can help protect waterway health. Most respondents also have a clear or general sense of how the water cycle works and know where their drinking water comes from.

It was also evident, however, that there were some issues where our Australian respondents were not as knowledgeable. These related mainly to the treatment of water and the costs and sources of drinking water. Only a minority of respondents understand that domestic wastewater is treated before being released into waterways, that stormwater is not treated before entering waterways, and that stormwater and wastewater do not travel through the same pipes. In terms of knowledge of drinking water, there were gaps in knowledge in that a minority understand that the amount of water available for use is finite, know what catchment they are part of, and can correctly identify what a catchment is. These findings show some similarities with the findings of the Healthy Waterways survey conducted in South East Queensland; that research also showed some confusion about whether domestic wastewater is treated prior to entering waterways (James et al., 2010). Water literacy research conducted in the U.S. has shown inconsistent results for knowledge of whether stormwater is treated prior to entering waterways; our findings accord with those of Bartlett (n.d.) who also found that a minority of respondents know that stormwater receives no treatment prior to entering waterways. Our findings are also consistent with those of Giacalone et al. (2010) who showed that only a minority understand what a catchment is (in U.S. terms, a watershed).

Another area where there appeared to be some confusion related to the cost and complexity of water treatment. There is only limited recognition that delivering clean, safe drinking water is not a simple low cost process, although there is somewhat greater recognition that the costs of managing water infrastructure is high. Overall, only 10% of respondents disagreed that the cost of water is too high, whereas 42% believe that it is and 24% were neutral. Combined with the findings discussed above, these results highlight areas where education efforts have gained traction as well as areas where there are still gaps.

The data provide guidance for the issues that may be particularly important to focus on in efforts to engage communities.

Finally, there was a high level of understanding that a range of factors, from individual actions, to institutional actions and policy can impact on water quality. Those actions that were seen to have the least positive impact were covering exposed dirt (28% believed that this would have no impact or negative impact), reducing commercial fishing (35% thought this would have no impact or negative impact), and reducing car usage (28% thought this would have no impact or negative impact). Respondents may have rated the impact of these actions as less positive because they do not understand the connection between the action and water quality or, potentially, because of vested interests in wanting to continue engaging in the activities (e.g., car use).

4.2. Attitudes to alternative water sources and treatment

The findings for attitudes to alternative water sources, especially that relate to as recycled wastewater and desalinated water very much mirror past research (e.g., Dillon, 2000; Dolnicar, Hurlimann, & Grun, 2011; Marks, Martin, & Zadaroznyj, 2008; Nancarrow et al., 2007). Overall, the majority of respondents did not support the use of these alternative sources for drinking, although the dominant response in relation to drinking desalinated water was neutral.

There was majority support, though, for using alternative sources for non-drinking purposes. There is widespread recognition that community opposition is a major barrier to the introduction of alternative water sources for potable use with the groundwater aquifer recharge project in Perth the first recycled wastewater project to be given the green light in Australia. In keeping with this development, there was some evidence on our findings of greater acceptance of recycled water for potable use in Western Australian than other states and also greater acceptance of desalinated for drinking and non-drinking purposes in Western Australia.

The findings of this national survey along with past research indicate the need to build support for fit-for-purpose water supplies. In line with this aim, researchers have recently turned their attention to identifying the role of information and the types of information that could help to build trust and support for alternative water supplies, particularly recycled wastewater (Dolnicar, Hurlimann, & Nghiem, 2010; Fielding & Roiko, in press; Roseth, 2008; Simpson & Stratton, 2011). The national survey also provided insight into acceptance of raingardens, a management strategy that can help to reduce stormwater flows. It is clear that most people would not install a raingarden on their own property but they are willing to have one in their street. Further research that explores the reasons that respondents rejected raingardens on their own land is needed to understand the factors that may act as facilitators or barriers to greater uptake of this stormwater management approach.

4.3. Waterway-related activities

We asked people how often they engage in activities that bring them into contact with waterways in their region. The main activities that people engage in near waterways are: enjoying scenery, photography and viewing native animals, plants, and birds; hiking or cycling; picnics and barbeques; swimming, surfing, going to the beach. These findings are consistent with results from the Healthy Waterways survey (James et al., 2010). The logic for including these questions is that the responses can provide us with a measure of the extent of people's contact with water and, potentially, greater water-related contact may elicit higher concern and care for waterways. Future analyses in the A2.3 project will assess this possibility.

4.4. Sources of information about water

Finally, we asked people about whether they had seen or heard any information about water from a range of sources in the last six months. The majority of respondents had not seen or heard any information about water. Of those respondents who had seen or heard information, the predominant sources of that information were water utility bills, TV, and newspapers.

4.5. Comparison across states, education level, and home ownership

Analyses were conducted to explore whether knowledge and other selected variables varied depending on state, education, and home ownership. A key point to make is that the size of the significant effects of state, education, home ownership—when they did emerge—were small. The general pattern to emerge was that Queensland and Western Australian respondents tended to show more knowledge and Victorians less knowledge about water issues. As might be expected, in general more highly educated respondents showed more knowledge and owners rather than renters also showed more knowledge. One explanation for the higher level of knowledge of homeowners is that they are paying for water and this may orient them more to water information. In the same vein, it may also be the case that homeowners more often receive water bills and water utility newsletters and this information could help to build their knowledge. Another possibility is that home ownership covaries with age and it is age rather than ownership that predicts knowledge. Future analyses conducted in the A2.3 project will explore this possibility. The generally higher levels of knowledge amongst Queensland and Western Australian respondents may reflect the ongoing drought and extreme water-related weather events that have happened in these states. This may orient people more to water issues.

In general there were only very small statistical differences in attitudes to alternative water sources depending on state and education. Where these small effects emerged, the general pattern was for more educated respondents to be more accepting and for Western Australian respondents to be more supportive than respondents from other states of recycled water for drinking and the use of desalinated water. This latter finding is probably not surprising when considering the uptake of desalinated water in Western Australia and the recent trialling and introduction of a potable recycled water scheme in the state.

In terms of differences across state, education and home ownership on exposure to water information from a variety of sources, more Western Australian respondents than respondents from other states reported having seen information about water from most of the sources. Similarly, exposure to water information also differed depending on education category and home ownership; in general more educated respondents and those who own homes reporting have seen more information about water from the range of sources in the last 6 months.

4.6. Strengths and limitations

The study had a number of strengths including a large sample of the Australian community who were broadly representative in terms of age, gender, education and state of residence. There was also an attempt to draw on existing questions so that data from the survey can be compared with data from (the limited) studies that have been conducted in the past. Nevertheless, we must acknowledge that there may be some level of bias as the sample was obtained through a social research company and it was conducted entirely online. In addition, although where possible questions were modelled on past research, the very limited research that exists meant that in many cases questions needed to be devised for the purpose of the study and there is therefore a lack of validation of the measures. As an example, the question that relates to the cost of water could have been misinterpreted by respondents: they may not have interpreted it as the cost of household water but rather the cost of bottled water. Every effort was made to construct knowledge questions that assessed a range of water-related issues, and the survey was informed by preliminary interviews conducted with water organisations. Still, it is possible that there may be other areas of water knowledge that have not been covered in this study. Finally, a limitation of quantitative research more generally is that you cannot always know how participants interpreted the questions. Triangulating these quantitative findings with qualitative data could help to confirm or qualify these findings as well as deepen the understanding of the issues addressed in this research.

5. Conclusion

This report describes the preliminary descriptive findings of a national survey of Australians' knowledge and attitudes to a range of water-related issues. It provides a baseline understanding of Australians' water literacy, as well as information about water-related behaviour and attitudes that may be connected to knowledge. Future reports describing this data will report on analyses that investigate the relationship of water literacy with other key variables, for example, support for alternative water sources and extent of engagement in positive water-related practices.

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Appendix A

Questionnaire items for Water Literacy and Water-related Attitudes

Water Knowledge questionnaire

1 = strongly disagree, 2 = disagree, 3 = neither agree or disagree, 4 = agree, 5 = strongly agree, 6 = don't know

Negative Impact items

- The fertilisers that individual householders use in their garden can have a negative impact on the health of waterways.
- The pesticides that individual householders use in their garden have no negative impact on the health of waterways.
- Soil erosion from urban areas does not affect the health of waterways.
- Waterways can cope easily with large amounts of sediment (i.e., eroded soil suspended in the water)
- Waterways can be damaged by storm water flows

Positive Impact Items

- Planting native plants along a waterway's bank improves the health of the waterway
- What individual residents do in their home and garden has consequences for the health of waterways and coastal bays
- Water conservation actions by householders can significantly reduce the amount of water used in urban areas

Water Treatment Items

- Wastewater from domestic bathrooms and laundries receives little or no treatment before entering waterways
- Storm water from roofs and roads is treated to remove pollutants before entering the waterways
- Domestic wastewater and stormwater are carried through the same pipes

Costs and Drinks items

- The amount of water available for use is finite
- I know where my household drinking water comes from (e.g., dam, groundwater, desalinated water, etc)
- I know what catchment my household is part of
- Delivering clean, safe drinking water to households is a simple, low cost process
- The costs of managing water infrastructure are high
- The cost of water is too high

Impact of actions on the health waterways questionnaire

1 = very negative impact, 2 = somewhat negative impact, 3 = no impact, 4 = somewhat positive impact, 5 = very positive impact

What impact, if any, do you think that each of these actions in the urban environment has on the health of waterways?

- Reducing the amount of litter in streets and parks
- Placing all cigarette butts in bins
- Covering all exposed dirt in gardens and building sites
- Widespread participation in community environmental groups like Landcare or
- Waterwatch

Cooperation between industry and government to identify ways to voluntarily reduce

- Water pollution
- Upgrading sewage treatment plants
- Limiting further residential development on waterfronts and canal estates
- Designing urban areas to be more water sensitive
- Reducing commercial fishing
- Reducing industrial pollution
- Recycling or disposing of used oil, paint and cleaners through council transfer stations
- Reducing car usage
- Building raingardens to help manage stormwater
- Installing rainwater tanks
- Reducing the amount of litter in streets and parks
- Placing all cigarette butts in bins

Attitudes to alternative water sources and water management approaches questionnaire

How willing would you be to

1 = not willing at all, 3 = neither unwilling or willing, 5 = very willing

- Use recycled water for drinking
- Use recycled water for non-drinking purposes

How much do you support…?

1 = do not support at all, 3 = neither unsupportive or supportive, 5 = completely supportive

- Using desalinated water for drinking
- Using desalinated water for non-drinking purposes

How much do you agree with the following statements

1 = strongly disagree, 3 = neither disagree or agree, 5 = strongly agree

- Storm water harvesting should be used as a source of water to irrigate parks, gardens,and sporting fields
- Storm water can be suitable for drinking after treatment

A raingarden is a water-saving garden that is similar to a regular garden bed, but is designed specifically to capture stormwater from hard surfaces such as driveways, patios, and roofs after it rains (yes/no)

- I would be willing to install a raingarden on my property
- I would support the installation of a raingarden in my street
- Not interested

Engagement in water-related activities questionnaire

How often do you use your local waterways (e.g., creeks, rivers, beaches in your region) for the following purposes?

1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often

- Recreational fishing
- Recreational boating including water skiing and jet skiing, etc
- Indigenous activities
- Picnics and barbeques
- Enjoying the scenery, photography, native animals, plants, bird watching
- Spiritual and ceremonial uses
- Swimming, surfing, going to the beach
- Camping
- Walking, hiking or cycling
- Visiting cultural or historical sites
- Rehabilitating native habitat
- Accessing water for animal/stock use or irrigation
- Transport (e.g., ferry)
- Rowing, kayaking, canoeing

Sources of information about water questionnaire

In the last six months, have you seen or heard any information about water from the following sources? (choose as many as apply)

- Newspaper
- TV
- Radio
- Online news
- Water organization (e.g., water utility) website
- Water utility newsletter
- Water utility bill
- Local government newsletter
- Social media such as Facebook or Twitter

Appendix B

Detail overview of the responses on Knowledge of Water and Water Management survey, based on the National sample

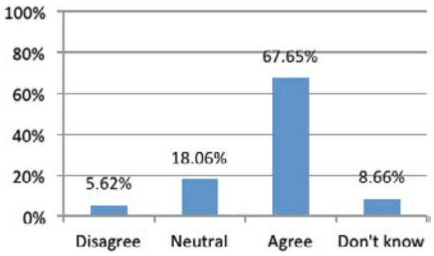

Figure 1. The fertilisers that individual householders use in their garden can have a negative impact on the health of waterways

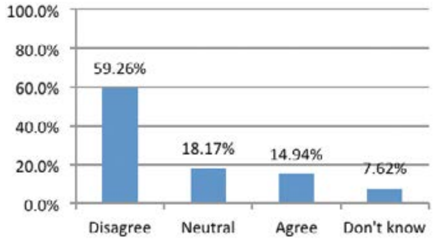

Figure 2. The pesticides that individual householders use in their garden have no negative impact on the health of waterways

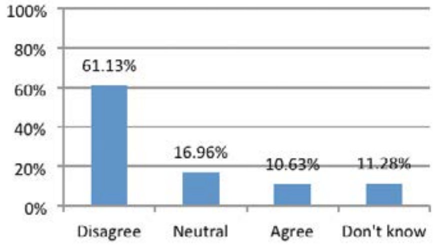

Figure 3. Soil erosion from urban areas does not affect the health of waterways.

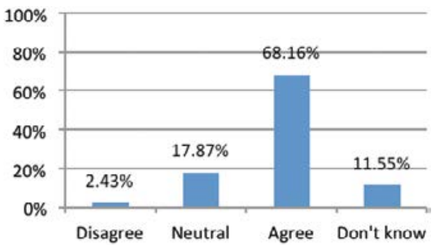

Figure 4. Planting native plants along a waterway's bank improves the health of the waterway (riparian)

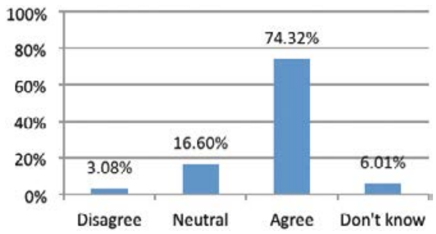

Figure 5. Water conservation actions by householders can significantly reduce the amount of water used in urban areas

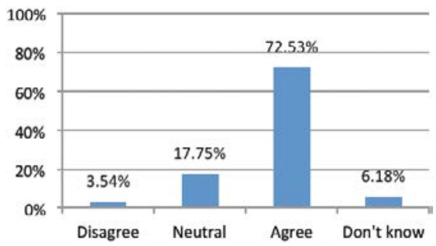

Figure 6. What individual residents do in their home and garden has consequences for the health of waterways and coastal bays

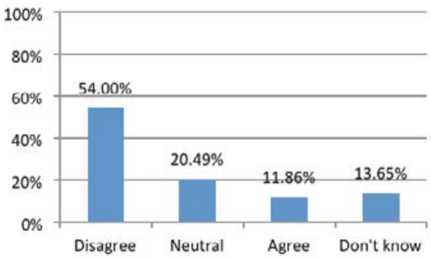

Figure 7. Waterways can cope easily with large amounts of sediment (i.e., eroded soil suspended in the water)

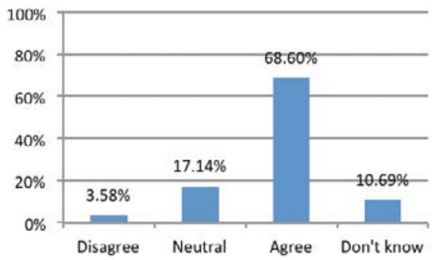

Figure 8. Waterways can be damaged by stormwater flows

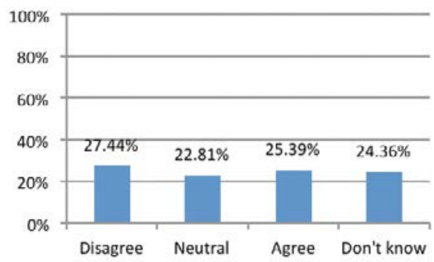

Figure 9. Wastewater from domestic bathrooms and laundries receives little or no treatment before entering waterways

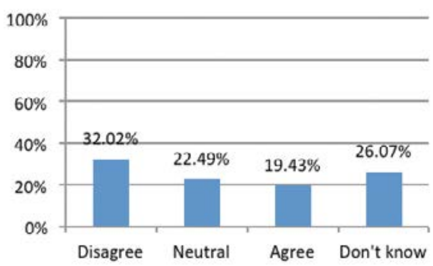

Figure 10. Stormwater from roofs and roads is treated to remove pollutants before entering the waterways

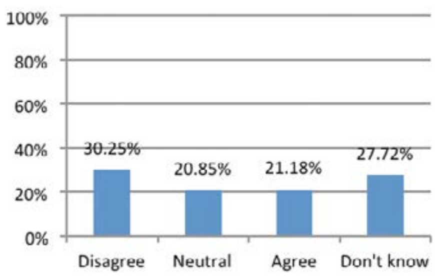

Figure 11. Domestic wastewater and stormwater are carried through the same pipes

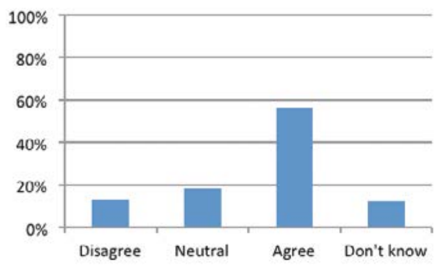

Figure 12. I know where my household drinking water comes from (e.g., dam, groundwater, desalinated water, etc)

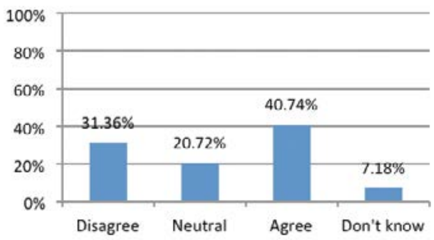

Figure 13. The amount of water available for use is finite

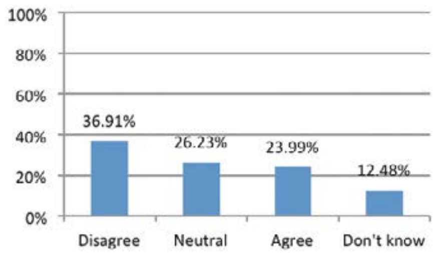

Figure 14. Delivering clean, safe drinking water to households is a simple, low cost process

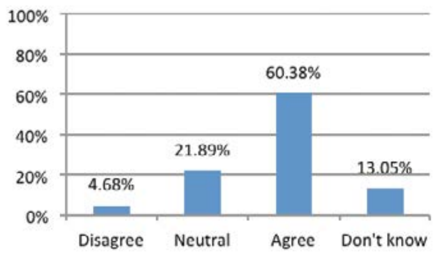

Figure 15. The costs of managing water infrastructure are high

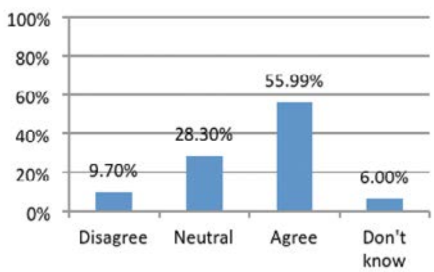

Figure 16. The cost of water is too high

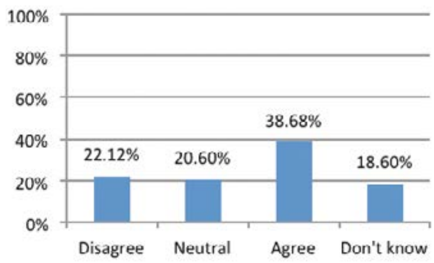

Figure 17. I know what catchment my household is part of

Appendix C

Detail overview of the responses on Knowledge of Water and Water Management survey, based on the States breakdown

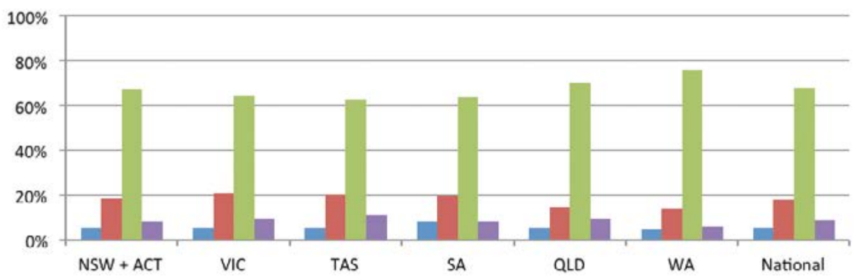

Figure 18. The fertilisers that individual householders use in their garden can have a negative impact on the health of waterways.

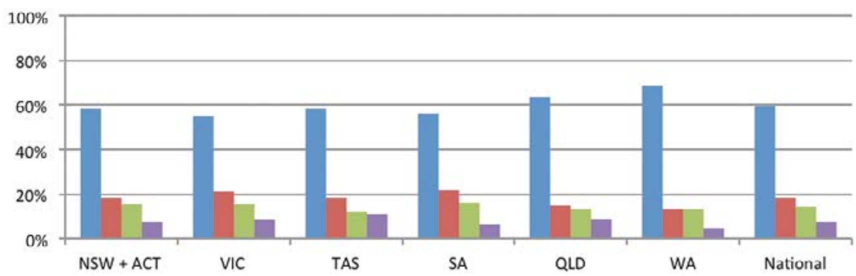

Figure 19. The pesticides that individual householders use in their garden have no negative impact on the health of waterways

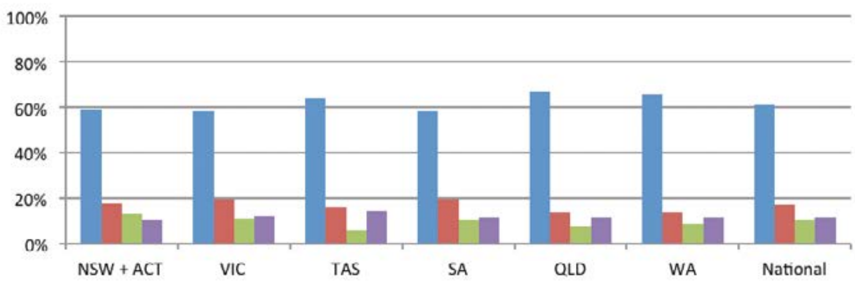

Figure 20. Soil erosion from urban areas does not affect the health of waterways.

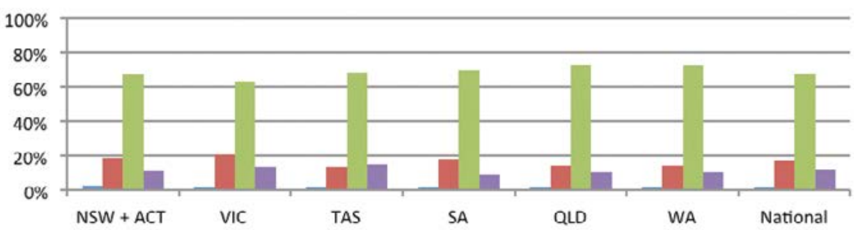

Figure 21. Planting native plants along a waterway's bank improves the health of the waterway (riparian)

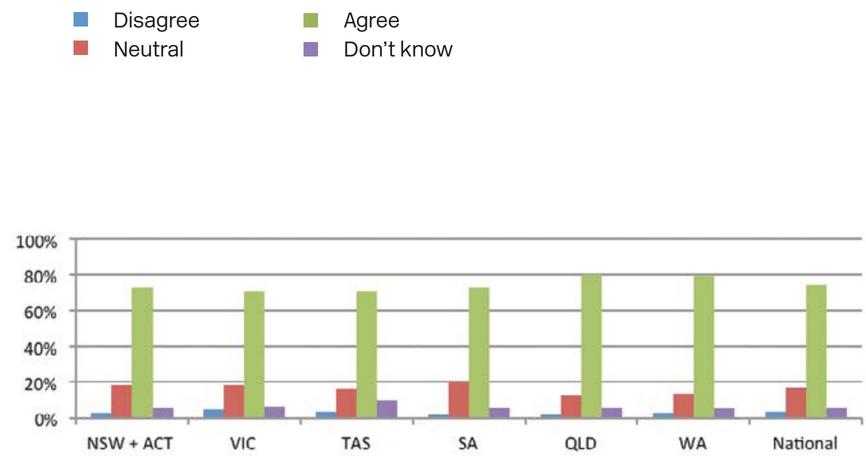

Figure 22. Water conservation actions by householders can significantly reduce the amount of water used in urban areas

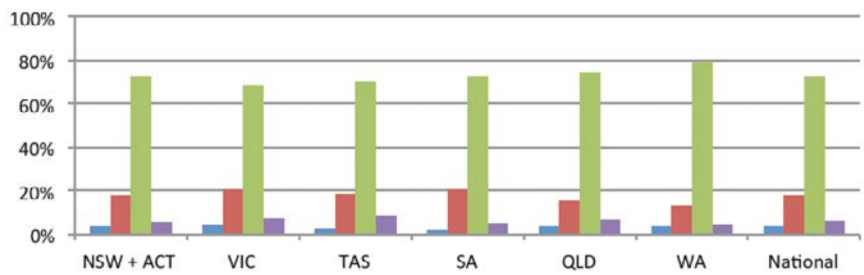

Figure 23. What individual residents do in their home and garden has consequences for the health of waterways and coastal bays

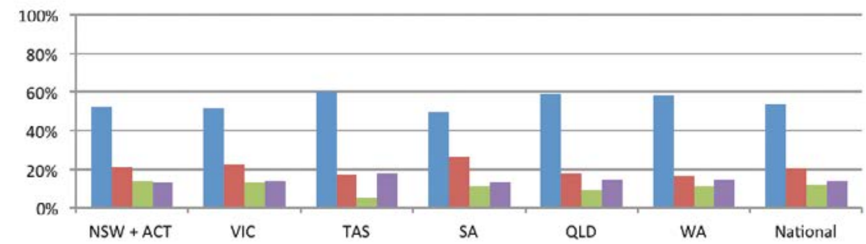

Figure 24. Waterways can cope easily with large amounts of sediment (i.e., eroded soil suspended in the water)

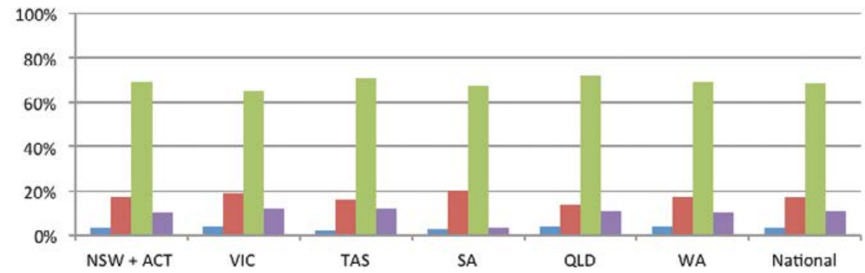

Figure 25. Waterways can be damaged by stormwater flows

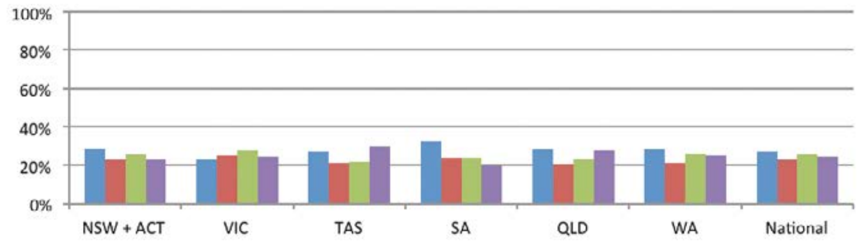

Figure 26. Wastewater from domestic bathrooms and laundries receives little or no treatment before entering waterways

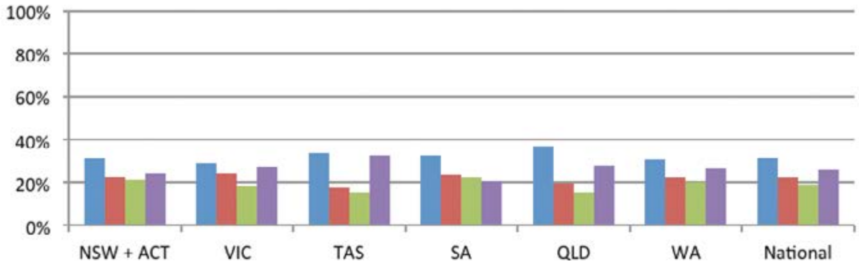

Figure 27. Stormwater from roofs and roads is treated to remove pollutants before entering the waterways

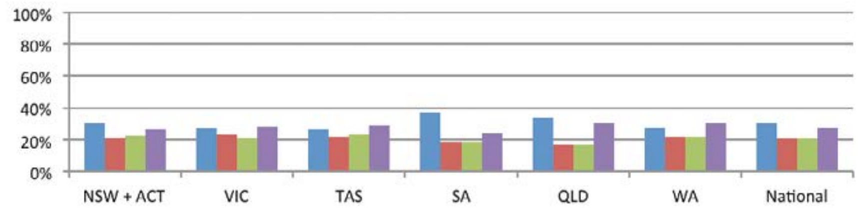

Figure 28. Domestic wastewater and stormwater are carried through the same pipes

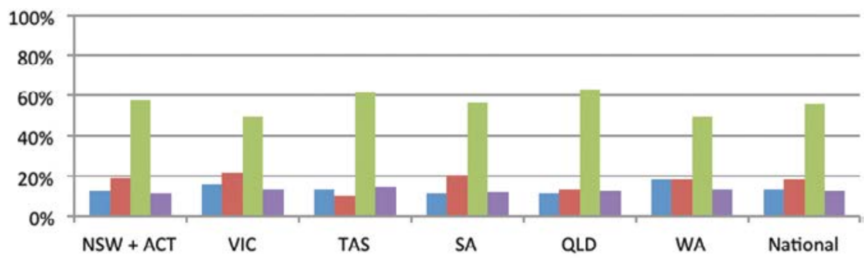

Figure 29. I know where my household drinking water comes from (e.g., dam, groundwater, desalinated water, etc)

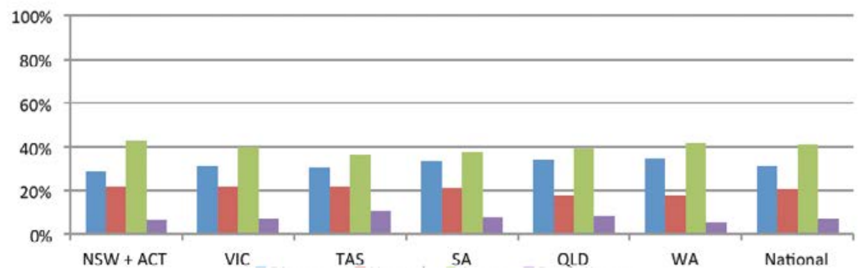

Figure 30. The amount of water available for use is finite

Disagree
Neutral
Agree
Don't know

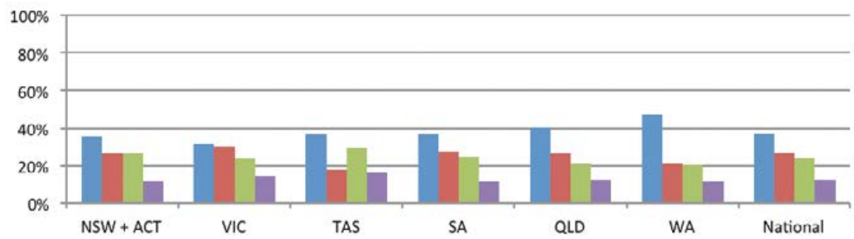

Figure 31. Delivering clean, safe drinking water to households is a simple, low cost process

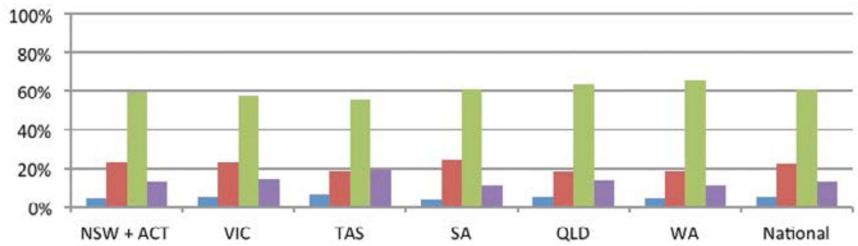

Figure 32. The costs of managing water infrastructure are high

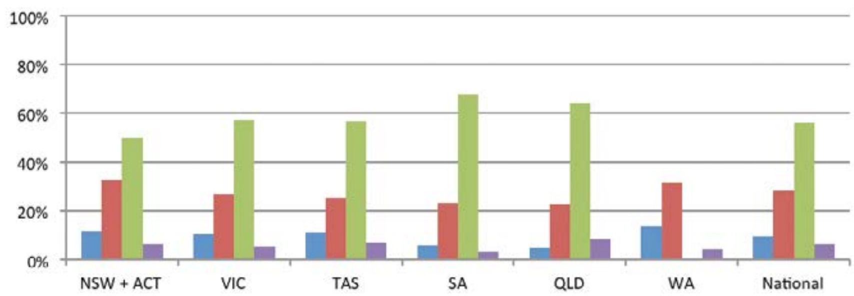

Figure 33. The cost of water is too high

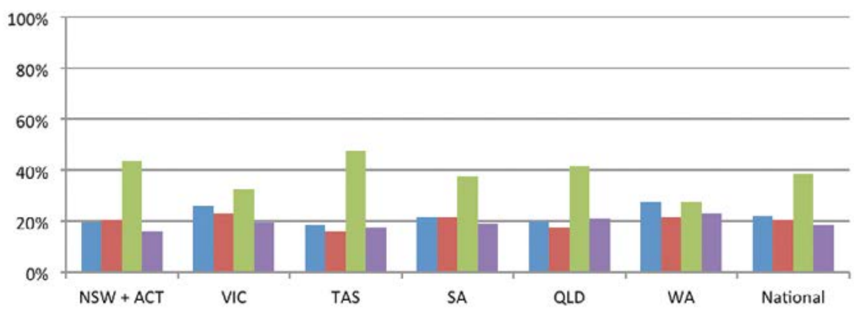

Figure 34. I know what catchment my household is part of

Appendix D

Detail overview of the responses on Knowledge of Water and Water Management survey, based on the Education background

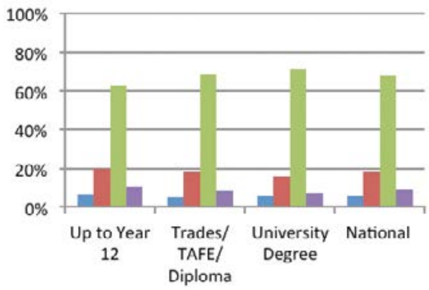

Figure 35. The fertilisers that individual householders use in their garden can have a negative impact on the health of waterways

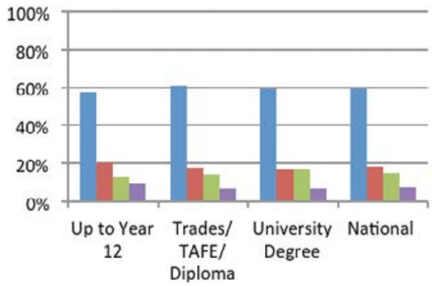

Figure 36. The pesticides that individual householders use in their garden have no negative impact on the health of waterways.

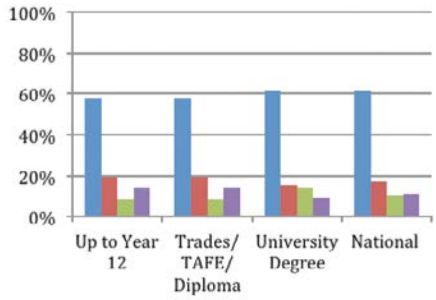

Figure 37. Soil erosion from urban areas does not affect the health of waterways.

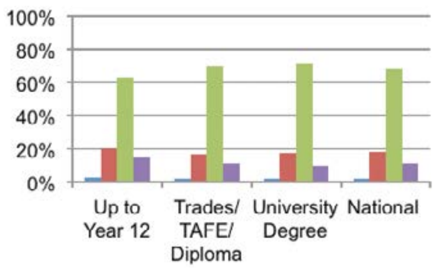

Figure 38. Planting native plants along a waterway's bank improves the health of the waterway (riparian)

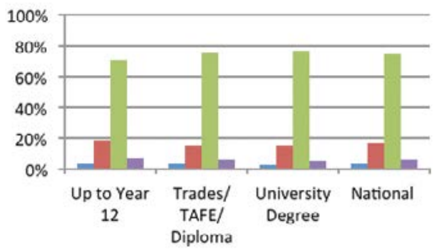

Figure 39. Water conservation actions by householders can significantly reduce the amount of water used in urban areas

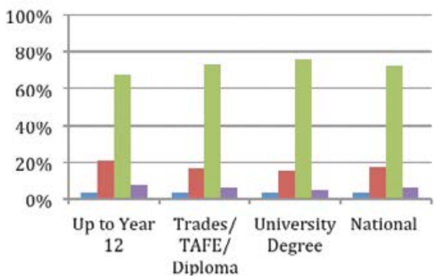

Figure 40. What individual residents do in their home and garden has consequences for the health of waterways and coastal bays

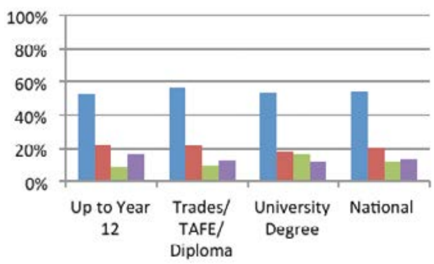

Figure 41. Waterways can cope easily with large amounts of sediment (i.e., eroded soil suspended in the water)

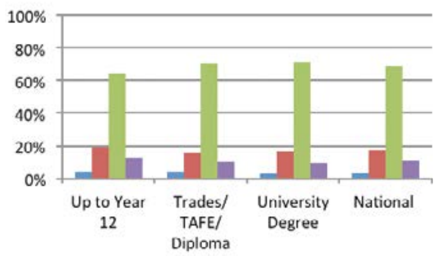

Figure 42. Waterways can be damaged by stormwater flows

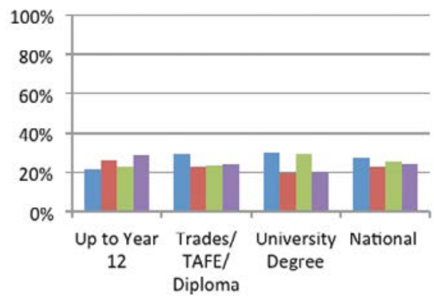

Figure 43. Wastewater from domestic bathrooms and laundries receives little or no treatment before entering waterways

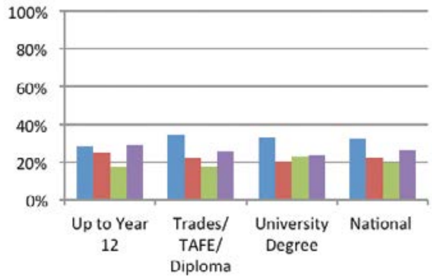

Figure 44. Stormwater from roofs and roads is treated to remove pollutants before entering the waterways

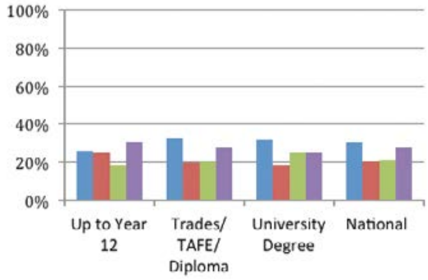

Figure 45. Domestic wastewater and stormwater are carried through the same pipes

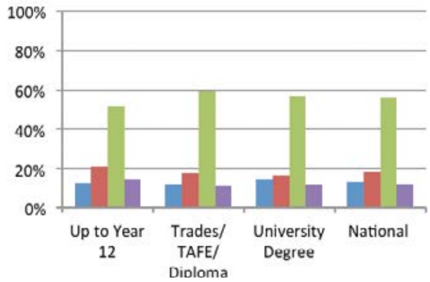

Figure 46. I know where my household drinking water comes from (e.g., dam, groundwater, desalinated water, etc)

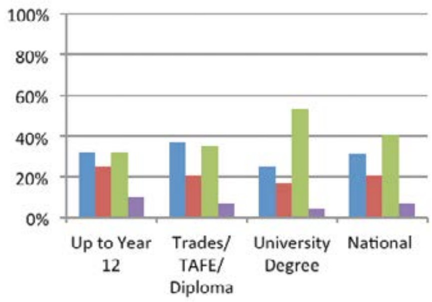

Figure 47. The amount of water available for use is finite

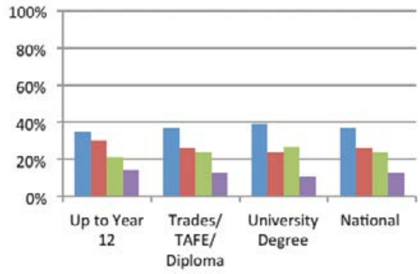

Figure 48. Delivering clean, safe drinking water to households is a simple, low cost process

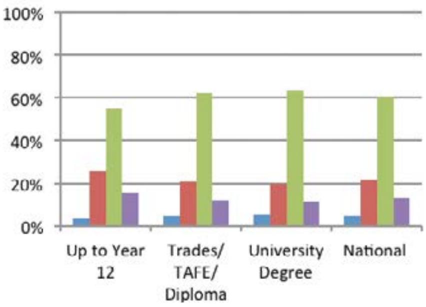

Figure 49. The costs of managing water infrastructure are high

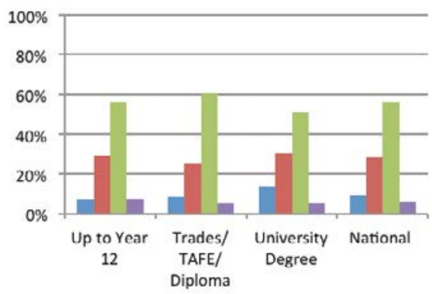

Figure 50. The cost of water is too high

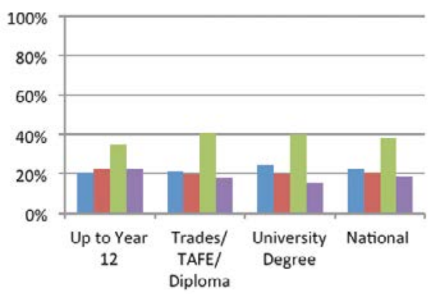

Figure 51. I know what catchment my household is part of

Appendix E

Detail overview of the responses on Knowledge of Water and Water Management survey, based on household ownership

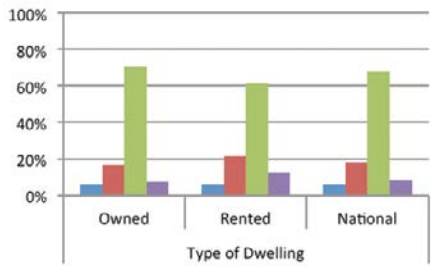

Figure 52. The fertilisers that individual householders use in their garden can have a negative impact on the health of waterways

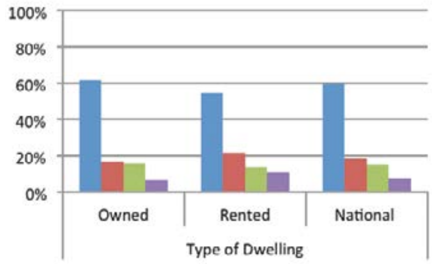

Figure 53. The pesticides that individual householders use in their garden have no negative impact on the health of waterways.

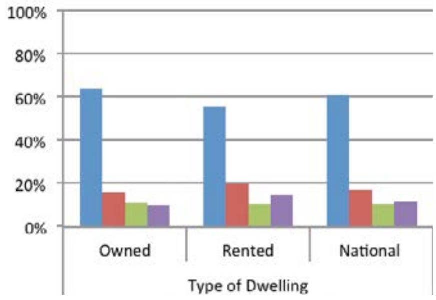

Figure 54. Soil erosion from urban areas does not affect the health of waterways.

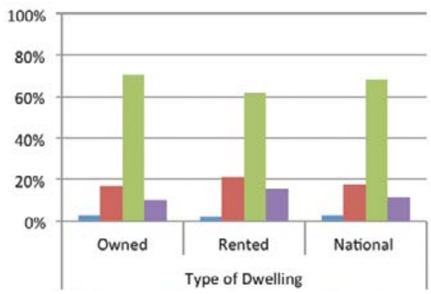

Figure 55. Planting native plants along a waterway's bank improves the health of the waterway (riparian)

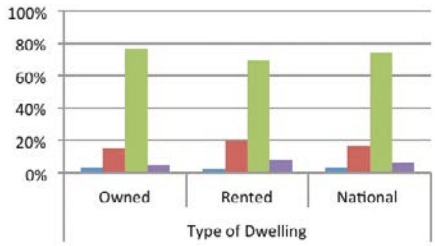

Figure 56. Water conservation actions by householders can significantly reduce the amount of water used in urban areas

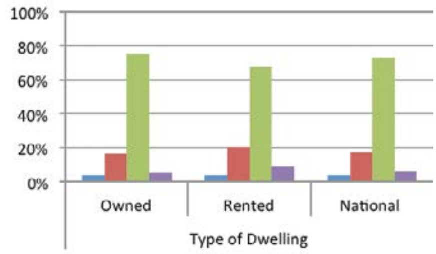

Figure 57. What individual residents do in their home and garden has consequences for the health of waterways and coastal bays

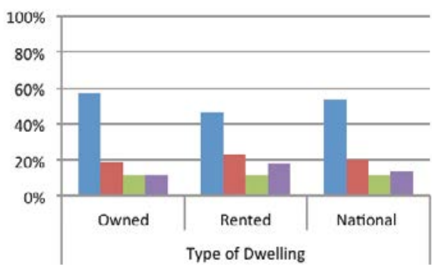

Figure 58. Waterways can cope easily with large amounts of sediment (i.e., eroded soil suspended in the water)

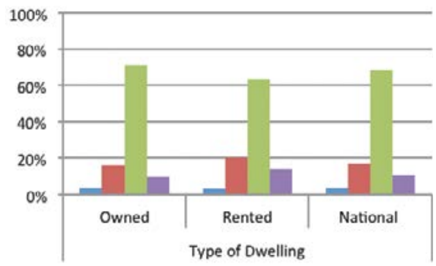

Figure 59. Waterways can be damaged by stormwater flows

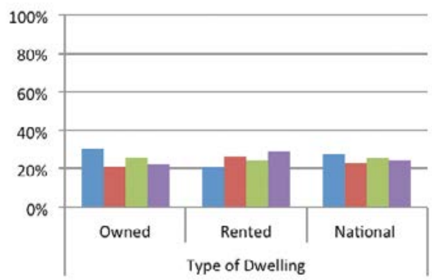

Figure 60. Wastewater from domestic bathrooms and laundries receives little or no treatment before entering waterways

Disagree
Neutral
Agree
Don't know

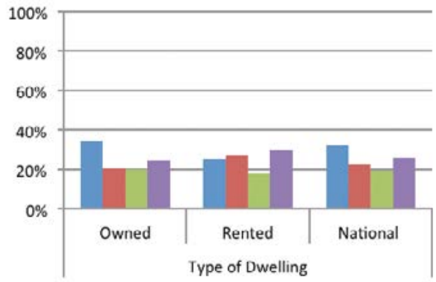

Figure 61. Stormwater from roofs and roads is treated to remove pollutants before entering the waterways

Figure 62. Domestic wastewater and stormwater are carried through the same pipes

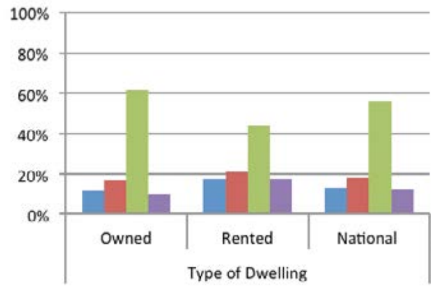

Figure 63. I know where my household drinking water comes from (e.g., dam, groundwater, desalinated water, etc)

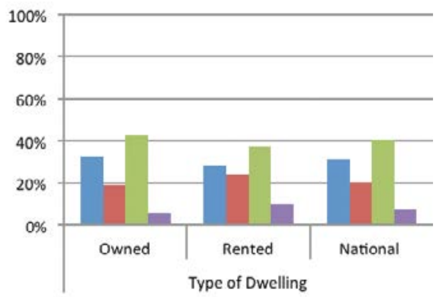

Figure 64. The amount of water available for use is finite

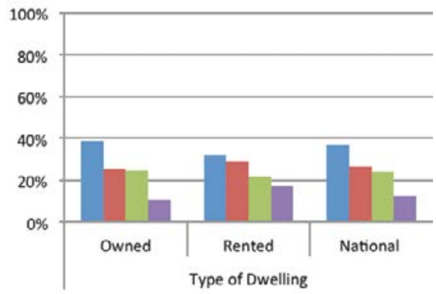

Figure 65. Delivering clean, safe drinking water to households is a simple, low cost process

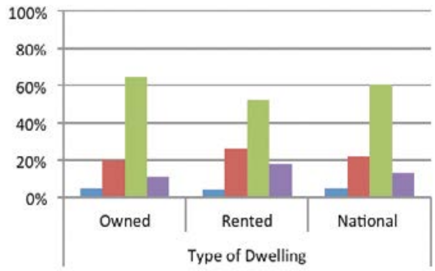

Figure 66. The costs of managing water infrastructure are high

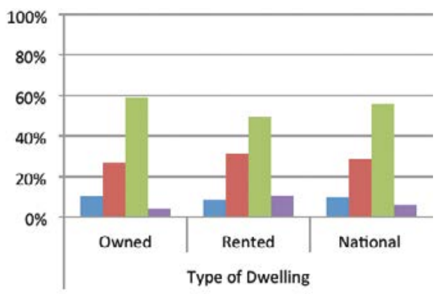

Figure 67. The cost of water is too high

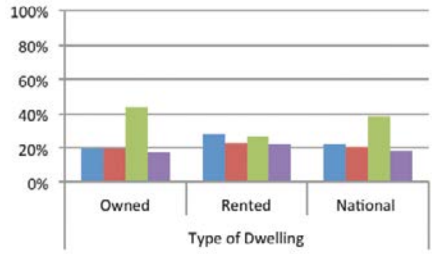

Figure 68. I know what catchment my household is part of

Appendix F

Chi-Squares for Water Knowledge items by States breakdown

	NSW+ ACT	VIC	TAS	SA	QLD	WA	Chi-square	Cramer's V
Negative Impact items:								
Fertilisers	67.4	**64.3**	62.7	63.8	**70.3**	**75.8**	28.51 ***	0.074
Pesticides	58.2	**55**	58.5	55.9	**63.4**	**68.5**	37.02 ***	0.085
Soil Erosion	**59.2**	**58.1**	63.6	58.2	**66.9**	**65.7**	28.15 ***	0.074
Sediments	52.4	**51.4**	60.2	49.4	**59.1**	58.1	24.73 ***	0.069
(Stormwater) Damage	69.1	**65.4**	70.3	67.1	**71.9**	69.1	12.17 *	0.049
Positive Impact items:								
Riparian	67.2	**63.1**	68.6	69.9	**72.9**	72.2	30.03 ***	0.076
Residents	72.5	**68.5**	70.3	72.2	**74.6**	**78.9**	22.58 ***	0.066
Conservation	72.9	**70.8**	70.3	72.7	**79.9**	**78.9**	33.79 ***	0.081
Water Treatment:								
Wastewater	28.8	**22.8**	27.1	**32.4**	28.2	28.3	20.48 **	0.063
Stormwater	31.3	**29.1**	33.9	32.7	**36.8**	30.7	16.85 **	0.057
Same pipes	29.9	**27**	26.3	**37**	**33.9**	27.6	23.73 ***	0.068
Costs and Drinks items:								
Finite	**43**	40	36.4	37.7	38.9	41.9	8.25	0.04
Drinking Water	**57.7**	49.5	61.9	56.5	**63.3**	**50**	54.95 ***	0.103
Catchment	**43.7**	**32.3**	**47.5**	37.7	**41.5**	**27.6**	73.90 ***	0.12
Low cost	35.7	**31.8**	36.4	36.7	**40.3**	**47.2**	42.61 ***	0.091
High cost	59.3	**57.5**	55.1	61	**63.5**	**65.9**	16.98 **	0.057
Too high	**11.5**	10.4	11	**5.8**	**5**	**13.6**	49.08 ***	0.097

Note: Percentages in bold are those with significant values of adjusted standardised residuals (> 1.96)

** $p < 0.05$*
*** $p < 0.01$*
**** $p < .001$*

Appendix G

Chi-Squares for Water Knowledge items by Education breakdown

	Up to Year 12	TAFE/ Dipl.	University	Chi-square	Cramer's V
Negative Impact items:					
Fertilisers	**63.0**	68.5	**71.1**	26.19 ***	0.071
Pesticides	57.6	**61.2**	59.0	4.49	0.029
Soil Erosion	**58.1**	**63.8**	61.2	11.34 **	0.047
Sediments	52.3	**56.2**	53.4	5.37	0.032
(Stormwater) Damage	**64.1**	70.4	**71.1**	22.62 ***	0.066
Positive Impact items:					
Riparian	**62.7**	69.8	**71.1**	31.77 ***	0.078
Residents	**67.4**	73.7	**75.9**	33.16 ***	0.080
Conservation	**70.7**	75.4	**76.5**	16.66 ***	0.057
Water Treatment:					
Wastewater	**21.7**	**29.8**	**30.2**	38.67 ***	0.086
Stormwater	**28.2**	**34.5**	32.8	15.91 ***	0.055
Same pipes	**25.9**	**32.7**	31.8	21.37 ***	0.064
Costs and Drinks items:					
Finite	**32.1**	**35.2**	**53.9**	200.96 ***	0.197
Drinking Water	**51.8**	**59.5**	56.8	20.34 ***	0.063
Catchment	**34.6**	**40.9**	39.9	15.85 ***	0.055
Low cost	**34.6**	36.8	**39.0**	7.16 *	0.037
High cost	**55.0**	62.2	**63.4**	28.88 ***	0.075
Too high	**6.8**	**8.4**	**13.5**	48.93 ***	0.097

Note: Percentages in bold are those with significant values of adjusted standardised residuals (> 1.96)

** $p < 0.05$*
*** $p < 0.01$*
**** $p < .001$*

Appendix H

Chi-Squares for Water Knowledge items by Tenure breakdown

	Own	Rent	Chi-square	Cramer's V
Negative Impact items:				
Fertilisers	**70.6**	**61.1**	45.38 ***	0.094
Pesticides	**61.3**	**54.6**	20.42 ***	0.063
Soil Erosion	**63.7**	**55.3**	32.76 ***	0.08
Sediments	**57.3**	**46.5**	50.64 ***	0.099
(Stormwater) Damage	**71.1**	**63.1**	32.65 ***	0.08
Positive Impact items:				
Riparian	**70.9**	**61.6**	43.13 ***	0.091
Residents	**74.8**	**67.4**	30.14 ***	0.076
Conservation	**76.5**	**69.4**	28.85 ***	0.075
Water Treatment:				
Wastewater	**30.5**	**20.5**	55.02 ***	0.103
Stormwater	**34.8**	**25.5**	43.04 ***	0.091
Same pipes	**33.9**	**22**	73.79 ***	0.12
Costs and Drinks items:				
Finite	**42.4**	**37.2**	12.10 **	0.048
Drinking Water	**61.5**	**44**	136.90 ***	0.163
Catchment	**43.7**	**27.1**	127.3 ***	0.157
Low cost	**39**	**32.1**	22.24 ***	0.066
High cost	**64.2**	**51.8**	69.77 ***	0.116
Too high	10.2	8.5	3.57	0.026

Note: Percentages in bold are those with significant values of adjusted standardised residuals (> 1.96)

** $p < 0.05$*
*** $p < 0.01$*
**** $p < .001$*

Appendix I

Chi-square for Correct understanding of Catchment (definition) – by States breakdown

	NSW+ACT	VIC	TAS	SA	QLD	WA	Chi-square	Cramer's V
Correct	46.4	**35.6**	47.5	48.4	**57.2**	43.9	109.27 ***	0.145

Appendix J

Chi-squares for Correct understanding of Catchment (definition) – by Education level

	Up to Year 12	Trades/TAFE/Diploma	University	Chi-square	Cramer's V
Correct	**38.6**	47.7	**50.7**	53.84 ***	0.102

Appendix K

Chi-squares for Correct understanding of Catchment (definition) – by Household ownership

	Own	Rent	Chi-square	Cramer's V
Correct	**49.4**	**38.0**	56.61 ***	0.105

Note: Percentages in bold are those with significant values of adjusted standardised residuals (> 1.96)

Appendix L

Chi-squares for the Understanding of Water Cycle - by States breakdown

	NSW+ACT	VIC	TAS	SA	QLD	WA	Chi-square	Cramer's V
Clearly understood	**27.2**	22	20.3	**19.7**	**21.1**	26	26.41 **	0.051
General sense	**48.3**	51.8	53.4	**55.9**	51.1	49.2		
Do not understand	24.5	26.2	26.3	24.3	27.8	24.8		

Appendix M

Chi-squares for the Understanding of Water Cycle - by Education level

	Up to Year 12	Trades/ TAFE/ Diploma	University	Chi-square	Cramer's V
Clearly understood	**16.9**	**21.6**	**32.3**	170.70 ***	0.128
General sense	49.5	52.3	49.6		
Do not understand	**33.6**	26.1	**18.1**		

Appendix N

Chi-squares for the Understanding of Water Cycle - by States breakdown

	Own	Rent	Chi-square	Cramer's V
Clearly understood	**25.5**	**20.2**	57.13 ***	0.074
General sense	**51.8**	**47.4**		
Do not understand	**22.7**	**32.4**		

Note: Percentages in bold are those with significant values of adjusted standardised residuals (> 1.96)

Appendix O

ANOVA for the Attitudes to the Alternative Water Sources and Treatment by States Breakdown

	NSW +ACT	VIC	TAS	SA	QLD	WA		Partial Eta square
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	F	(η_p^2)
Attitudes to Recycled and Desalinated Water:								
Willingness to use recycled water for drinking	2.82 (1.32)	2.7 (1.32)	2.66 (1.30)	2.87 (1.34)	2.82 (1.36)	3.14 (1.36)	8.16***	0.008
Willingness to use recycled water for non-drinking	4.18 (1.05)	4.22 (.99)	4.18 (1.13)	4.36 (.87)	4.25 (1.01)	4.3 (1.01)	2.60*	0.003
Support to use desalinated water for drinking	3.1 (1.25)	3.08 (1.27)	3.14 (1.19)	3.44 (1.18)	3.21 (1.28)	3.72 (1.15)	24.34***	0.023
Support to use desalinated water for non-drinking	3.77 (1.20)	3.81 (1.20)	3.76 (1.20)	3.85 (1.16)	3.87 (1.17)	4.1 (1.09)	6.45***	0.006
Attitudes to Stormwater:								
Agreement to use stormwater for drinking	3.38 (1.07)	3.3 (1.05)	3.25 (1.05)	3.45 (1.08)	3.53 (1.11)	3.55 (.936)	7.95***	0.008
Agreement to use stormwater for public space use	4.03 (1.10)	4.03 (1.06)	4.11 (.99)	4.21 (1.06)	4.11 (1.07)	4.11 (1.00)	2.71*	0.003

Note: Bonferroni corrected at .003

** p < .05*
****p < .001*

Appendix P

ANOVA for the Attitudes to the Alternative Water Sources and Treatment by Education Breakdown

	Up to Year 12	Trades/TAFE/Diploma	University Degree		Partial Eta square
	M (SD)	M (SD)	M (SD)	F	(η_p^2)
Attitudes to Recycled and Desalinated Water:					
Willingness to use recycled water for drinking	2.70 (1.3)	2.77 (1.35)	2.97 (1.35)	20.28 ***	0.008
Willingness to use recycled water for non-drinking	4.14 (1.07)	4.23 (1.04)	4.32 (.93)	13.33 ***	0.005
Support to use desalinated water for drinking	3.12 (1.24)	3.17 (1.29)	3.31 (1.24)	9.98 ***	0.004
Support to use desalinated water for non-drinking	3.80 (1.16)	3.84 (1.23)	3.86 (1.17)	1.03	0.000
Attitudes to Stormwater:					
Agreement to use stormwater for drinking	3.31 (1.09)	3.42 (1.08)	3.49 (1.03)	11.10 ***	0.004
Agreement to use stormwater for public space use	4.00 (1.10)	4.17 (1.02)	4.04 (1.08)	11.85 ***	0.005

Note: Bonferroni corrected at .017

**** p < .001*

Appendix Q

Chi-Squares for the Attitudes to Installing Raingardens by States breakdown

	NSW+ ACT	VIC	TAS	SA	QLD	WA	Chi-square	Cramer's V
On my property	38.1	37.2	34.7	37.5	34.8	38.6	3.81	0.027
In my street	55.2	55.6	**44.1**	60.3	56.8	59.6	13.04	0.050
Not interested	22.3	22.4	**35.6**	19.2	23.0	18.9	17.76	0.590

Appendix R

Chi-Squares for the Attitudes to Raingardens by Education background

	Up to Year 12	TAFE/Dipl.	University	Chi-square	Cramer's V
On my property	**31.8**	36.0	**43.0**	47.60 ***	0.096
In my street	**53.6**	55.3	**59.3**	12.21 **	0.049
Not interested	**26.3**	23.1	**17.6**	39.20 ***	0.087

Note: Percentages in bold are those with significant values of adjusted standardised residuals (> 1.96)

Appendix S

Chi-Squares for the sources of water information about water – by States breakdown

	NSW+ACT	VIC	TAS	SA	QLD	WA	Chi-square	Cramer's V
Nothing in the last 6 months	53.1	**53.8**	55.9	54.7	50	**37.4**	47.14 ***	0.095
Other	0.8	1.2	1.7	0.5	1.4	1.2	3.59	0.026
Social Media	3.1	2.2	2.5	1.8	2.2	3.9	6.83	0.036
Online news	8.3	**6.6**	9.3	6.8	8	9.8	6.83	0.036
Water Org. Web	**5.2**	6.2	9.3	5.1	5.9	**14.6**	62.34 ***	0.11
Govt. Newsletter	**7.8**	**7.2**	11	8.6	**14.3**	**6.5**	48.02 ***	0.096
Utility Bills	**23.1**	**29.1**	25.4	24.8	24.9	**32.3**	25.58 ***	0.07
Utility Newsletter	12.4	11.6	15.3	**7.1**	11.9	**22.4**	55.30 ***	0.103
Radio	10.1	9.4	9.3	10.9	8.5	**14**	12.41 *	0.049
TV	**21.9**	**21.6**	27.1	24.3	26.3	**36.6**	53.10 ***	0.102
Newspaper	**16.8**	17.3	20.3	20	17.8	**25.2**	20.54 **	0.063

Note: Percentages in bold are those with significant values of adjusted standardised residuals (> 1.96)

Appendix T

Chi-Squares for the sources of water information about water – by Education breakdown

	Up to Year 12	TAFE/ Dipl.	University	Chi-square	Cramer's V
Nothing in the last 6 months	**55.9**	52.5	**46.1**	34.53 ***	0.082
Other	1.0	1.0	1.2	.233	0.007
Social Media	2.9	**2.0**	3.1	4.71	0.030
Online news	**5.7**	**6.8**	**10.8**	35.19 ***	0.083
Water Org. Web	**4.8**	6.8	**7.9**	13.24 **	0.051
Govt. Newsletter	**7.0**	9.0	**10.7**	14.13 **	0.052
Utility Bills	**22.5**	26.6	**28.5**	16.24 ***	0.056
Utility Newsletter	**9.2**	12.7	**15.9**	34.09 ***	0.081
Radio	9.8	9.3	11.0	3.14	0.025
TV	23.4	23.3	**26.3**	5.35	0.032
Newspaper	**16.1**	**15.8**	**22.5**	33.25 ***	0.080

Note: Percentages in bold are those with significant values of adjusted standardised residuals (> 1.96)

Appendix U

Chi-Squares for the sources of water information about water – by household ownership breakdown

	Own	Rent	Chi-square	Cramer's V
Nothing in the last 6mths	**47.2**	**60.9**	82.21 ***	0.126
Other	1.0	1.1	0.235	0.007
Social Media	**2.3**	**3.4**	7.58 *	0.038
Online news	7.6	8.5	1.37	0.016
Water Org. Web	**7.3**	**4.8**	11.84 **	0.048
Govt. Newsletter	**10.3**	**5.7**	30.81 ***	0.077
Utility Bills	**30.9**	**14.6**	150.10 ***	0.171
Utility Newsletter	**16.4**	**4.3**	142.58 ***	0.166
Radio	**10.9**	**8.1**	9.32 **	0.042
TV	**25.5**	**21.8**	11.00 **	0.046
Newspaper	**20.1**	**13.9**	28.55 ***	0.074

Note: Percentages in bold are those with significant values of adjusted standardised residuals (> 1.96)

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