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Water alternatives – who and what influences public acceptance?

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Abstract

Water supports life, society, the environment and the economy. Ensuring a nation's water supply is therefore one of the most fundamental responsibilities of every government. Water management is becoming an increasing challenge due to the impact of climate change on the variability of rainfall, and the increased demand for water as a result of population growth. In response, many cities have implemented plans to augment their traditional water supplies (e.g. dams and groundwater) with new or alternative sources (e.g. recycled wastewater and desalinated sea water). Historical evidence suggests that in order for water augmentation projects to be successfully implemented, the support of the general public is required. Thus, it is critical to understand the factors which influence people's attitudes regarding water-related matters. The aim of this study is to identify these influencing factors. Results from an empirical study including both a qualitative and quantitative study component indicate that a number of factors are influential, including: research findings, the experience of water shortage, consideration for future generations, and news, facts and other publicized information. Politicians and the government were rated by respondents as having a low level of influence. Factors which may determine differences in influence were explored. This revealed a small number of differences for people with low acceptance levels of recycled and desalinated water, and people with higher levels of

education. Systematic differences were identified when comparing the general Australian population with that of Toowoomba, a regional town in Queensland where a referendum on a water recycling project was held. Policy implications are discussed.

Keywords: desalinated water, recycled water, public acceptance, information, communication, social influence, marketing

1. Introduction

A city's water supply is one of the most fundamental bases for existence, prosperity and growth. Because in developed nations water is typically provided to households in a centralized supply system often regulated by the State, it is a political matter. Governments and public policy makers are thus responsible for ensuring sufficient water supply at the least possible environmental cost, and in the most economically cost effective manner. However, because it is a political matter which impacts all members of society, water-policy related decisions implemented without the support of the population can backfire.

The management of water is becoming an increasingly contentious issue in many areas of the world due to the challenges posed by climate change (increasing variability of supply), and increased demand for water (driven by factors including population growth, and rising per capita consumption related to increasing affluence). The water supply levels of many cities world wide have reached perilously low levels, particularly in developed nations, and in regional areas where infrastructure is not as developed. Notably, Australia's South-East (see The Wentworth Group) and the USA's California (see California Governor's Advisory Drought Planning Panel 2000) have received much attention related to their

battles with managing water supply and consumption over recent decade. In Australia shortfalls in water supply are typically managed firstly through restrictions to water use in the short term (through mandatory water conservation programs) and water supply augmentation in the long term.

Historical evidence suggests that ignoring public sentiments can prevent water-related initiatives from being implemented. For example, in the 1990's a plan to purify wastewater to augment San Diego's (USA) drinking water supply failed. The reasons for the demise of the project include negative attitudes by some members of the community and politicians (Christen, 2005). More recently, in 2005 in Australia, a potable (drinking) recycled water scheme was planned for Toowoomba in regional Queensland. In reaction, a group of residents of Toowoomba formed CADS (Community against Drinking Sewage) and campaigned aggressively ("Poo-woomba", "Dunny to tap") against the water recycling plant. The CADS campaign was launched many months before official consultation and information campaigning by the government started, leading to a competitive advantage in term of informing and influencing the public by CADS. In 2006 a referendum was announced. Only then did Toowoomba City Council start an information campaign arguing that recycled water is being used safely around the world, water will meet drinking water guidelines and providing testimonials from GPs and academics about the safety of recycled water. Despite these efforts, the proposed recycled water scheme was voted down in the referendum leading to the abandonment of the proposed recycled water scheme (a detailed description of the case of Toowoomba is provided by Hurlimann and Dolnicar, 2010). This has arguably had lasting negative consequences for Australia's water future.

Probably due to fear of public resistance and political risk as evidenced in Toowoomba, all other Australian states that are endangered by insufficient water supply (ironically, except Queensland) have

not proposed a large scale potable water recycling scheme. Instead, plans for seawater desalination have dominated. Desalination produces freshwater by extracting salt from seawater, which is an extremely energy-consuming process and therefore arguably in most cases is not the rationally optimal solution to a city's water crisis in view of the two key criteria (sufficient water supply at the lowest possible cost, both financially and environmentally).

These cases demonstrate that (1) a nation's water management is a public affairs matter of fundamental importance, and (2) it is critical to communicate effectively with the public and elected officials to provide them with the information they require to judge a proposed project and make an informed decision about whether or not to support it. In order to communicate effectively, it is necessary to understand which factors influence people's attitudes regarding water related matters, and who should deliver these communication messages (Dolnicar and Saunders, 2006). Addressing the latter problem is the contribution we make in the present paper. More specifically, we aim to:

- (1) identify which factors of influence (who and what) are perceived as strong,
- (2) determine which of these sources are seen among the general population to be most and least influential, and
- (3) determine whether the influence of these factors varies across sub-segments of the population: people with different acceptance levels of water from alternative sources; people with different levels of education; and people who have or have not been confronted in the past with large amounts of information on water-related policy measures

- (4) create segments of people who differ with respect to which sources influence their water-related behaviors and gain insight about who these segments are and whether separate communication strategies are required

The study has major practical benefit: it will provide guidance to governments and public policy makers in the selection of the most suitable information sources or forms through which to communicate water messages to the public.

2. Prior research on willingness to use alternative water sources and the role of information

A significant body of work regarding public attitudes to recycled water use has developed since the early 1970's with Bruvold [1972; 1979; 1988; 1992] pioneering this stream of research. A comprehensive review of research relating to water behaviours can be found in Hurlimann et al. 2009, other reviews of note include Po et al 2003 and Po et al 2004. While the percentage figures tend to vary across studies, one finding has been confirmed consistently: public acceptance of alternative water sources is higher for water uses with low human contact (such as flushing toilets) than for close-to-body uses such as showering, bathing babies or drinking (Bruvold, 1988; Dolnicar and Hurlimann, 2010; Dolnicar and Schäfer, 2009; Marks, 2004; Stone and Company Incorporated, 1974).

A number of factors influencing positive attitude to recycled water have been identified in the past. Factors found to promote acceptance include gender – being male (Dolnicar and Schäfer, 2009; Lohman and Milliken, 1985; Nancarrow et al., 2008; Tsagarakis et al., 2007); being highly educated (Alhumoud et al., 2003; Bruvold, 1972; Hurlimann, 2007; Menegaki et al., 2006; Stone and Company

Incorporated, 1974), trusting the water authority (Hurlimann and McKay, 2004; Lohman and Milliken, 1985; Po et al., 2005); low perception of risk (Hurlimann et al., 2008; Po et al., 2005); past experience of recycled water use (Dishman et al., 1989; Flack and Greenberg, 1987; Hurlimann, 2007; Sims and Baumann, 1974); and importantly for this research, knowledge and information about recycled water (Flack and Greenberg, 1987; Hurlimann et al., 2008; Jeffrey and Jefferson, 2003; Lohman and Milliken, 1985; Tsagarakis and Georgantzis, 2003).

Hartley (2001) postulates that information, context, communication, and dialogue will be key factors involved in gaining public participation and positive perception of recycled water use. Importantly, Syme and Sadler (1994) encourage cooperation between water institutions and the general public in their decision making in decision making. However, despite this, there has been limited research conducted to understand what communication factors influence people's attitudes to water related matters e.g. what, who, how and when information messages should be communicated. This is increasingly important given that recent research has indicated the public know very little about alternative water sources, and would like more information (Dolnicar and Hurlimann, 2009). Given the limitations of existing research, work in other disciplines is drawn upon and discussed below. This work indicates that effective communication may have an important impact on the acceptance and use of alternative water sources.

In the context of new products and services, Rogers (2003) suggests that the provision of information may help reduce uncertainty. Selnes (1998) describes that in communication literature the perceived expertise or competence of an information source has been found to be a major determinant of the effect of any communication. Hovland et al. (1953) have found that a communicator is more likely to

induce a change in attitude if their credibility (measured by trustworthiness and expertise) is high.

They posit that the way in which communication is worded, organized and presented determines how it is received. Interestingly, in the case of recycled water, Marks (2006) found that “purification” was perceived by participants of a focus group as a better term for the process of supplementing drinking water supplies with highly treated reclaimed water, because the research participants “felt that ‘repurified’ sounded as if the water had already been used”.

Krech et al.’s (1962) social psychology research found that how the audience perceives the credibility, attractiveness and group affiliations of the communicator are important determinants of how effective the communication will be. Hovland et al. (1953) suggests that the views of the receiver of the information will be influential to how the message is received. They put forward that individuals in favor of an advocated opinion will consider the communication fair and unbiased, but those opposed will be more likely to regard the identical communication as propagandistic and unfair. This indicates that reactions to communication and information will vary from message to message and from receiver to receiver depending on the characteristics of both.

In a study of people’s perceptions and evaluation of technical risk information Jungermann et al. (1996) asked participants who would be the best source to inform the public about risk. A committee consisting of the public, the company and societal groups was chosen over the authorities and private companies. They found that government and industry officials were not highly trusted. Respondents were found to have a strong interest in receiving information, which was found to be more strongly determined by perceived risk than by the credibility of the potential sources of information.

Hurlimann (2006) explored community perceptions of trust, communication, and integrity for three authorities associated with the provision of recycled water in a suburb with a dual pipe recycled water system (delivering recycled water for non-potable use) in Australia. The results indicate that, overall, the respondents perceived that the water authority had the highest integrity, followed by the local government authority, then the developer. Highest trust was placed in the water authority, who were also rated the best communicator. In another Australian study of public attitudes to the use of recycled water, Miller and Buys (2008) found that the CSIRO (Commonwealth Scientific and Industrial Research Organisation) was the organization most trusted to ‘tell the truth’ about water recycling and greywater. Conversely the media and all levels of government were the least trusted.

The literature reviewed above indicates that the content and source of information regarding alternative water sources, along with an individual’s prior attitude to the alternative water source, will influence their perception of and response to information. Yet, to date limited research has been undertaken to determine what the most influential sources of information are in the areas of a nation’s water supply, which is different to situations involving products and services that people can opt to purchase or not to purchase.

3. Method

This study employed a two step research approach. Firstly qualitative research was conducted in mid-2008 in eight locations across Australia to identify all possible sources of information that have the potential to inform or influence people with respect to water alternatives. In order to ensure inclusion of a wide range of respondents with respect to local water situations, the locations selected for

interviews and focus groups differed significantly with respect to water source, water availability, water restrictions as well as history of (attempted) implementation of water augmentation projects. These locations were Melbourne, The Mallee, Sydney, Brisbane, Toowoomba, Darwin, Perth, and Adelaide. In total eight focus groups and sixty-six in-depth interviews were undertaken. The results of these qualitative components were coded, categorized and analyzed in line with Richards (2005) and Marshall (2002).

From the interviews and focus group results, a list of 19 sources of information / influence was derived (most frequently identified by respondents). These were included in the quantitative survey conducted six months later. The precise wording of the survey question was:

“Who or what could influence you attitude towards water related matters (e.g. the use of water efficient appliances, the use of recycled water etc.)?”

Respondents were then presented with a list of the 19 influencing factors and were asked to answer with “yes” or “no”. This binary answer format was chosen for three reasons: (1) conceptually, each source of information can either have or not have an influence. Even if the influence is small, it still is an influence and in this study we were interested in identifying all sources of information, (2) methodologically, binary survey questions have a number of advantages over the popular five or seven-point scales: they are unambiguous in their meaning, they are not prone to capturing response styles, including cross-cultural response styles (which can be a significant source of data contamination in multicultural societies such as Australia) and the scale properties have clear implications for data

analysis, (3) practically, binary answer formats are easy for people to understand and respond to, thus reducing the overall burden on respondents (Dolnicar, 2003).

The survey was made available online in January 2009 and a research-only permission-based internet panel was used to collect responses. Respondents, who are members of a panel, are paid compensation for their participation which is based on the duration of the survey. This approach had two advantages: (1) it enabled a quota sampling procedure to be applied and thus ensured that the final sample was representative of the Australian population with respect to key socio-demographic information (age, gender, state, and education) as known from census data provided by the Australian Bureau of Statistics, (2) it minimized both omission error and data entry error because respondents are alerted if they missed a question and asked to complete it and because data is entered automatically with no third-person data entry required. The final sample consisted of 1495 respondents. The methods of analysis are explained in the respective results sections.

4. Results

4.1 Stated sources of influence

Results of the frequency analysis of the influencing factors are provided in Figure 1, indicating for each source of information the percentage of respondents who stated that this source could influence their attitudes with respect to water-related issues.

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Figure 1. Stated influence of information sources on attitudes to water-related matters

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As can be seen, a wide range of sources have been identified as influential by respondents. ‘Research findings’ (indicated as influential by 88% of respondents) represents an objective source of information which is relatively removed from people’s everyday life. In contrast, the experience of water shortage (indicated as influential by 86% of respondents) is very much related directly to people’s lives and their experiences in water-related matters. Consideration for future generations (84%) is an altruistic motivation which neither falls into the category of objective information, nor subjective experience. Finally, news, facts and other publicized information is a generic source of information which does not specify in detail the nature of the argument or the trustworthiness of the sources as perceived by respondents, yet is viewed as an influential source by a significant proportion of the public.

At the lower end of influence, politicians and the government are only seen as influential by 15% and 38% of the population, respectively. This is a very interesting finding, given that, arguably, most of the information regarding water related matters in Australia is communicated through the news media by government or politicians (see Stempel’s (1989) comments regarding politician’s use of the media). Based on our study findings, this may not be the most effective way of communicating to the Australian public. As found by Hovland et al. (1953), Krech et al. (1962) and Selnes (1998) an audience’s perception of the communicator plays an important role in how the information is received.

The water authority is seen as influential by 68% of respondents, thus representing a more promising source of information than direct government, although it is likely to be less efficient than using objective factual information, such as research findings communicated by a scientist (76%).

4.2 Different sources of influence for different people?

Three analyses were conducted to investigate the second research question. First, it was investigated whether sources of influence differ for people with different levels of stated likelihood of use for desalinated and recycled water. We would expect that this will be the case because people with higher acceptance levels are likely to be more familiar and thus have a clear idea about which sources of information are suitable. Second, differences with respect to people's education level were investigated. The reason for choosing the education variable is that education has emerged consistently as a predictor of acceptance of recycled water (e.g. Bruvold 1972, Lohman and Milliken 1985, Menegaki et al. 2006, Dolnicar and Schafer 2009). Finally, Toowoomba respondents were compared to the total Australian sample. This was done because Toowoomba residents experienced a time of being inundated with information about recycled water from a range of different sources and can therefore be hypothesized to have developed clear views on which sources they would pay attention to and which they would dismiss.

4.2.1 Stated likelihood of use

Respondents were asked to indicate their likelihood of using recycled water and desalinated water for 14 household uses. They indicated likelihood to use each source of water with a visual analogue scale, where they placed an X on a line between two end points, one which represented 'very unlikely' and

the other 'very likely'. This translated to a point between 1 and 100. A regression analysis was computed with stated likelihood to use desalinated and recycled water, respectively, for the total score of the 14 households used as the dependent variable and potential sources of influence as independent variables. Note that a regression analysis was not computed assuming that sources of influence would have high explanatory power for the stated likelihood of using water from alternative sources. Rather it was used to simultaneously test the effects of all 19 influence variables and thus avoid the overestimation of statistical significance due to multiple testing.

Results indicate that no sources of influence are associated with low levels of stated likelihood of use. A number of sources of influence return significant or marginally significant regression coefficient values and can thus be assumed to be associated with high stated likelihood of use levels. These sources include, for desalinated water; experience of water shortage (p-value of coefficient = 0.052), partner (p=0.059), scientist (p=0.018) and news/facts/other publicized information (p=0.000). For recycled water these sources include; experience of water shortage (p-value of coefficient = 0.054), the water authority (p=0.012) and news/facts/other publicized information (p=0.003).

One key conclusion can be drawn from this analysis: it is easier to identify sources of influence for those people who already have a high likelihood of use and thus a positive attitude towards these non-traditional water sources. This is not an encouraging finding in terms of making recommendations for public policy because, while the general distribution of influence (as depicted in Figure 1) gives some indication as to what the key sources are, no useful sources can be identified for those residents who hold negative attitudes towards recycled and desalinated water.

4.2.2 Education

In order to assess the effect of education level on the influence of the full range of influential factors, Chi-squared tests were computed. Results indicate that for most sources of information no statistically significant difference exists across educational groups. Only three information sources differ. The government is perceived as more influential by respondents with higher education levels ($p=0.000$): between 44% and 48% of respondents with a university degree state that the government influences their attitudes in water-related matters, whereas only between 28% and 33% of respondents without a university degree indicate the government as a source that influences them. The same pattern is identified for scientists ($p=0.021$), with between 78% and 82% of university-educated people stating that scientists influence them, as opposed to between 71% and 73% for respondents without a university education. In contrast, one fifth of respondents without a university degree state that nobody influences them. This percentage is only 7% for respondents with a postgraduate degree ($p=0.038$).

This analysis indicates that generally, the full range of information sources is available for the total population. People with lower levels of education tend to be more convinced that nobody influences them.

4.2.3 Toowoomba

Because the sample of Toowoomba residents was insufficient in the data set representative of Australia, an additional 200 responses were collected from Toowoomba residents. The same questionnaire was used. Given that Toowoomba went through the experience of voting on a proposed water recycling scheme and as a consequence were confronted with a wide range of information about

recycled water from a number of sources - including a community group that launched a very aggressive scare campaign (Hurlimann and Dolnicar, 2010) - it can be expected that significant differences would be found with respect to respondents' stated influence of various information sources. The results of the comparison are provided in Table 1. Note that the sample sizes are 1495 for the Australian sample and 200 for the Toowoomba sample.

Insert Table 1 here

As can be seen, Toowoomba residents have consistently evaluated the influence of most information sources as lower than the general Australian population. The highest differences occur with respect to friends and partners, followed by environmental groups and neighbors. The only four sources of information with respect to which Toowoomba residents assigned a higher level of influence were research findings, experience of water shortage, scientists, and news, facts and other publicized information.

These findings lead to the conclusion that the experience of being exposed to a large amount of information may have increased people's levels of skepticism with respect to most sources of information. This may have also related to their enhanced perceptions of the communicators' trustworthiness, expertise and associated affiliations – which have been discussed in the literature to be important determinants of how individuals receive messages (Selnes, 1998, Hovland et al., 1953 and Krech et al., 1962). Also interesting is the fact that the largest difference in stated influence is identified with respect to highly subjective sources of information (with Toowoomba residents trusting

those significantly less), whereas more influence is assigned to what would be perceived as more objective sources of information, such as scientists and research findings. This is likely to be a consequence of the heated public debate that took place in Toowoomba and the aggressive scare campaign by a community interest group fighting against the proposed water recycling scheme.

4.3 Different segments using different sources?

The last investigation of heterogeneity takes a different perspective: rather than selecting personal characteristics which are assumed to cause differences in the information sources used, it constructs segments of the market in a way to reflect the largest possible differences between groups with respect to information sources used. The original 19 items representing the full range of sources of influence was used as a segmentation analysis for an a posteriori (Mazanec, 2000) or data-driven (Dolnicar, 2004) segmentation study. However, because the sample only includes 1495 respondents, the number of variables in the segmentation base is limited to ten (Formann, 1984). In order to decide which of the original 19 items to include in the segmentation base, a principal components analysis with Varimax rotation was computed, using the Kaiser criterion to select the number of factors. The solution recommended the use of three factors, one broadly representing experts, one representing media and the government and one representing friends and family. The highest loading non-redundant variables were included in the analysis.

The data set was then pre-analyzed using a framework proposed by Dolnicar and Leisch (2010) which draws a number of bootstrap samples and computed segmentation analysis across a range of numbers of clusters using these bootstrap samples. This approach allows the analysis of robustness of solutions over repeated computations and thus provides conceptual clarity about the segmentation solution:

whether it has revealed naturally occurring segments, used pseudo structure in the data to arrive at relatively stable solutions, or whether segments are artificially created. For the present analysis 2 bootstrap samples were drawn for each number of clusters between 2 and 10. The results of the stability analysis using the Rand Index as criterion of stability are provided in Figure 2.

Insert

Figure 2. Stability analysis of segmentation results

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Figure 2a shows a boxplot of the Rand Indices across the full range of numbers of clusters studied. Highly stable solutions have a high median (horizontal black line) and little dispersion of the Rand Indices (narrow box). Figure 2b shows the same information in a density plot where a highly stable solution would demonstrate many repeated calculations (high peak) at the right hand side of the box (high Rand Index value). Based on the results provided in Figure 2, two solutions emerge with high stability values: the three cluster solution and the five cluster solution. Upon inspection of the segment profiles for both solutions it becomes evident that the three cluster solution does not discriminate sufficiently to be of practical value because, and this is common in cluster analysis, one of the segments identified states that none of these sources would influence them whereas a second group indicated that all of these sources would influence them. Choosing the five cluster solution is therefore preferable: it leads to three segments with influence patterns which are not either all low or all high. The segment profiles for the five cluster solution are presented in Figure 3.

Insert

Figure 3. Segment profiles

here

In Figure 3 the horizontal bars indicate the percentage of members of each of the five segments who state that they are influenced by the sources listed on the left side of the figure. The horizontal line with the dot at the end shows the total population average for each of the information sources, thus making it simple to compare in which way each segment differs from the total sample.

As can be seen, Segment 4 believes that nobody except they play a role in their water related behaviors. Members of Segment 2, on the other hand, state that all listed information sources have an impact on their behavior. Segment 3 is very interesting. Members of this group differ from the total population because a much larger proportion of members agreed that prior experience and family influences their behavior, both very personal factors which cannot easily be influenced by public policy makers. Segment 1 members state that most of the listed information sources influence them, except politicians and personalities which are famous but not experts (for example, stars giving testimonials on TV). Segment 5 members also claim not to be influenced by personalities and politicians. In addition, they state that advertisements do not influence them. These results add significantly to findings reported in previous sections. While some of the segment profiles mirror the overall frequency statistics of the influence of each of the listed sources of information (especially for politicians and famous personalities), one segment emerges (Segment 3) which appears to be very hard to reach with public policy measures because prior experience and attitudes of their family represent the most influential factors.

Testing the external validity of the segments by assessing whether or not they differ in other variables than those used to create the segments, confirms that the segments have distinct profiles beyond the differences in the self-reported factors influencing their water-related behaviors. Significant differences occur with respect to gender (Chi-square test p-value < 0.003, Segment 1 contains the most female members, 63%), education (Chi-square test p-value < 0.003, Segments 2 and 3 have the lowest overall level of education), income (Chi-square test p-value < 0.002, Segments 1 and 5 have the highest incomes), and marital status (Chi-square test p-value < 0.002, Segment 3 contains the highest proportion of married respondents). Segments also differ significantly (Analysis of Variance p-value < 0.03) in terms of their stated likelihood of using recycled water for all uses included in the survey, with Segment 1 and 5 demonstrating the highest level of stated acceptance and Segment 3 stating the lowest level of stated acceptance.

5. Conclusions

This study comprehensively investigates which information sources people use to inform their water related behaviors, which sources are likely to be the most and the least powerful for governments to use when communicating to the public about water-related matters, and whether differences in the use of information sources exist across sub-groups of the population.

A wide range of potentially influential factors were identified, which could be grouped into 19 categories, namely: experience of water shortage, the media, an ecologist, a politician, a recognizable personality, family, friends, an environmentalist / an environmental group, the water authority,

consideration of future generations, the government, an individual or organization qualified in water management, my partner, a scientist, conservation advertisements, neighbors, research findings, news / facts / other publicized information, and no one.

Analyzing the frequency with which a sample of 1000 Australians stated factors influencing their behavior leads to the conclusion that research findings are seen by the general population as most influential on their behavior (in line with Kretch et al.'s 1962 psychological research findings about the importance of the perceived credibility of a communication source), followed by the personal experience of water shortage, consideration of future generations, and news and facts publicized. In terms of the actual source - the communicator - individuals and organizations qualified in water management were seen as most influential (in line with the findings of Hovland et al. 1953 about the importance of the perceived credibility of the communicator), followed by family, scientists and friends. Governments and politicians are seen as being among the least influential sources (in line with the findings of Miller and Buys 2008, and Jungermann et al. 1996), although most communications relating to water policy, for example in the case of Toowoomba, are traditionally communicated through these very communication channels. This raises the question as to whether the current communication strategy is optimal or whether it could be improved by using other communication messages (e.g. research findings, the well-being of future generations) through other channels (e.g. scientists).

It is also interesting that people listen to either experts who they are not familiar with or non-experts who are very close to them and that they trust. Practically this means that communication strategies can attempt to both inform the public, but especially opinion leaders, through experts conveying

information. At the same time, however, it is critical that the information becomes a topic of conversation at BBQ's and dinner tables. Based on the segmentation analysis undertaken, this may be the only avenue to reach certain segments of the market (such as Segment 3 depicted in Figure 3).

Not many differences in who and what influences people were identified in regards to different levels of education and different levels of acceptance for recycled water and desalinated water. Our findings indicate that it is easier to identify sources of influence for those people who already have a high likelihood of using alternative water sources; no distinguishing sources could be identified for those residents who have a low stated likelihood of use. However, the patterns of responses were distinctly different when the general Australian population was compared with Toowoomba residents.

Toowoomba residents perceive most factors of influence as less effective than Australians in general. The four factors which are assigned more weight to by Toowoomba residents are all factual and objective in nature or relate to personal experiences of not having enough water.

Finally, the results of the data-driven segmentation study using information sources as a segmentation base leads to the conclusion that distinct segments can be created with variety in the extent to which a range of different sources can influence their water-related behaviors. Segment membership is strongly associated with socio-demographic status as well as stated willingness to use recycled water for a range of household uses. Practical implications from the segmentation analysis are, as with some of the other analyses presented earlier, that testimonials by well-known personalities and politicians' statements (as used in the case of Toowoomba) are not seen as influential for most segments, and that some segments, such as Segment 3 (containing about 10 percent of the population) can only be reached through direct family members of friends or by having themselves experience water shortages. One possible way of

trying to reach this segment is to develop communication messages that place the audience in the position of experiencing water shortages.

While this study was conducted in Australia, we believe that results may be generalized beyond national borders. Nevertheless, it would be of great interest to conduct international replication studies and compare the results with other countries, especially those that are also facing serious water challenges. In addition, it would be interesting to extend this research to a larger set of information sources, communication media, and water policy options. It would also be beneficial to explore the community's perceived trust, credibility, expertise and vested interest in each source to see if there are correlations.

Finally, it should be noted that the approach taken above relating to water alternatives could also be applied to other public policy challenges where the national necessity or benefit is not immediately obvious to residents who instead are primarily concerned about potential direct and immediate negative implications on their lives.

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Tables

Table 1. Differences in stated influence of information sources between Australian and Toowoomba residents.

	Australia	Toowoomba
Friends	74%	62%
My partner	69%	60%
An environmentalist / an environmental group	63%	55%
Neighbors	41%	33%
A politician	15%	9%
A recognizable personality	27%	21%
The government	38%	32%
The media	45%	39%
Family	77%	72%
Conservation advertisements	54%	49%
An individual or organization qualified in water management	81%	78%
An ecologist	72%	71%
Consideration of future generations	84%	84%
No one	17%	17%
The water authority	68%	69%
Research findings	88%	89%
Experience of water shortage	86%	87%
A scientist	76%	78%
News / facts / other publicized information	84%	86%