Understanding drivers and barriers: the key to water use behaviour change

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ABSTRACT

In southwest Victoria, like many other regions in Australia, drought, climate change and population growth have exposed gaps in water supply. To develop effective demand management strategies for rural and regional areas, this paper investigates the drivers and barriers to water saving in southwest Victoria. Although the majority of people felt water saving was important, the drivers for water saving differed between different groups. Residential users were saving water for altruistic reasons, while for farmers the drivers were farm viability and productivity. Although the barriers differed between property types, common barriers included lack of understanding of the impact their water use has on supplies, lack of knowledge, the pricing system and distrust of the water authority. The findings provide information for effective demand management strategies for the region.

Key words | behaviour change, demand management, efficient use, water saving, water supply

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INTRODUCTION

In Australia, and in many regions around the world, water supply is becoming a critical issue. Population growth, increasing demands from agriculture to feed the population and climate change are all mean that there is declining water availability in many regional and rural areas. In some regions, such as southwest Victoria, climate change is likely to reduce water availability by 40–65% of long-term average inflows (Department of Sustainability and Environment 2009). As such, water managers are faced with having to meet the shortfalls in water supply with other sources, including desalination. At the same time, they are attempting to reduce per capita demand by implementing a range of water demand management strategies to encourage residents, farmers, business operators and industry to reduce the amount of water they use.

Currently, demand management strategies being used by water managers in rural and regional areas in Australia include permanent water saving measures, staged water restrictions, rising block tariff pricing, allocation limits for rural users, education programs and housing retrofit programs including rebate programs (e.g. Wannon Water 2007). The majority of demand management strategies are aimed at reducing residential water use, particularly by targeting discretionary uses, such as garden watering. For example water restrictions and the permanent water saving measures, are directed at reducing outside water use by householders and those responsible for public gardens, parks and sporting facilities. While mandatory restrictions have consistently shown a 30% or more reduction in household use (Renwick & Green 2000; Klein *et al.* 2006); voluntary restrictions, like the permanent water saving measures used in Victoria, show more variable results (Klein *et al.* 2006). Furthermore, restrictions have been shown to work better when individuals perceive there is a need to conserve and that others are also conserving water (Corral-Verdugo *et al.* 2002). Little research has been conducted to determine restrictions impact on farm water use. Furthermore, restrictions primarily aimed at outside use does not recognise that many in the community would rather sacrifice inside water uses than reduce their garden

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use. However, this is an important consideration as the garden is a source of enjoyment and happiness for many in the community and is possibly related to the mental health of some community members.

Other demand management strategies have been shown in various studies to have highly variable impacts on water use. For example, retrofit and rebate programs have been shown to have highly variable success in uptake rates (Stinchcombe *et al.* 2005), while at the same time offsetting behaviour can reduce the effectiveness of water saving devices installed for instance people often increase their shower once they have installed a low flow shower head (Campbell *et al.* 2004). While the use of price and price structure has demonstrated a reduction in water use with increased prices (e.g. Berk *et al.* 1980; Campbell *et al.* 2004), but if the pricing structure has a free allowance of water it can lead to water wastage (Dandy *et al.* 1997). This also appears to be true in areas where users pay for an allocation of water, with high excess fee, as people feel they allocation will be reduced if they don't use it all (Graymore & Wallis 2010). These results suggest that there are a number of factors impacting on people's water use behaviour, causing the large variation in the impact of common demand management strategies.

Numerous studies have shown the range of factors that influence the adoption of environmental behaviours (i.e. behaviours that seek to reduce a person's negative impact on the natural world) including situational and personal factors (see reviews Jackson 2005; Klein *et al.* 2006). As such, many models have been developed to explain the uptake of environmental behaviours based on theory (e.g. Hines *et al.* 1986; Bamberg & Moser 2007) as well as those based on empirical studies (e.g. Renwick & Archibald 1998; Gregory & Di Leo 2003; Syme *et al.* 2004). These models have demonstrated that a range of factors, both personal (or internal) and situational (or external) act to produce the observed behaviour. Some factors act as drivers, motivating people to save water for instance, others act as barriers preventing people from taking up water saving behaviours even though they feel there is a need to save water. For example, Dziegielewski (1994) found belief in the seriousness of water shortage, knowledge of how much water can be saved by using conservation practices and perception that conservation measures are equitable important factors in predicting water conservation behaviour, acting as both drivers or barriers. However, many of the models developed only include the factors they were investigating, and as such, they are unable to explain all the variation in water use observed. This suggests that there are other factors at play that are yet to be discovered.

Furthermore, most research has focused on urban residential use. As such, there is little understanding of the drivers and barriers rural and regional people have to taking up water saving behaviours. But to develop effective behaviour change programs to reduce water demand in rural and regional areas, an understanding of the drivers and barriers to water saving behaviours of regional urban, rural residential and farm water users is essential.

Thus, the aim of this study is to investigate the drivers and barriers to water saving in rural and regional urban areas. This research is part of a larger study aimed at developing water use behaviour change strategies for southwest Victorian residents and farmers. The results of an early stage of this project indicated that there are differences between the drivers and barriers to water saving between both urban and rural residential, hobby farmers and farmers. Therefore, this study surveyed the local water authority's customers in both regional urban and rural areas. The survey investigated the attitudes to water and water saving, drivers for using water saving behaviours, barriers to adoption of water saving, as well as the water saving behaviours people were using. However, the focus of this paper is in the attitudes, drivers and barriers to water saving of the four water using groups.

MATERIALS AND METHODS

Case study: Southwest Victoria

Southwest Victoria is located in south eastern Australia extending from the South Australian border in the west to Camperdown in the east, and from the southern coastline to the Central Highlands in the north. The local water authority, Wannon Water, whose boundaries were used for this study, covers an area of 24,000 sq km. Wannon Water services a population of around 79,000, mostly located in the urban centres of Portland, Warrnambool

and Hamilton (Wannon Water 2007). Water is sourced from both groundwater and surface water flows. The majority of the region's economic prosperity comes from the agriculture sector with dairy, sheep, beef and cropping. Wannon Water supplies water to farms, industry, commercial and residential users though 34 customer supply zones that are spilt into rural and urban supply zones. This study focuses on farm and residential water use in the rural and urban supply zones, which is 57% of the total water use in the region (Wannon Water 2007).

In rural supply zones, customers pay for an annual allocation of water. If they exceed this allocation, they are charged excess fees. While in urban supply zones there is a rising block tariff pricing structure with quarterly billing for the water they use plus service charges for supply and waste treatment. Rural customers can only use water supplied by Wannon Water (called town water from here) for domestic purposes, stock watering and dairy wash down, and not for irrigation. While in the urban supply zones, residential customers can use town water for domestic, garden and other outdoor purposes under Permanent Water Saving Measures (i.e. permanent water use rules, including the use of a trigger nozzle on hoses and garden watering times). Water restrictions currently apply to a number of urban supply zones in the northern parts of the region: Glenthompson (Stage 2), Cavendish, Hamilton, Dunkeld, Tarrington (all Stage 3) and Balmoral (Stage 4)[1].

About five percent of Wannon Water's customers are rural consuming nearly 15% of the region's total demand (Wannon Water 2007). There is considerable variation in water consumption across these customers ranging from 219 kL/property to 2,900 kL/property in 2007–08 (Wannon Water 2008). However, the water authority knows little about the characteristics of their customers and their properties or their water use behaviour, to enable them to understand this variation in water use.

Urban residential customers use 42% of the total water demand in the region (Wannon Water 2007). For the majority of towns, average water use declined over the last three years from an average of 209 kL/household in 2005 06 to 169 kL/household in 2007–08 (Wannon Water 2008), which is likely to be due to the water use restrictions in place in some areas since 2006 and its associated information campaign.

Survey methods

In the previous stage of this project, four regional and rural customers groups were identified: urban; rural residential; hobby farmers; and farmers. Thus, three questionnaires were developed for the survey: 1) urban; 2) rural residential; and 3) hobby farm and farm. The first two questionnaires focused on domestic and garden use and the third questionnaire on farm use. The questionnaires were developed from the results of a series of in-depth interviews (Graymore & Wallis 2010) to determine attitudes to water and water saving, drivers and barriers to water saving, as well as water saving measures being employed. The questionnaires were piloted on a small group of Wannon Water customers to ensure the validity of the survey tool.

The questionnaire was distributed in multiple modes in May–June 2008 to increase participation rates using the tailored design method described in Dillman (2007). A paper and an online version were developed, which were identical except for an additional question on the online version to determine how the participant heard about the survey, so their responses could be grouped accordingly. Then 931 pre-notice letters (434 rural and 497 urban) were sent to a stratified random sample of Wannon Water customers (i.e. approximately 250 customers from four water use groups: lower than average use rural, higher than average use rural, lower than average use urban and higher than average use), alerting people to the forthcoming survey. A few days later, survey packs were sent to these customers. At the same time, the survey was launched on the Wannon Water website and survey packs were made available at the offices of Wannon Water for the general public and Portland Aluminium for their staff. To encourage participation in the survey, people who completed the survey were entered into a draw for a water efficient washing machine. The survey was advertised on local radio, local newspapers, and through Wannon Water and Portland Aluminium to encourage and alert people to the survey.

[1] Water restrictions: Stage 4, includes no garden watering or outside water use; Stage 3 only gardens not lawns can be watered on specific days and times twice a week, no pool filling and limited car washing; Stage 2 watering restricted to every second day (see www.wannonwater.com.au for further information).

Due to a low response rate for all but the stratified random sample, only the results of this group were analysed for this paper. A total of 369 questionnaires were returned from the 931 sent out producing a response rate was 40%. There were 194 urban responses, 84 rural residential responses and 91 rural farm responses.

A comparison of the respondent demographic data with the Australian Bureau of Statistics 2006 Census data for the Wannon Water region showed that in general the survey respondents were statistically representative of the Wannon Water region population. Although, there were slightly more people in the 54 years or older group and less people 24 years or younger, and more male respondents due to the high number of males filling in the farm survey. Additionally, there were slightly more people who fully own their home or are purchasing it and more couples with no children reflecting the older age groups of the respondents.

The data was analysed for differences between groups using SPSS using cross tabulations, chi-square test, one-way ANOVA (Tukey-Post hoc test) and Pearson's Correlations, where significant differences were those where $p < 0.05$.

RESULTS AND DISCUSSION

The survey results demonstrated that all respondents except one farmer and one hobby farmer had taken up some water saving behaviours, suggesting that the many people across the southwest region have taken up water saving. This is supported by the recent reductions in water consumption over the last 2 years in the region (Wannon Water 2009). However, the focus of this paper is on the attitudes, drivers and barriers of water saving which are described in the following sections.

Attitudes to water and water saving

Over 97% of respondents agreed or strongly agreed that water saving is important to them and that 'water is a precious resource we should be careful with' (Figure 1). However, significantly more farmers (including hobby farmers) strongly agreed that water saving was important to them compared to urban users ($p < 0.05$). This result may be because farmers' livelihoods rely on water and using

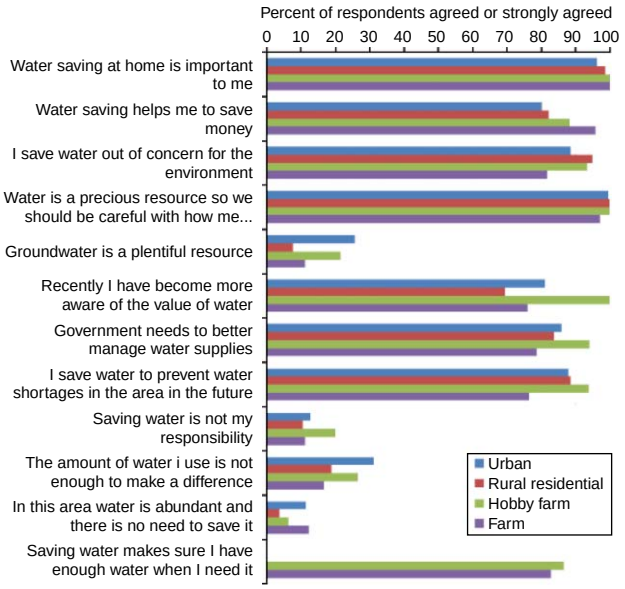

Figure 1 | Attitudes to water and water saving, percent of respondents who agreed or strongly agreed with the each statement. Subscribers to the online version of *Water Science and Technology: Water Supply* can access the colour version of this figure from http://www.iwaponline.com/ws

over their allocation limit incurs a high cost to farmers. In fact, 4% of urban respondents answered not sure or disagree with this statement suggesting there are still some urban people who don't feel water saving is important.

Greater than 80% of respondents felt that water wasn't abundant in their area. Unsurprisingly, this feeling was strongest in areas under water restrictions ($p < 0.05$). At the same time, over 20% of urban residents and hobby farmers felt that groundwater is a plentiful resource. However, over 25% of respondents were not sure of groundwater abundance. Significantly less urban people disagreed or strongly disagreed than other groups, suggesting perceptions of groundwater abundance may be barrier to water saving in urban areas as people are less likely to save water if they don't feel there is a need to (Cameron & Wright 1990; Dziegielewski 1994; Gregory & Di Leo 2003). This attitude difference may be due to less urban people having bores, and thus, having a less intimate knowledge of groundwater and changes in its levels than those in more rural settings.

The majority of respondents (over 80%) felt that it was their responsibility to save water. Although, their reasons for doing so differed. A smaller proportion of farmers (76%) agreed or strongly agreed to 'I save water to prevent water shortages in the area in the future' compared to both rural

residential (89%) and urban (88%) users. Similarly, 82% farmers agreed that 'I save water out of concern for the environment' compared to 95% rural residential and 89% urban users. Interestingly, hobby farmers have a similar result to the residential groups for both of these statements, with 94 and 93% agreeing respectively. This suggests that saving water to prevent water shortages or for the environment is a stronger motivator for water saving for urban and rural residential and hobby farmers than it is for farmers. However, neither of these differences were significant.

For farmers, saving water to save money was more of a motivator, with 96% farmers agreeing or strongly agreeing compared to 88% hobby farmers, 82% rural residential and 80% urban residents. In fact, the difference between farm and urban respondents feelings to this statement was significant ($p < 0.05$). The reason for this finding may again be related to the high excess charges farmers incur if they go over their allocation limits compared to urban users who only pay a slightly higher rate for using over the first tier. The potential money savings for farmers are larger. While with urban users, many comments were made that the low pricing of water, particularly compared to the service charges actually was a disincentive for water saving. A study in Sydney also found that many urban water users felt water charging did not encourage water saving (Randolph & Troy 2008), suggesting that a review of water pricing is needed if it is to be used as a demand management tool.

The majority of farmers (85%) agreed that they save water to ensure they have enough when they need it, suggesting that farmers are saving water to ensure farm viability and save money, while residential users are saving for a secure water future and for the environment. Similar differences in reasons for saving water was seen in a previous study in the region, where farmers were saving for farm viability and rural residential and urban users were saving water for more altruistic reasons (Graymore & Wallis 2010).

Interestingly, 80% of respondents felt that the government needs to do a better job managing water supplies. This attitude could prove to be an important barrier to water saving, as trust in the water authority and government and in how others are using water can impact on whether people feel they should make efforts to save if others, including water managers, have not done their bit. For example, Roaf (2006) found disenfranchisement from the water company to be acting as a barrier for water saving in the UK, while Corral-Verdugo *et al.* (2002) found perceptions of how others were using water influenced water consumption. In relation to this, there were a number of negative comments about the inequity of water being carted to the city from regional supplies. This is interesting considering the Victorian Government is building pipes to transport water from regional areas to Melbourne, which may impact water saving in these regions.

Furthermore, farmers expressed their worries that the water authority will reduce their allocation or remove it altogether if they manage to reduce their water use below their allocation limit. Similarly, insecure water rights were identified as a barrier to water saving in the Rio Grande basin (Ward *et al.* 2007). Thereby supporting Jorgensen *et al.* (2009) argument that trust is an important factor in household water consumption behaviour, and suggesting that it is also an important factor for farm water use. Water managers will need to address these trust issues when developing water saving programs to breakdown any trust issues so that more people take up water saving measures across the region.

Drivers of water saving

The drivers of water saving behaviours differed between the four groups (Figure 2). Although there were some common drivers, including grown up with rainwater being the only supply, community responsibility, environmental concern and drought. The last three drivers have been identified by other studies, with environmental concern being a particularly common motivator of water saving behaviour (St Hilaire *et al.* 2003; Roaf 2006).

For farmers, water saving is driven by wanting to ensure the farm's viability and profitability. While for residential users, both urban and rural, the drivers are more altruistic. The most common drivers for farmers were to save money, keep the farm productive, make sure they don't run out and to stay within allocation limits. In fact, significantly more farmers identified saving money as a driver compared to urban residential users ($p < 0.05$). Residential users saved water because it was a community responsibility, out of concern for the environment, because they grew up where rainwater was the only source or because parents taught

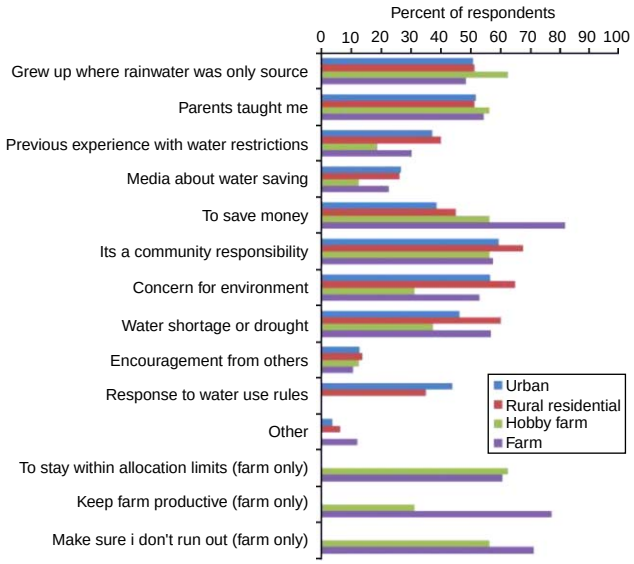

Figure 2 | Drivers for water saving behaviours for urban, rural residential, hobby farm and farm users. Subscribers to the online version of *Water Science and Technology: Water Supply* can access the colour version of this figure from http://www.iwaponline.com/ws

them to be water conscious. Whereas, the drivers for hobby farmers are a mix of farm viability and altruistic drivers, although saving money and farm profitability are not as common, nor concern for the environment. This is possible due to the mix of people who become hobby farmers, with retired farmers and urban residential people both making the lifestyle change to hobby farming. Thus, property type plays an important role in determining the drivers for water saving (Graymore & Wallis 2010).

Water restrictions are a common driver for water saving for residential users. In fact, no farmers or hobby farmers indicated that this was a driver for their water saving behaviours, making this a significant difference ($p < 0.05$) between drivers for farm and residential users. This finding suggests that water restrictions have no influence over farm water use. Around 40% of urban and rural residential people said they save water in response to Wannon Water rules. Since only 13% of these people lived in areas that had water restrictions, this result shows that many people are responding to the permanent water saving measures that are in place across the region. It may also indicate that many people believe they are under restrictions even when they are not, possibly due to advertising in media from other regions, such as Melbourne, Ballarat or Geelong, who are currently under water restrictions. Whatever the cause, this result shows the positive impact the water use rules are having on water use around the region.

Furthermore, the impact of water restrictions on water use behaviour was apparent through the survey results. People in areas under restrictions have shorter showers ($p < 0.05$), are more likely to use laundry/shower water for gardening ($p < 0.05$), wash their car at a car wash and use greywater for their garden. Also, more people in Hamilton, Coleraine and Mortlake have rainwater tanks ($p < 0.05$). While Hamilton and Coleraine were under restrictions, Mortlake was only recently connected to town supply in 2001, making rainwater tanks necessary up to this time. Suggesting historical water supply also influences water use behaviour.

Consequently, drought or the current water shortage was also a strong driver for urban respondents living in areas under restrictions. For example, more people in Hamilton identified drought as a driver, compared to people Koroit, Portland, Timboon or Heywood, all towns not under restrictions ($p < 0.05$). Furthermore, more people in urban areas under restrictions stated that previous experience with water shortages (61% compared to 35%), the drought (87% compared to 41%) and response to Wannon Water rules (61% compared to 39%) were among the reasons they saved water ($p < 0.05$). Thus, showing the impact of water restrictions and drought as drivers for motivating people to take up water saving behaviours.

Interestingly, few people felt support or encouragement from others and media were drivers of water saving. These results, particularly the low figures for encouragement or support, have implications for the types of water saving programs that will have success in the region. In particular, the use of media awareness campaigns or neighbour recruiting neighbour type programs may not have a significant impact on increasing water saving behaviours.

The drivers identified here for rural and regional water users contrast to those identified for capital city dwellers in Australia. The strongest motivator for city dwellers was making sure we don't run out, with care for the environment and saving money only very small drivers (Roseth 2006). Therefore, these results illustrate the importance of investigating the drivers for rural and regional areas, as they are different to those of in city areas, which is important when

developing water saving programs if it is going to appeal to the target group. However, a good understanding of the barriers to water saving behaviours is also needed, thus, the barriers identified in the survey are explored in the next section.

Barriers to water saving

Although all respondents were using some water saving measures, they still identified a number of factors that were stopping them from taking up more water saving behaviours, despite their water saving attitudes. The most common barrier identified for farmers and hobby farmers was 'I have reduced my farm water use already' (Figure 3). However, none of the respondents who identified this as a barrier had taken up all water saving behaviours identified in the survey. These results suggest that many farmers have a perception that they are doing all they can to save water, when in fact there are a range of other water saving behaviours that could be taken up. This perception may also be caused by a lack of knowledge on other ways to save water. Thus, the use of water use audits could be a good way to help overcome this barrier by pointing out areas where individuals could make further changes to their water use to reduce use.

Significantly more hobby farmers identified 'will not make farm more productive' and 'lack of knowledge about ways to save' as barriers to water saving compared to farmers ($p < 0.05$). Farm productivity as a barrier, is interesting since less than 30% of hobby farmers identified this as a driver of their water saving. However, this result may be linked to hobby farmers only using town water for stock watering. There is a limited ability to influence how much water is required for stock watering. Since the only ways to change the amount of water used for stock watering are to put in a more water efficient watering system, move troughs into shade to prevent evaporation or change the type of feed. However, none of these measures would increase the production of the stock, making them unattractive options for hobby farmers. Hence, there were a number of comments made about not being able to reduce the amount of water stock need.

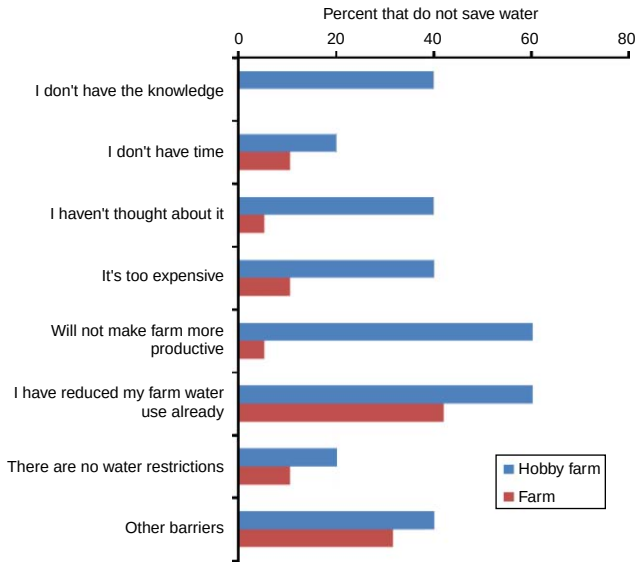

Figure 3 | Barriers to water saving for farmers and hobby farmers.

In fact, the large variation in farm water use seen across the region appear to be due, in part, to differences in the water needs of properties and the availability of alternative water sources to supplement town water use. The two biggest users of town water are dairy and beef farmers as cattle require between 45 to 120 litres of water a day. Dairy farmers can also use town water for dairy cleaning, thus, they are often the biggest uses of water depending on how reliant they are on town water for all their water needs. Thus, the water requirements of farms and access to good quality alternative sources are important factors in farm water use.

The common barriers to the use of alternative water sources on farms are around availability of good quality sources, including bore quality, suitability of the land for dams and lack of recent rainfall. While for hobby farmers the barriers were the expense and planning to but haven't done it yet, again highlighting the difference in barriers between hobby farmers and farmers. The use of alternative sources for stock watering, dairy cleaning or domestic use has the potential to make a large difference in property water consumption. However, not all farms have access to alternative sources. Therefore, water managers will have to take individual farm differences into account when developing demand management strategies as the ability to reduce water use on farms is largely dependent on the type of production and availability of other sources of water.

There was some variation between the barriers identified by urban and rural residential users (Figure 4).

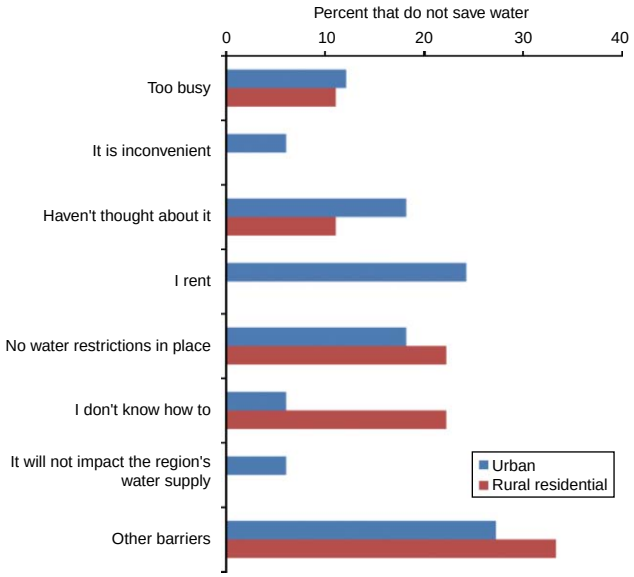

Figure 4 | Barriers to water saving for urban and rural residential users.

However, a similar proportion of each identified the lack of water restrictions in place and being too busy as barriers. Too busy was more likely to be a barrier for those in the 25–54 year old age groups, than those in 55 or older ($p < 0.05$). Almost 25% of urban residents found renting to be a barrier. Home ownership/rental status was also identified as a barrier to water sustainability in previous studies of Perth and Canberra household water use due to inability to control garden type/maintenance and certain water using appliances (Browne *et al.* 2007). In our case, renting was identified as a barrier to installing water saving devices, a similar finding to that of Clarke & Brown (2006) in their study of the Melbourne suburb of Bayside. The combination of these findings, suggest the need for a water saving program that targets behaviour change aiming at empowering renters to change their behaviour to reduce their water use, in combination with a retrofit program targeting landlords to encourage retrofitting of rental properties with water saving devices.

Rural residential users found lack of knowledge on how to save water as a major barrier to water saving. Hobby farmers also found lack of knowledge to be a barrier. These results indicate that these two groups feel they need more information on ways to save to reduce their water use. Their need may be related to the previous targeting of water saving information to areas under water restrictions, particularly urban users. Thus, providing a potential reason why rural residential and hobby farmers feel they need more information on water saving. However, this does not explain why farmers don't feel they need more information on water saving. Particularly since lack of knowledge is a common barrier seen in many studies of urban water conservation (e.g. Roaf 2006; Clark & Finley 2008).

Garden importance appears to be an important barrier to water saving for residential users. People whose garden is important to them watered their garden more often than those who felt their garden wasn't important. This finding is particularly important in areas under restrictions as garden watering is thought to be a discretionary use, and as such, is one of the first uses to be cut. However, for some people watering their garden is extremely important and this is reflected in garden watering habits (i.e. they more frequently water their garden compared to those who don't feel it is important ($p < 0.05$). Others have also found garden interest, value and use of garden to be important factors in urban water consumption (e.g. Gregory & Di Leo 2003; Syme *et al.* 2004; Keshavarzia *et al.* 2006). Our finding further substantiates this, and suggests that this is also true for rural residential users. Furthermore, this finding suggests for some people no amount of encouragement or incentives will reduce their garden watering habits. In fact, it may be that these people will turn to other sources and reduce their inside water use before reducing their garden watering, such is the importance of their garden to them.

Unlike previous studies where age (Gregory & Di Leo 2003), income (Renwick & Archibald 1998; Syme *et al.* 2004), education level (Samdahl & Robertson 1989; Gregory & Di Leo 2003) and household size (Renwick & Archibald 1998; Domene & Sauri 2006) were found to influence attitude and behaviour, we found few significant relationships between demographic data and attitudes, drivers and barriers. However, this maybe because demographics are more closely linked to behaviours, which will be investigated in another paper to follow.

IMPLICATIONS FOR DEMAND MANAGEMENT

Previously, little was known about the differences in drivers and barriers to water saving between the various types of

rural and regional water users, particularly regional urban and rural residential, hobby farmers and farmers. Thus, water demand management has relied on non specific information, often based on metropolitan studies with no regard to any differences in property type. However, this study has demonstrated that these four groups, although they have some similarities in attitudes, drivers and barriers, also have some significant differences which require different strategies to encourage increased water saving behaviours.

Despite the majority of people feeling that water saving was important and that it was their responsibility, few respondents had taken up the full range of water saving measures. Further supporting Aitken *et al.* (1994) finding that a positive water saving attitude does not always lead to adoption of water saving behaviours. A range of factors were found to act as barriers to water saving in this region including both situational (i.e. pricing structure and lack of restrictions) and personal factors (i.e. lack of knowledge on ways to save and perceptions that they are already saving as much as possible). The barriers included issues of trust in the water managers to continue to provide their allocation, lack of knowledge about ways to save water, I am already doing all I can to save water, renting and the importance of the garden. But the exact barriers people identified have been shaped and influenced by their local context, particularly dependent on the property type, previous water supply history including previous restrictions and experience with water shortages. The contextual nature of water saving behaviour change was also highlighted by Shepherd *et al.* (2006) in their study on climate change adaptation in Okanagan. Illustrating the need for water managers to take into account the local context, including the type of user, water supply history and previous information or retrofit programs when developing demand management strategies to better understand the factors interacting in water use decision making at the property level.

Due to the nature of Australia's climate where droughts are common place, most Australians living in rural and regional areas have had experience with drought, water shortages or limited supply such as rainwater tanks. Thus, many people are raised to be aware of water use to conserve dams or tank water. This is reflected in the drivers of water saving discovered here, with over 70% of urban, 79% rural residential, 64% farm and 67% hobby farmers all stating previous experience, parents taught or grew up with rainwater tanks as drivers for their water saving behaviours. Thus, water saving is more likely to be habit, particularly for those who identified these drivers. As such, the majority of people have already taken up water saving measures in rural and regional areas and thus demand management has to acknowledge this and focus on helping people uncover other areas where savings could be made. This could be done through the use of water audits or water diaries to making people more aware of areas where they may not be as water efficient as they are in other areas.

The behaviour change strategies for southwest Victoria will need to be flexible to overcome the range of barriers, by providing, for instance, practical information about the full range of water saving measures, as well as feedback about the impact efforts have on water use. At the same time, the program needs to acknowledge that many people regardless of type of property have already implemented some water saving measures through past experiences with water restrictions, parents, or from living with only rainwater tanks in the past. Thus, the use of self water audits that are sent to the water managers to help people identify for themselves potential areas for savings while providing a method for people to tell water managers about the water saving measures they are already using will help overcome this issue.

However, since the majority of respondents had already taken up some water saving measures, the question of how much more scope is there to reduce water demand through household and farm water saving programs needs to be answered. It may be that the small amount more people in rural and regional urban areas can do to save water will have little impact on total demand. In the case of farms, where the use of alternative sources will make the most difference to town water use, the collection of more runoff and the increased use of groundwater will also impact water supply availability and the environment. Therefore, there should also be a focus on the development of other sources, such as recycling for industry, to ensure future supply for the current population and debate about the ability of these areas to support additional population, particularly in the face of declines in runoff predicted for areas such as southwest Victoria due to climate change.

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