THE INFLUENCE OF DECLINING PERCEPTIONS OF SCARCITY

Exploring a new paradigm of future demand management options

D Giurco, T Boyle, S White, B Clarke, P Houlihan

Abstract

Many jurisdictions have implemented major supply augmentation schemes to compensate for population growth and climatic variability. Demand management (water efficiency) strategies are also embedded into urban water management across many Australian utilities. However, the focus on demand management is now at risk of dilution in a less supply-constrained context.

This paper explores the future of demand management in utilities with (perceptions of) reduced water scarcity. Using the Central Highlands Water (CHW) Ballarat & District and Maryborough Water Supply Systems (hereafter referred to as Ballarat and Maryborough) as case studies, this paper details current efforts to not only sustain existing efficient water use behaviour but explore additional strategies for managing demand after major supply augmentation and perceived 'breaking of the drought'.

Following the case study findings, the role of demand management in the future is discussed, including how programs can be measured and justified, both in terms of water and energy saved and wider sustainability and community engagement benefits.

Introduction

Demand management: a changing context

Demand management programs have been increasingly implemented in cities and towns across Australia. These have been driven by droughts and a focus on the need to conserve water as well as future supply-demand balance shortfalls resulting from rising population and uncertainty over future inflows to dams, including as a result of climate change. Demand management (water efficiency) programs, such as leakage repair and installing lower-flow showerheads are generally more cost-effective than looking to new supply infrastracture to meet any shortfall, and at the same time save energy through reduced system pumping – and in the case of end uses such as showers and washing machines – water heating.

However, in addition to utlities implementing water demand management programs, many have built new supply infrastructure including desalination plants, pipelines and the development of new groundwater resources. This increase in available supplies, together with recent rains in several parts of Australia, has implications for community perceptions of water scarcity and potentially changed approaches to water conservation and demand management. From the utility perspective, there is a need to manage future revenue streams to ensure recent infrastructure investments can be paid for, while still promoting sustainable water use. The future role of demand management needs revisiting in this unchartered context.

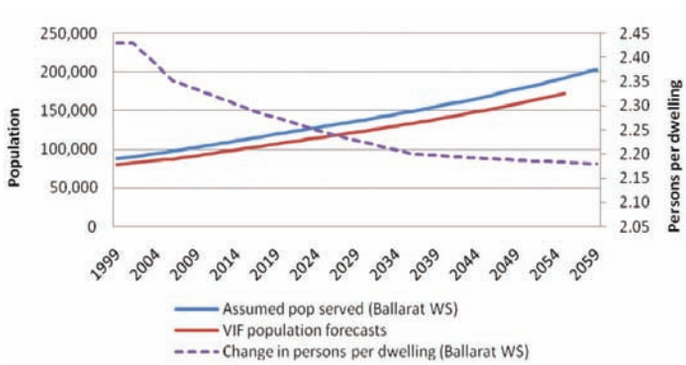

Figure 1: Population growth projections for CHW Ballarat & District Water Supply System.

Aims of the Paper

This paper uses Ballarat and Maryborough as case studies to explore current efforts to sustain existing efficient water-use behaviours following supply augmentation via connection of the Superpipe to Ballarat, and additional surface water and groundwater supplies to both Ballarat and Maryborough. Potential demand management options to complement the existing portfolio are explored and evaluated. Finally, the discussion focuses on the future of demand management in a post supply-constrained context in Australia and the need for a new framework in which to evaluate its benefits and costs.

Ballarat Context

The Ballarat and Maryborough regions are located approximately 115km north-west of Melbourne, Victoria. The state-owned water utility, Central Highlands Water Corporation, currently services around 120,000 people within the region (CHW 2010b) and manages the bulk supply of around 12,500ML/yr of water (including 60,470 connections) (CHW 2010a). Head works infrastructure managed by the utility includes 31 reservoirs, 13 diversion weirs and 30 groundwater bores (CHW 2010a). The region is set to experience significant population growth over the next 50 years. The population serviced by the Ballarat & District Water Supply System (c. 115,000), for example, is expected to almost double, as shown in Figure 1 (CHW 2010b, VIF 2008). Further strain on water supplies may stem from the decline in projections to rain-fed storages and the number of persons per dwelling, following a national trend of larger houses with fewer occupants and thus a greater number of potable connections (ABS 2006).

Recent Events

In the years leading up to 2008, prolonged drought and record low inflows saw Ballarat's water supplies fall to a historical low of 7.4%. The situation resulted in the drying of Ballarat's central recreation lake, Lake Wendouree. In 2006, following the release of the Victorian Government White Paper and Central Region Sustainable Water Strategy, the Institute for Sustainable Futures assisted CHW in creating a Demand Management (DM) Strategy which identified demand side options to be considered for

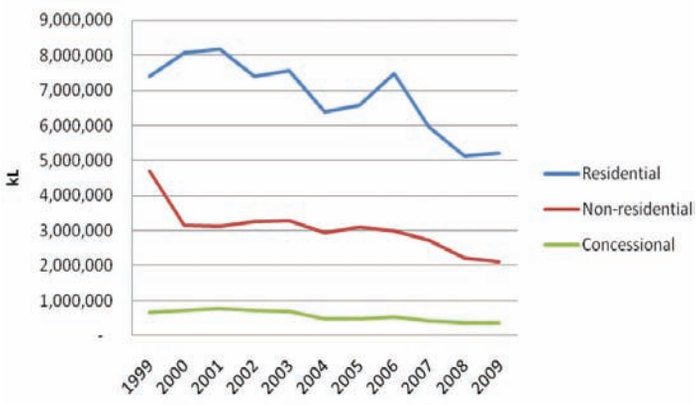

Figure 2: Historical demand by sector.

implementation. The work conducted was based on the principles of Integrated Resource Planning (IRP) as outlined in the Water Services Association of Australia (WSAA) *Guide to Demand Management* (Turner *et al*., 2008). Since 2006, CHW has successfully implemented a number of DM programs that have significantly assisted in reducing demand. These include a targeted residential retrofit program with over 4,700 retrofits, saving around 170ML/yr; additionally, non-residential efficiency programs have saved around 800ML/yr.

The lack of water in Lake Wendouree and Ballarat storages brought the issue into focus within the community and assisted in accelerating the uptake of these programs. In addition, state-wide programs have been implemented (together with CHW) which have also assisted in reducing demand, such as 3,600 residential water-efficient showerhead exchanges saving an additional 40ML/yr. Combined with stringent water restrictions these DM initiatives have aided a significant drop in potable consumption (see Figure 2).

In 2008, supply augmentation consisting of an $180m 87km Superpipe, connecting the Sandhurst Reservoir near Bendigo to the White Swan Reservoir near Ballarat, secured the region's long-term water supply (Department of Premier & Cabinet, 2008); however, the pumping energy of around 2000kWh/ML (approximately 2–3 t CO_2/ML) means a carbon price of $20–$30/t would translate to a carbon cost of $60–$90/ML. More recent supply upgrades include a $7m water recycling project to provide 600ML/yr of water to Lake Wendouree.

The Post-Scarcity Conundrum

It is within this context of post-major supply augmentation that CHW seeks to continue supporting and promoting sustainable and responsible water use, while recognising severely restricted water use is no longer appropriate for either the community or the utility. Complementary gains in water efficiency will enable greater water security in the context of forecast climatic uncertainty and state-wide population growth serviced by major common water sources. It is important, however, that in lifting drought restrictions the community still uses water responsibly.

The prolonged water scarcities experienced in the region (2006–2009) had a big influence on community attitudes to water use. Low water levels in Lake Wendouree were particularly symbolic of water consumption and, among other issues, heightened awareness of the need to use water wisely. After the supply augmentation the current high levels of social capital remain as an opportunity for maintaining a water smart/wise message. Indeed, CHW predicted significant near-term water savings "due to an expectation that consumer memory from recent drought will help to achieve greater savings" (CHW 2010c). It is anticipated this social capital can be harnessed to promote future sustainable water use, notwithstanding that the lake has now re-filled.

Organisational Goals

Efforts to encourage sustainable water use allow CHW to continue running its business in a 'sustainable and responsible' manner – namely, developing sustainable responses to future challenges which build on past successes.

Continuing to engage with the community to promote water conservation also guards against bounce-back in water use. Demand management offers CHW a means by which the operational carbon intensity of recent supply augmentations can be offset, subsequently aiding the organisation to achieve its goals to reduce greenhouse gas emissions and satisfying compliance requirements set out in the Victorian EPA Corporate Licence Sustainability Commitment (CHW 2010a). Further, through demand management CHW continues to support the Victorian Water Industry Greenhouse Emissions Reduction Framework (CHW 2010a).

Methodology

The approach taken for this research was for the Institute for Sustainable Futures, UTS, to review demand management initiatives implemented in other jurisdictions in Australia and assess their potential for implementation within CHW using a set of triple bottom line sustainability criteria (Table 1).

The approximate costs and savings (or supply) of each option were based on indicative total resource unit costs (present value $/present value kL from the combined perspective of the utility, customer and other partners where applicable) of similar options implemented in other jurisdictions. Detailed modelling was not undertaken. Community reach/impact refers to the breadth of customer base that an option potentially engages with to promote sustainable and responsible water use awareness.

Table 1: Demand management triple bottom line evaluation criteria (semi-quantitative).

Score	0	1	2	3
Water saving potential	Negligible	Low 1-5ML/yr	Moderate 5-25ML/yr	High >25ML/yr
Greenhouse and energy savings	Negligible	Low	Medium (from water pumping	High (pumping plus, e.g. hot water savings)
Community reach/impact	Negligible	Sector-specific (<20%)	Moderate (20-50%)	High (>50%)
Cost-effectiveness*	Moderate-High >$3000/ML	Low-Moderate $1000-$3000/ML	Very Low <$1000/ML	No cost
Health risk*	Low-Moderate	Low	Negligible	None

***NB: Trend for 0=Nil to 3=high is reversed for cost-effectiveness and health risk (to maintain the higher the number the better).**

Results: Demand Management Options

Evaluation of options

The DM options assessed are summarised in Table 2. The analysis aimed to cover a diverse range of options and has already led to the successful establishment of an outdoor water saving program – "Ballarat Gardens Come Alive" and Maryborough "Gardens Come Alive" – with participation approaching 1,000 households. These programs encourage water efficiency through monitoring rainfall to reduce over-watering, and by encouraging efficient garden practices, including mulching.

Note, the list of options in Table 2 represents a menu of potential options, but it is not cost-effective for all to be implemented with the current supply-demand balance context. The next section discusses how changing drivers may affect the future selection and uptake of water efficiency options, both in Ballarat and nationally.

Discussion: Future of Water Efficiency

Ballarat

Implementing water efficiency options in the Ballarat region may have merit for a range of reasons and over different time scales, for example:

- Maintaining efficient water use behaviours in the community;
- Cost-effective water saving options to close future supply-demand balance gaps;
- Next generation options for longer term implementation, with water saving, greenhouse saving and nutrient recovery.

In addition to the drivers for the utility to be sustainable and responsible, mandated Government water saving targets (in Victoria through the Central Region Sustainable Water Strategy) will continue to drive water efficiency options. However, in cases where such targets are readily met, what drivers remain for the continuing pursuit of water efficiency? How efficient should we aim to be?

Nationally

These are open questions presented in a changing context, as much of Australia withdraws from drought due to the strengthening of La Niña and the construction of pipelines, interconnects or water grids and desalination plants. If populations continue to grow in our cities, in 30 years' time even these augmented supplies may be inadequate. But for the intervening decades we must find new answers to the question of what role we think water efficiency should play in the urban context – year-on-year water savings, or just a rapid implementation as drought response? What are the appropriate strategies to manage demand and community expectations beyond the period of acute scarcity?

The authors propose that a new urban water efficiency framework is required to assess the contemporary drivers

Table 2: Assessment of demand management options (see Table 1 for scoring system.)

Option	Water Saving Potential	Unit Cost ($/kL)	Energy & GHG Savings	Community Reach	Health Risk
Ballarat water-clock and website to raise awareness of real-time community use	3	2	2	3	3
Outdoor garden program: home visits, in-home advice on water-efficient garden practices	3	1	2	2	3
Outdoor program: workshops/nurseries. Point-of-sale advice on water-efficient gardens	2	2	2	2	3
Evaporative air conditioners: supply and 'tune up' option; reduce new bleed rate	2	2	1	1	1
Accommodation: water-wise information; raise awareness of efficient water use for visitors	2	2	3	2	3
Secondary schools: Smart meters – installation of smart meters (e.g. Hydroshare)	2	1	2	1	3
Primary schools: water saving clubs – school-based competition/awareness raising	2	3	2	2	3
Raintank users' guide and servicing maintenance information to tank owners	2	1	2	1	3
Additional residential retrofits: potential to target public housing and renters;build on success of Aquarius retrofit program	3	1	3	2	3
Toilet retrofits: potential to target accommodation; extend toilet retrofit to accommodation sector	3	1	2	2	2
Washing machine rebate: could target lower income families	3	1	3	2	3
Urine diverting toilets: links to potential for nutrient recovery (P, N)	3	1	2	1	1
Smart metering: residential –reduce leakage; better understanding of end uses	3	1	3	2	3
Smart metering: non-residential – extend focus on high users	3	2	3	2	3
Smart growth: new developments includes smart sewers, local treatment and reuse	3	1	3	2	1

and wider (non-monetary) benefits from current and future water efficiency measures. This would enable the foundations on which water efficiency initiatives are proposed or withdrawn to be better understood, not as individual options, but recognising the cumulative impacts of the range of demand management options already in place across many communities. To what extent might utilities use demand management programs to "manage demand" both down and up, as the external operating environment and commitments to capital expenditure change?

Further work is also needed to better understand the extent to which water-efficient behaviours have become deeply embedded in community behaviours and the extent to which usage will rise as a result of building the new supply infrastructure and the recent rains.

Conclusion

This paper has explored a range of demand management options for potential implementation in Ballarat, Victoria – a region where a prolonged period of water scarcity has led to the successful implementation of several demand management initiatives.

It also identifies factors which change the motivation to pursue water efficiency options and argues for further work to establish the role of water efficiency in this new paradigm affecting much of Australia.

Acknowledgement

The authors wish to thank Paul O'Donohue, CHW General Manager Strategy & Communications, for his guidance and support of the project and John Frdelja, CHW Hydrologist, for his help with providing data to underpin the research.

The Authors

Dr Damien Giurco (email: Damien.Giurco@uts.edu.au) is a Research Director at the Institute for Sustainable Futures, University of Technology, Sydney. His research focuses on Integrated Resources Planning, Smart Metering and Industrial Ecology. He works together with **Thomas Boyle**, Researcher in Urban Water Futures and Sustainable Buildings; and **Professor Stuart White**, Director of the Institute for Sustainable Futures. **Brendon Clarke** is Coordinator Demand Management and **Paul Houlihan** is Manager Customer Products, both at Central Highlands Water, Ballarat, Victoria.

References

Australian Bureau of Statistics, 2006: *Household and family projections, Australia, 2001 to 2026*. Cat. no. 3236.0, ABS, Canberra.

CHW, 2010a, Annual Report 2009/10: Central Highlands Water, Ballarat, Vic, Australia.

CHW, 2010b: Population data projections, Central Highlands Water, Ballarat, Vic, Australia.

CHW, 2010c: Demand History Data, J. Frdelja 16/3/10 Excel File.

Department of Premier & Cabinet, 2008: Goldfields Superpipe Ballarat Link, Media Release, Melbourne, Vic, Australia.

Turner A, Willetts J, Fane S, Giurco D & White S, 2008: *Guide to Demand Management*. Prepared for the Water Services Association of Australia by the Institute for Sustainable Futures, University of Technology, Sydney.

VIF, 2008: Population Projections, Victoria in Future, Department of Planning and Community Development, Melbourne, Vic, Australia.