WATER SERVICES ASSOCIATION OF AUSTRALIA

The WSAA Report Card for 2006/07

Performance of the Australian Urban Water Industry and projections for the future

The WSAA Report Card for 2006/07

Contents

Conclusion

- Climate change which is reducing inflows into storages and rapid population growth present significant challenges to the Australian urban water industry.
- The industry is responding by diversifying its portfolio of water supply options to include sources that are not depending on rainfall such as desalination and recycled water. The new sources of water developed for each of our cities and towns will vary depending on a range of factors. There are no silver bullets.
- The need to diversify sources of water and build water grids will result in approximately $30 billion investment in urban water infrastructure over the next five to ten years.
- Urban water prices will rise steadily over this period to pay for the new water infrastructure.
- The ability to deliver capital investment programs of this magnitude could be constrained by the ageing of the workforce in the industry and the more general skills shortage.
- The new sources of water being developed are more technically sophisticated and energy intensive compared to traditional sources such as dams.
- Higher energy use will need to be offset through the use of greenhouse gas neutral energy sources and the introduction of energy conservation programs.
- Given that protection of public health is a key driver for the industry, risk management will be imperative so that the community can continue to have the same confidence in the quality of the water produced by these new technologies as they currently have in the water that comes from rivers and dams.
- Experience over the last several summers indicates that ongoing harsh water restrictions will not be accepted by the community and the challenge is to develop reliable supplies of water for our growing cities in a sustainable manner.

Overview of WSAA

The Water Services Association (WSAA) is the peak body of the Australian urban water industry. Its 29 members and 27 associate members provide water and sewerage services to approximately 15 million Australians and to many of our largest industrial and commercial enterprises.

WSAA was formed in 1995 to provide a forum for debate on issues important to the urban water industry and to be a focal point for communicating the industry's views. WSAA encourages the exchange of information and cooperation between its members so that the industry has a culture of continuous improvement and is always receptive to new ideas.

Data sources in this Report Card where not specifically indicated have been obtained from the National Performance Report Volumes 1 and 2 and WSAA Members.

The functions of WSAA are:

- be the voice of the urban industry at the national and international level and represent the industry in the development of national water policy,
- facilitate the exchange of information and communication within the industry,
- undertake research of national importance to the Australian urban water industry and coordinate key national research for the industry,
- develop benchmarking and improvement activities to facilitate the development and improved productivity of the industry,
- develop national codes of practice for water and sewerage systems,
- assess new products relating to water, sewerage and trade waste systems on behalf of the water industry,
- jointly oversee the Smart Approved Watermark Scheme for products and services involved in conserving water use
- coordinate annual metric benchmarking of the industry and publish the National Performance Framework with the Federal and State Governments.

Appreciation

I am grateful to WSAA staff and WSAA Members that have contributed data and commented on drafts of this Report Card.

Ross Young, Executive Director, WSAA

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Introduction

This Report Card provides an overview of the context in which the Australian urban water industry operated during 2006-2007 and outlines the future challenges confronting the industry going forward.

The challenges confronting the industry

Key issues covered in this report card include:

- **climate change and population growth** as key issues that are driving change in the industry,
- **the responses being implemented to reduce water consumption and the development of new sources of water** that are not dependant on rainfall to mitigate climate change risks,
- **the future challenges going forward** include, managing large investments in water infrastructure projects during a period where there is a shortage of skills and the ageing workforces,
- **managing the risks** associated with more sophisticated water supply systems including recycled water for drinking,
- **understanding community expectations** in relation to levels of service, and
- **minimising greenhouse gas emissions** from water projects and implementing future water conservation programs.

The 2006/07 year was particularly challenging for water resource managers across Australia in rural and urban areas. **Rainfall in catchments that serve urban Australia was reduced in a number of instances by 80% compared to the long term average**, resulting in dramatic reductions in inflows to storages. The reductions in inflows came after nearly a decade of reduced rainfall and runoff which had left many storages that serve urban Australia severely depleted.

The urban community became, as never before, concerned about the reliability of water supplies for our cities after seeing water supplies steadily diminish. This gave urban water a national profile it has not had in the living memories of most people working in the industry today. The concern about water supplies, urban and rural, coincided with wide ranging discussions at the political and community level on the impact of climate change on Australia's water resources. Until recently, climate change was viewed as a long term issue; something for us to worry about in 25 or 50 years time. The reduction in inflows to storages changed sentiment in the community and whether the science supports it or not, the community clearly associates the changes in rainfall patterns and associated sharp decline in inflows with climate change.

Growing concerns over water reliability are the key reason that climate change has become such a 'lightning rod' issue in Australia and the water industry is regarded as the 'canary in the coal mine' for climate change. Although Australian cities have experienced dry and highly variable weather patterns before, this particular dry period is the first time the spectre of climate change has hung over our heads. This has introduced a sense of fear in the community that Australia may never return to the rainfall patterns of the past, and new ways need to be found to secure water supplies for our cities.

Exacerbating the decline in inflows to urban storages was the impact on water consumption of continued rapid population growth in urban Australia. This is outlined in Table 1, which shows that **the population of Australia's urban areas increased by 180,998 (or**

Table 1: Estimated Resident Population Increase for Australia's Major Urban Areas 2005-2006

City	Population Increase	Annual Growth Rate %
Sydney	37,151	0.87
Melbourne	48,953	1.35
Brisbane	29,454	1.64
Adelaide	9,688	0.86
Perth	29,910	2.02
Hobart	1,983	0.97
Darwin	2,776	2.50
Canberra	3,036	0.93
Gold Coast-Tweed (QLD/NSW)	14,513	2.69
Lower Hunter	3,534	0.69
Total	**180,998**	**1.34**

Source: ABS Australian Demographic Statistics 2006 Census Edition – Preliminary 5 June 2007

The challenges confronting the industry

continued

1.34%) during the 2005/06 year.

Table 2 shows that according to the ABS, **Australia's major urban areas will experience strong population growth with an increase in population of over 8.5 million people by 2050**. This increase is approximately the equivalent of two Sydneys and on today's consumption rates would require additional water supplies of 1,036 gigalitres per annum. It should be remembered that strong population growth is also predicted for many regional urban areas.

Table 3 shows the levels of storages serving Australia's major urban areas as at the end of July 2007 compared to the storage levels for the same time last year. It should be noted that with the onset of winter rains, most storages (with the exception of those supplying Brisbane and Perth) have began to recover but only three cities have storage levels higher than the corresponding period last year. On a positive note, the storages that serve Sydney and the Lower Hunter have risen substantially recently.

With the exception of Hobart, there can be no complacency in the process of developing new sources of water for Australia's major urban areas. Even Darwin is vulnerable if there is a shift in the monsoonal patterns (as has happened in South East Queensland) which results in summer rainfall not filling the Darwin River Dam.

Table 3: Storage Levels for Australia's Major Urban Areas

City/Region	Current Storage Levels	Storage Levels same time last year	Annual Change
Sydney	57%	42%	15%
Melbourne	35%	48%	-13%
Adelaide	75%	52%	23%
Canberra	41%	51%	-10%
Hobart	77%	81%	-4%
Darwin	95%	100%	-5%
Perth	25%	31%	-6%
Brisbane	17%	31%	-14%
Gold Coast	62%	92%	-30%
Lower Hunter	97%	66%	31%

Source: WSAA Monthly Storage Levels and Restrictions Report – July 2007

The inflow charts 1 and 2 on the following page show just how dramatically inflows declined in 2006 for the storages supplying Melbourne and Canberra. Both of these cities experienced near record low inflows following a decade-long period of inflows that are substantially lower than the long term average. **Nearly all major urban areas have experienced similar declines but Canberra and Melbourne best illustrate just how dry 2006 was.**

This raises the critical strategic question as to whether the past performance of our water supply catchments are really going to be an accurate guide to how the catchments will perform in the future.

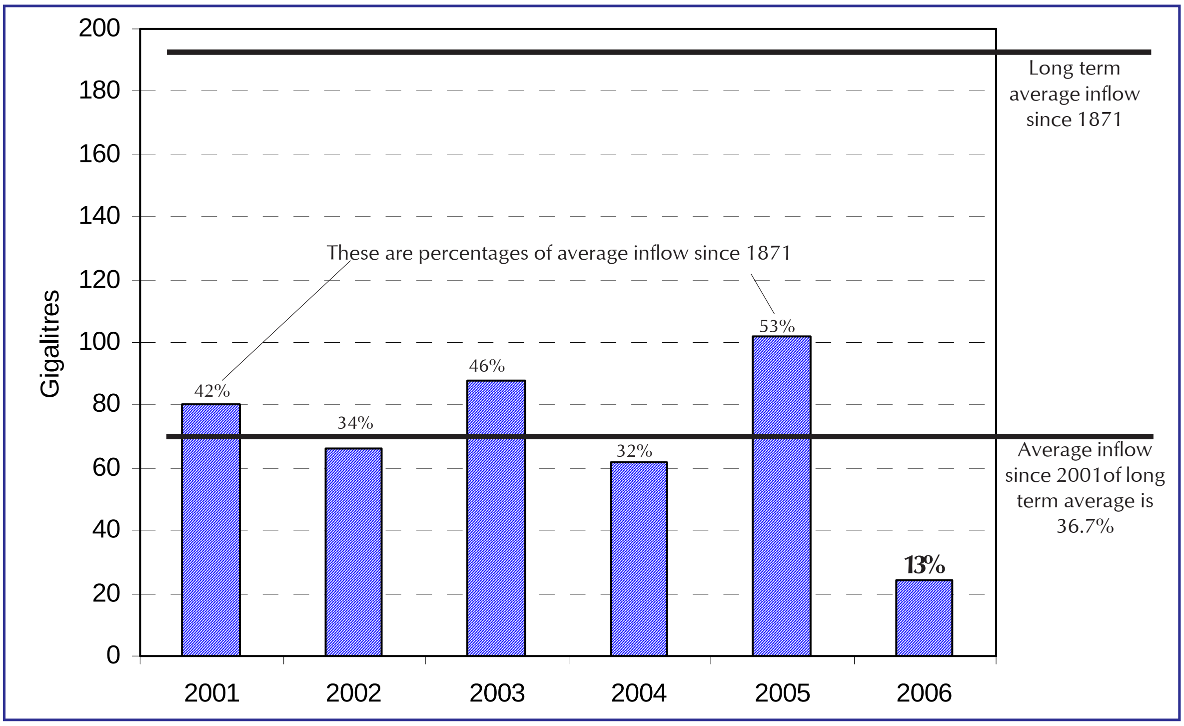
Table 2: Projected Population Increases for Australia's Major Urban Areas up to 2050

City	Current Population June 2006 (000s)	Project population 2030 (000s)	Project population 2050 (000s)	% increase from June 2006 to 2050
Melbourne	3,682.6	4,869.9	5,846.5	58.8
Sydney	4,307.7	5,386.7	6,267.8	45.5
Brisbane	1,864.0	3,071.3	4,147.1	122.5
Perth	1,512.2	2,299.4	2,965.9	96.1
Darwin	114.7	199.8	290.4	153.2
Canberra	330.3	446.7	542.3	64.2
Hobart	206.3	253.5	285.4	38.3
Adelaide	1,133.2	1,259.9	1,324.5	16.9
Total	**13,151.0**	**17,787.2**	**21,669.9**	**64.8**

Source: ABS Population Projections Australia 2006

The challenges confronting the industry
continued

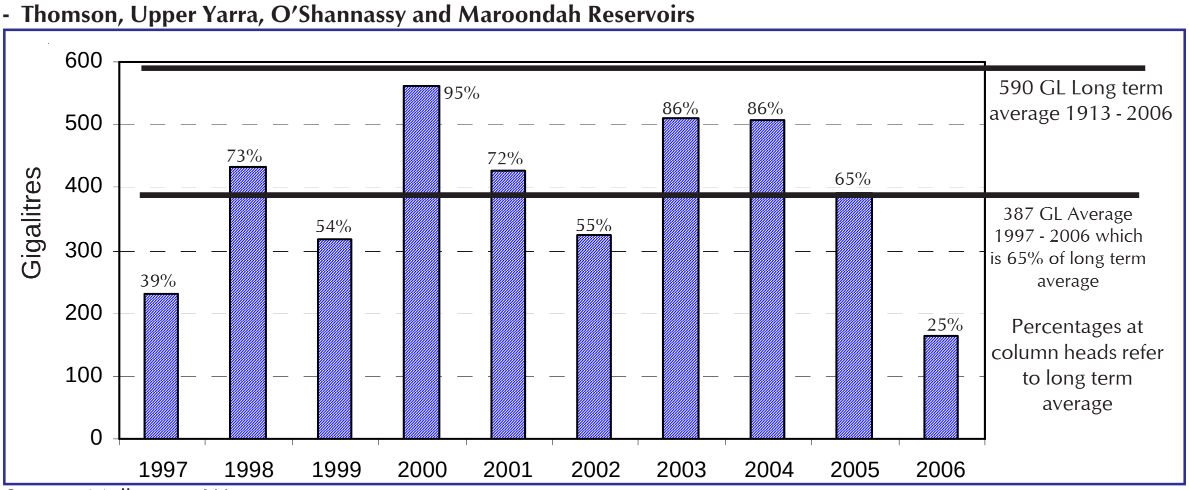
Chart 1: Annual inflows to Canberra's storages
- Corin, Bendora & Googong Reservoirs



Source: ACTEW Corporation

Average inflows to Canberra storages since 2001 were 63% lower than the long term average. Inflows in 2006 were 87% less than the long term average.

Chart 2: Annual inflows to Melbourne's water storages 1913 to 2006
- Thomson, Upper Yarra, O'Shannassy and Maroondah Reservoirs



Source: Melbourne Water

The wastewater system

While the focus of the urban water industry has been climate change driven in recent times, the industry has not been complacent in other areas of service delivery.

Utilities across Australia are regularly revising and updating sewerage strategies and implementing priority sewerage programs to provide improved services to existing customers and unsewered urban and remote communities.

By connecting properties to the sewer, poorly performing septic systems can be eliminated reducing the risks to public health and helping improve the environment, especially local waterways.

Upgrades of sewage treatment plants in urban Australia have continued across urban areas to reduce the deleterious impact of treated effluent on receiving waters.

Given the ever growing use of recycled water, the management of the sewerage system is pivotal to ensuring reliable water supplies, as this is the source water that becomes recycled water. It is not only the quality of the treated effluent that is available for recycling but adequate flows are also required to provide reliable supplies.

There has been a significant reduction in flows experienced in some sewerage systems over the last number of years. Probable causes are a reduction in water infiltration to sewers due to reduced rainfall and ground water tables becoming lower.

The amount of grey water recycling occurring at the household level, particularly in those areas where complete outdoor water bans are in place would also be contributing to lower flows in sewers, along with the widespread use of water efficient washing machines and shower heads. A watching brief is required on this topic as our sewerage system is designed on the basis of adequate flow velocities to transport waste to sewage treatment plants and to provide self clensing to reduce septicity and odours.

Responses implemented to meet the challenges of water scarcity

In response to the challenges previously outlined the following measures were already in place or were introduced throughout the year that assisted in the industry ensuring that cities did not run out of water.

Water Restrictions

Water restrictions of varying degrees of severity were in place in almost all urban areas across Australia, with the exception of Tasmania and the Northern Territory. Restrictions have been in place in some cities and towns for some years now and during the last year the severity of the restrictions was increased quite significantly in many urban areas in the the face of declining storage levels. Regional towns such as Geelong, Bendigo and Ballarat in Victoria and Gosford/Wyong in New South Wales and Toowoomba in Queensland were particularly hard hit by severe restrictions that banned outdoor water use. These restrictions were introduced before the onset of the summer which was particularly challenging for people in these towns to keep gardens and pot plants alive.

The impact of water restrictions was clearly evident in Melbourne. Due to restrictions that limited watering of public open space, the visual amenity of the city was severely impacted, not to mention the struggle to keep important historic trees alive. The impact on community sporting events being disrupted due to parched and hard sports fields was also significant. During the year the realisation that restrictions don't come 'cost free' hit home to urban Australia. Home owners rushed to nurseries and hardware stores buying products and devices that would allow them to use water more economically and keep their gardens alive. The response from the community initially has generally been positive towards restrictions but now having experienced harsh restrictions in a hot and dry summer there is now evidence that long duration harsh water restrictions will not be tolerated on an ongoing basis by urban communities.

Table 4 on the following page shows at a high level, the water restrictions that were in place in Australia's capital cities at the time of publication.

Responses implemented to meet the challenges of water scarcity

continued

Table 4: High Level Summary of Water Restrictions in Capital Cities as at 1 July 2007

City	Level	What's permitted
Brisbane	Stage 5	Bucket or watering can of gardens and lawns between 4pm to 7pm three days per week. Safety aspects of vehicles only by bucket. High users to submit water assessment form..
Sydney	Stage 3	Hand held hose and drip irrigation only on Wednesdays and Sundays before 10am and after 4pm. Vehicles only by bucket.
Adelaide	Stage 3	Buckets and watering cans for outdoor trees, shrubs and plants. Household sprinklers, hoses and watering systems including drippers and any lawn watering banned for July and August.
Melbourne	Stage 3a	Hand held hoses between 6am to 8am on two days a week. Lawn watering banned. Only vehicle mirrors, windows and lights can be washed. Manual drip systems and automatic systems for limited hours two times per week.
Perth	Permanent water	Hand watering at any time. Sprinklers two times per week between 6pm and 9am. Vehicles can be washed.
Canberra	Stage 3	No sprinkler or other irrigation system may be used on private gardens. Watering of lawns not permitted. Hand held hose between 7am and 10am; and 7pm and 10pm on alternate days. Vehicle washing banned.
Hobart	No restrictions	
Darwin	No restrictions	

Water Conservation Programs

Extensive and world leading water conservation programs were once again implemented and promoted by governments and the urban water industry across Australia. The measures adopted varied from city to city but some of the key initiatives undertaken included:

- rebates for water efficient washing machines,
- rebates for low flow shower heads or in some instances distributing free water efficient shower heads,
- rebates for rainwater tanks with higher rebates for those connected to an internal fixture (such as a toilet) and/or appliance,
- audits of households by trained plumbers to replace leaking valves, taps and install water efficient shower heads and checking for leaks,
- education programs for home gardeners on how to use water wisely external to the home,
- rebates for pool covers, and
- rebates for the installation of dual flush toilets in existing dwellings.

Overall, the water conservation measures introduced in Australia over the last 20 years have produced staggering results. **For instance, Sydney now uses the same amount of water as it did in 1974 even though it now has one million more people**. Similar impressive results, contained in the National Performance Report 2005-06, have been achieved right across the urban water industry.

- **The population served by Major Urban Water Utilities increased by 2.2%** from 2004/05 to 2005/06, yet over the same period **total urban water supplied decreased by 3.2%**.
- **The average residential water consumption per property across Australia decreased** from 226 kilolitres in 2004-05 to 213 kilolitres in 2005-06, **a 6% decrease**.
- In 2005/06 **residential per capita water consumption decreased by 3.3%** to 83 kilolitres per person per annum from 86 kilolitres per person per annum in 2004/05.

Responses implemented to meet the challenges of water scarcity
continued

- From 2000/01 to 2005/06 **average residential per capita water consumption decreased by 9.6%** from 91.9 kilolitres per person per annum to 83 kilolitres per person per annum in 2005/06.
- Residential water consumption ranges from 73.5 kilolitres per person per annum in Brisbane to 169.8 per person per annum in Darwin.

The Australian government's Water Efficiency Labelling and Standards scheme continues to play an important role in reducing water consumption by allowing consumers to compare the water efficiency performance of appliances, taps and shower heads at the time of purchase.

Water loss and leakage management

The industry continues to make progress in reducing the amount of water lost through leakage. At a time when restrictions are in place it is important for the industry to demonstrate that it has programs in place to ensure that water loss and leakage is minimised on an ongoing basis.

Australia's urban water utilities are drawing on the latest technological advances to better understand water leakage, to improve the way leaks are identified, measured and repaired, and to manage infrastructure and water pressure to reduce losses.

Reduction in water pressure is one of the easiest ways of improving leakage performance. Not only does this result in less water leaking from the water supply system, but the life of assets such as pipes, valves and fittings will be extended as the whole system is under less pressure.

It must be recognised that there is an economic level of leakage beyond which inordinate expenditure would be required to save relatively small volumes of water. The Infrastructure Leakage Index (ILI) is a methodology that allows real water losses such as leaking pipes to be differentiated from apparent water losses such as meter errors.

The average ILI for major water utilities across Australia in 2005-06 was 1.4, a significant improvement from the 1.8 in 2004-05 and 2.1 in 2001-02.

A comparison in 2005 showed that the lower performers in leakage in the Australia urban water industry were equal to the best performers in leakage in Europe, North America, United Kingdom and South Africa. As new technology and methods evolve the industry will continue to reduce leakage.

Water pricing

There was a general trend throughout the year for urban water prices to increase.

As shown in Table 5, the use of block tariffs is now almost universal in the major urban areas.

The tendency in recent times has been to increase the volumetric component of the water charge so that customers receive a stronger price signal to conserve water during a time that storage levels are very low.

Despite recent price increases, the cost of water is still a relatively small component of the total household expenditure. The average typical residential bill for water in 2005-06 was $321.62 and combined with the sewerage component the total bill was $581.74.

There are often calls for water prices to be dramatically increased to ensure water is used more efficiently. However, care is required to ensure that the purity of the two part tariff pricing model (where the fixed charge recovers the costs associated with the existing infrastructure and the volumetric component signals the long run marginal cost of the next augmentation) is not distorted too greatly as this could lead to perverse outcomes such as 'cherry picking' by new entrants.

Water pricing does play an important role in a comprehensive water conservation program but it is not the panacea, and should be used in conjunction with a number of other demand management measures.

The price of water in the major urban areas is generally significantly higher than customers are charged in regional urban areas, particularly those regional areas serviced by local government water providers in New South Wales, Queensland and Tasmania. Reform is required to ensure that all urban water customers receive a price signal that reflects the value and the scarcity of our water resources.

Responses implemented to meet the challenges of water scarcity
continued

Table 5: Capital City Water Prices as at 27 June 2007

City	Fixed Charge	Quantity	Usage Charge
Adelaide	$148	0 to 125KL pa	$0.47 per KL
		> 125KL pa $1.09 per KL	$1.09 per KL
Brisbane	$113	0 to 200KL pa	$0.96 per KL
		201 to 300KL pa	$0.99 per KL
		> 300 KL pa	$1.25 per KL
Canberra	$75	0 to 100 KL pa	$0.66 per KL
		101 to 300 KL pa	$1.29 per KL
		> 300 KL pa	$1.74 per KL
	An additional environmental abstraction charge of $0.55 per KL applies		
Melbourne	$45.40 to $101.28	0 to 160 KL pa	$0.81 to $0.8205 per KL
		161 to 320 KL pa	$0.96 to $0.9682 per KL
		> 321 KL pa	$1.4185 to $1.55 per KL
Perth	$154.60	0 to 150 KL pa	$0.493 per KL
		151 to 350 KL pa	$0.732 per KL
		351 to 550 KL pa	$0.95 per KL
		551 to 950 KL pa	$1.268 per KL
		> 950 KL pa	$1.588 per KL
Sydney	$64.40	0 to 400 KL pa	$1.339 per KL
		> 400 KL pa	$1.828 per KL
Hobart	3% of property value		No usage charges
Darwin	$103.11		$0.68 per KL

Source: Water utility websites and National Performance Report 2005-06 Volume 1 and 2

Increased diversification of water supply sources

To date, with the exception of Perth, the urban water industry in Australia has almost been totally reliant on surface runoff into storages for water. In the context of climate change, which is resulting in more unreliable and fickle rainfall patterns, reliance on runoff is an increasingly high risk option. This is why the urban water industry is diversifying its portfolio of water sources. These new sources of water, independent of rainfall include desalination plants and recycled water schemes. Other sources of water being developed include, water trading with the agricultural sector and ground water.

It is important to note that the new sources of water for each of our cities and towns will vary depending on a range of factors. There is no silver bullet here. Each option should be assessed in a thorough and transparent manner to ensure that the community understands why certain water supply options have been chosen over others.

One of the ironies of the current situation is that, despite community concern about the reliability of water supply systems for our cities, almost every water supply option proposed attracts significant criticism. It is therefore essential that the decision making process is transparent and leadership is provided by the industry and governments to ensure that the community and stakeholders are well educated on all of the issues.

During the year, the following major projects were either undertaken or announced to ensure the reliability of water supply for urban areas (these projects do not include recycled water schemes as these are discussed separately).

Responses implemented to meet the challenges of water scarcity
continued

Perth

- Water Corporation in Western Australia commissioned the first large desalination plant for an Australian city. This plant has a capacity of 45 GL per annum and will supply 17% of Perth's water supply.
- A second 45 GL per annum desalination plant with the potential to be increased to 100 GL was announced by the WA Premier on 15 May 2007. This plant will be located at Binningup south of Perth and will be completed by 2011.

South East Queensland

- Desalination plant (45 GL per annum) being built at Tugun, Gold Coast due for commissioning by November 2008;
- Extensive 400 kilometre water grid being created;
- Indirect potable reuse via Wivenhoe Dam which involves the construction of three advanced water reclamation plants;
- Traveston Dam to be built on the Mary River (inland of Gympie);
- Water sensitive urban development. Pimpama Coomera recycled water plant to commence commissioning early 2008, with recycled water supplied to development by end of 2008.

Sydney

- Sydney is building a desalination plant and just recently the successful consortium to build the plant was announced as well as the consortium to construct the pipeline. The desalination plant will be located at Kurnell and will have a capacity of 90 GL per annum.

Canberra

- Installing UV treatment for abstracting from the Murrumbidgee River.
- Currently evaluating proposal 'Water2Water' project which includes options to supplement dams with indirect drinking water recycling.
- Building new dam on Cotter River or Gudgenby River.
- Transferring water from Tantangara Dam in New South Wales to Australian Capital Territory.
- Increasing capicity to pump from the Murrumdidgee River.
- Or other options indentified in the Future Water Options study of 2005.

Lower Hunter

- The first dam for urban use to be built on the east coast of Australia for 20 years will be constructed in the Hunter. The Tillegra Dam is scheduled for completion by 2013 and will have a capacity of 450 GL which will more than double the existing storage capacity of the Lower Hunter and provide drought security to both the Lower Hunter and Central Coast regions of New South Wales.

Adelaide

- Desalination plant proposed at Port Augusta (in conjunction with BHP);
- Stormwater recycling;
- Weir on the Murray River under evaluation.
- A desalination plant and expanding the capacity of Mt Bold Reservoir are options currently being investigated to augument Adelaide's water supply.

Responses implemented to meet the challenges of water scarcity
continued

Melbourne

- Tarago Reservoir to be used again which will supply an additional 15 GL per annum by 2009.
- The Victorian State Government recently announced $4.9 billion of projects to secure Melbourne and Victoria's water supplies for the long term. These include:
  - A 150 GL desalination plant to provide water for Melbourne, Geelong, Westernport and Wonthaggi;
  - A major irrigation upgrade in the Food Bowl in Northern Victoria to deliver water savings to be shared equally between irrigators, the environment, and Melbourne;
  - A major expansion of the Victorian Water Grid with pipelines to connect Melbourne's water system with the desalination plant and Northern irrigation upgrades, connect Geelong to Melbourne's supplies, and connect Hamilton to the Grampians Wimmera Mallee System.
- These projects will deliver a 50 per cent boost to Melbourne's water supply within five years and allow water to be moved where it's needed most.
- They will increase Victoria's total supply by 375 GL each year, with Melbourne receiving 75 GL in 2010 and a further 150 GL by the end of 2011.

Regional Urban Areas of Australia

- Significant water grids are being established in South East Queensland and central Victoria. The latter grid will extend from Geelong (to the West of Melbourne), to Bendigo, Ballarat and Goulburn Valley (to the North of Melbourne), and to Gippsland and Wonthaggi (to the East of Melbourne) and will link to Melbourne.

Better understanding the impacts of climate change

The urban water industry has been proactive in funding and being involved in studies that evaluate the impacts of climate change on the urban water cycle.

The impacts of climate change will vary around Australia and this is why individual and detailed studies are required for each of the catchments areas that serve Australia's major urban areas.

It needs to be recognised that the impacts of climate change are broader than just reductions in inflow to water storages. There are likely to be significant impacts on both the wastewater and storm water systems and the interdependencies of all three elements of the urban water cycle need to be evaluated.

These are some of the more significant studies undertaken on the impacts of climate change on urban water management:

Melbourne

A comprehensive study was undertaken (using CSIRO) of the impact of climate change on Melbourne's water supply, sewerage system and drainage system. The work was carried out between 2003 and 2005

Perth

The Water Corporation was one of the founding financial contributors to the Indian Ocean Climate Initiative (IOCI) that looked at the impact of climate change on Western Australia. In 2004-05 the Western Australian government restructured the financing of that Initiative and the Water Corporation is no longer a contributor to it. The IOCI study was not specific to impact on water sources.

Brisbane

Brisbane City Council undertook early work in 2001 about energy use and how to minimize it. More recently, a study on Energy and Greenhouse (again focus was broader than Climate Change impact on water) suggested that "inflows to the City's water storage facilities could decrease by 11-30%"

Responses implemented to meet the challenges of water scarcity

continued

Sydney

Sydney Catchment Authority (SCA) has embarked on a number of projects to determine short term and longer term climate patterns for the Sydney region. The short term projects (six to twelve months) are in collaboration with the universities of NSW and Newcastle and will provide forecasts of rainfall and stream flows based on ocean temperatures and circulation off Eastern Australia. The longer term projects are in collaboration with the same universities and also with the CSIRO. The projects relate the local climatic conditions for the last 1,000 years and the likely impact of climate change on rainfall and run-off under various greenhouse gas emission scenarios. The project will also inform SCA regarding the delivery of sustainable supplies of bulk water for Sydney. One of the long term projects with the University of Newcastle studies the evidence of wetting and drying cycles on the stalagmites (these are highly responsive to variations in climate) in the Wombeyan caves in the Warragamba catchment and on the floodplain sediment (this will provide insights in the history and magnitude of past floods) in the Hawkesbury-Nepean catchment.

Canberra

The CSIRO had developed a climate change for Canberra's water supply system for 2030. This scenario has already been applied.

Recycled water schemes and wastewater treatment

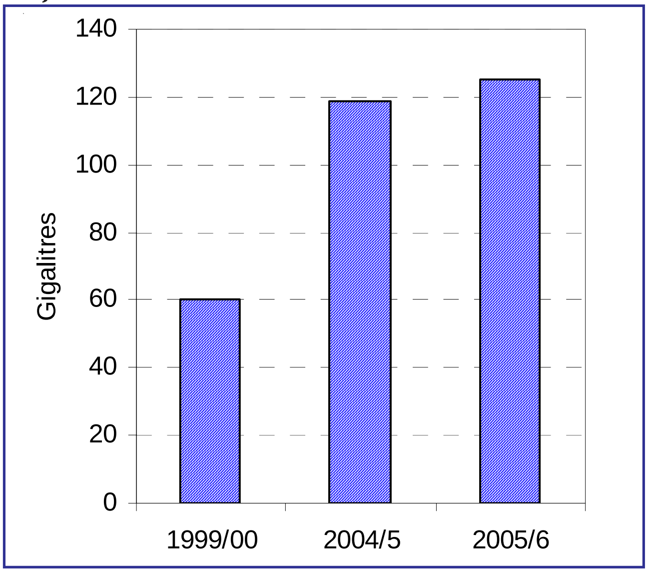
Over the past five years the urban water industry has been at the forefront of developing projects that increase the volume of water recycled and the variety of applications for which it is used.

Recycled water has now become an increasingly important component in the total portfolio of water supply options for our urban areas.

The growth in the use of recycled water is outlined in Chart 3.

The average percentage of water recycled by the major urban water utilities in 2005-06 was 9% which translates into a volume of 125 GL. This is double the volume of water used in Canberra during 2005/06.

Chart 3: Growth in the use of recycled water in major urban water utilities



Source: National Performance Report 2005/06

When the urban water industry first commenced to develop recycled water schemes, the main priority was to reduce the impacts of treated effluent on receiving waters. Due to the scarcity of water in our cities the focus has now changed to the point where recycled water is now viewed as a valuable resource for a variety of uses.

Community confidence in recycled water will be enhanced with the release of the Australian Guidelines for Water Recycling: Phase 1 and Phase 2 in 2007.

Great effort is taken to identify cost effective options for recycled water to be used to substitute for drinking water.

Additional recycled water projects are underway and being evaluated across urban Australia. For example:

- while already a leading recycler the volume of recycled water in **Adelaide** is targeted to almost double to 30 GL by 2025,
- in **Brisbane** there will be an additional 39 GL of recycled water used by 2007/08,
- volumes of recycled water in **Canberra** will increase by between 9 and 18 GL in the next few years before the "Water 2 Water" project is delivered in the medium term,

Responses implemented to meet the challenges of water scarcity

continued

- **Melbourne** has a target of recycling around 70 GL or 20% of its treated effluent by 2010 and 6.5 GL for potable substitution where fit for use by 2015. A portfolio of recycled water projects has been assembled to achieve these targets. Just recently the Victorian government announced in 'Our Water Our Future - The next stage of the government's water plan' that the Eastern Treatment Plant would be upgraded to produce more than 100 GL of high grade recycled water by 2012 in preparation for planned increases in demand from a range of uses.
- **Water Corporation in Western Australia** recycled 12.3% of its wastewater in 2006/07. A number of recycled water projects for industry and public open space are being developed in Perth which will deliver an additional 10 GL of recycled water in 2006-07 growing to 26 GL by 2010.
- **Sydney Water's** existing recycled water schemes for the year to June 2007 delivered recycled water in the order of 21 GL/year. The major scheme commissioned in 2006/07 was the Wollongong Stage 1 scheme serving BlueScope Steel with recycled water up to 7.3 GL/year (plant capacity).

  Projects planned for commissioning in 2007/08 and 2008/09 will deliver up to a further 4.0 GL/year and 2.0 GL/year respectively.

  At the end of 2009 the Replacement Flows Project (environmental release) will come on line. It will have a plant capacity of 18.3 GL/year. Similarly in 2010/11 the Camellia scheme will be commissioned with a plant capacity of 12 GL/year.

Servicing rural urban communities and remote townships

There are many examples across Australia where utilities have provided sewerage services to unsewered communities to improve public health, amenity and the environment.

For example, customers in the small township of Skenes Creek, located on the Great Ocean Road in south-west Victoria, can now connect to their new sewerage system, which brings significant environmental and social benefits to the community. Previously, treated effluent from septic tanks and household plumbing flowed via open drainage systems and sub-soil into the creek and onto the beach. A 14 km network of pipes now connects Skenes Creek homes to the Apollo Bay water reclamation plant.

Urban water utilities such as the Water Corporation in Western Australia, South Australia Water and Power and Water in the Northern Territory face the additional challenges of servicing remote townships. In January 2007, the town of Wiluna on the Canning Stock Route had its new sewerage system opened and this was the 91st regional sewerage scheme in Western Australia.

In the Goulburn Valley region of Victoria the provision of sewerage services to numerous small towns combined with the upgrade of the region's 26 wastewater treatment plants and development of land based re-use projects has reduced nutrient loads on the Goulburn River system, in particular phosphorous, from 43 tonnes per year in 1995 to less than 0.5 tonnes in 2006.

Pressure sewerage schemes

Servicing unsewered communities has required careful planning to identify and adopt the most appropriate system design that results in the lowest life cycle cost. **Pressure sewerage has emerged as a cost-effective solution to back-log areas that were hitherto difficult to service**.

The Brooklyn and Dangar Island Sewerage Scheme north of Sydney on the Hawkesbury River is typical of pressure sewerage schemes being constructed in metropolitan and non-metropolitan urban communities across Australia. Pressure sewerage requires installation of a collection tank and grinder pump on each eligible property allowing sewage to be pumped through a reticulated sewer main to a new sewage treatment plant in Brooklyn, which employs membrane bioreactor technology treatment and ultraviolet light disinfection.

Because construction of pressure sewerage often occurs in existing developed areas, the industry has adopted trenchless technology installation to minimise disruption to the community and reduce restoration costs.

The way forward

The next five to ten years will be a very exciting and challenging time in the urban water industry as the industry invests significant resources to manage the risks associated with climate change and rapidly growing urban populations.

Broader industry projections suggest that in the next five to ten years some $30 billion will be invested in urban water infrastructure. This projection does not take account of the significant investment that will continue to take place in both wastewater and storm water infrastructure.

By any standards, this is a significant investment program that will challenge the industry as it coincides with a boom in the infrastructure investment in other sectors of the economy such as mining, electricity generation and transport.

The following are some of the challenges that the urban water industry will have to deal with over the next decade:

1 Managing rapidly increasing capital investment programs

In response to the challenges and risks presented by climate change and population growth, the next five to ten years will see a dramatic increase in capital investment in water and wastewater projects in virtually every urban area.

In 2006-07 the water utilities in Australia's capital cities spent more than $0.75 billion on water infrastructure. In 2007-08 they will spend around $1.4 billion and the following year more than $2.3 billion. For comparison the capital city water utilities invested $1.2 billion in water infrastructure and $1.1 billion in sewerage infrastructure in 2005-06.

It is important to understand that these figures do not include bulk water, water reclamation plants and transport infrastructure in South East Queensland (as this is now the responsibility of the State Government) nor the desalination plant for Sydney.

Capital expenditure in wastewater services is also going to increase during the same period. Water utilities in our capital cities will spend around $935 million on wastewater related capital expenditure in 2006-07 and more than $1,055 million in 2007-08. In 2008-09 capital expenditure in this area is expected to increase further to just under $1,470 million.

The magnitude of the infrastructure investment in urban water in the future is best exemplified by the $9 billion South East Queensland Water Grid. This grid will comprise around 400 kilometres of pipeline and will connect the major bulk water sources in South East Queensland. The project also involves a desalination plant at Tugun, three water reclamation plants, two new dams and works on several other water storages.

The capital expenditure noted in the previous paragraphs are projects for which funding has been provided. It is possible that additional projects may be added during this period and therefore these projects probably represent a conservative projection.

In Victoria the 13 regional water corporations plan to invest a further $1.8 billion in urban water and wastewater infrastructure in the next five year regulatory period of 2008 to 2013. This follows on from the more than $1billion invested in infrastructure by these regional water utilities in the previous five years.

2 Managing the impacts of rising water prices

A capital investment program as outlined has to be paid for in some way, and in the case of urban water this will be paid for by urban consumers.

Under rules set down by COAG, urban water utilities must obtain a return on their investment in water infrastructure and this will flow through to water prices.

This pricing approach provides urban water utilities with funds to invest in new infrastructure and repair existing infrastructure without having to rely on government. It also enables the utilities to pay a dividend to their shareholder governments.

The use of inclining block tariffs can reduce the burden of higher water prices on those less well off in the community as the first increment of water used can be priced to make it affordable to all.

Even when water prices rise substantially it is likely that the cost of water compared to other utilities serves such as electricity will remain a relatively small proportion of total household expenditure.

According th Australian Bureau of Statistics data household expenditure on water and sewage is only 0.7 per cent of disposable income compared to 2.7 per cent for electricity and gas, 3.6 per cent for alcohol and cigarettes and five per cent for household furniture.

The construction of the desalination plant at Kurnell in Sydney is likely to add less than $2.00 per week to the average water bill.

The price of water in Melbourne is predicted to double over the medium term to cover the $4.9 billion cost of the new water infrastructure recently announced, although Melbourne currently has the lowest water prices of all the capital cities.

Further reforms that could take place that would allow stronger price signals to be sent to consumers on the scarcity of water include:

- Amend state and territory residential tenancy legislation so that tenants are sent the volumetric component of their water bill as is the case already in Victoria and Western Australia, whilst the landlord pays the fixed component. Given that up to 30% of properties in some capital cities are rented there is a significant proportion of the population not receiving a price signal on their use of water.
- A significant proportion of water utility customers receive government rebates e.g. pensioners etc on their water bills and social policy implications versus the need to send price signals on the scarcity of water needs careful assessment.
- During times of severe water shortages scarcity pricing could be introduced which would be based on the cost of the next water supply augmentation and/or demand management measure. This approach would emulate a market situation where prices for goods rise during periods of shortage.

The way forward
continued

3 Protection of public health in an era of recycled water for drinking

As we move from traditional sources such as dams to new sources of water such desalination and recycled water, the technology used has become more sophisticated and requires greater expertise in the way the systems are managed and operated.

Already the Queensland government has announced that highly purified recycled water will be pumped from Brisbane and Ipswich to Wivenhoe Dam to supplement drinking water supplies.

In the ACT, ACTEW is currently evaluating the 'Water2Water' project a similar indirect potable recycling scheme for Canberra. These two projects put Australia at the forefront of planning and managing planned indirect recycling schemes, as most of the recycling undertaken overseas is non-planned (such as river extractions) or the recycled water is used for non-drinking purposes.

Risk management, will be imperative to ensure that the community can continue to have the same confidence in the quality of the water produced by these new technologies as they currently have in the water that comes from rivers and dams.

An appropriate risk management framework for managing the risks associated with supplementing drinking water with recycled water was outlined in chapter 6 of WSAA Position Paper No. 2 'Refilling the Glass – Exploring the issues surrounding water recycling in Australia'. The components of this risk framework included:

- environmental buffers – using natural treatment,
- building community trust,
- modern treatment technologies,
- building institutional capacity,
- recycled water quality,
- industrial waste management,
- monitoring and assessing,
- environmental considerations,
- regulatory guidance and public reporting, and
- national research capacity.

The adoption of rigorous and robust quality management systems such as those used in other high risk industries such as chemical production and the aircraft manufacturing to ensure high degrees of reliability will also need to be adopted in an era where recycled water will be used to supplement drinking water supplies. Utilities will need to ensure that they have the appropriate management systems in place that address critical areas such change management, operator training, laboratory competency and ongoing research and development.

4 Managing the skills shortage

The ageing of the workforce in the urban water industry is a significant issue. For instance one large water utility in Australia has 21.8% of its staff older than 55 years.

Another utility had nearly 21% of its workforce in the same age bracket. At the other end of the scale a large water utility had only 2.4% of its workforce younger than 25 years of age whilst another had only 5% under 25 years of age.

The most significant age group in the water utilities is the 45-55 year old bracket which contains greater than 30% of staff.

With such significant proportions of staff potentially leaving the industry within the next five to ten years this leaves the industry is in a vulnerable position.

The age profile of the industry combined with the boom in the mining and infrastructure sectors of the economy has resulted in the industry having difficulty in attracting and retaining skilled staff.

The impacts of the skills shortage will be exacerbated when the significant water industry capital investment program as outlined earlier gains momentum.

This issue is not just related to the water utilities but applies equally to all other sections of the water industry including consulting engineers, contractors, construction companies, product manufacturers and the education and training providers.

A whole of industry approach will be required with support from governments at all levels if we are to meet the challenges posed by skills shortages. WSAA is currently embarking on a detailed survey of how the skills shortage is impacting the industry and the measures currently being undertaken to address this challenge. Detailed workforce planning and the water industry working together as a whole with governments would appear to be the most successful means of meeting the challenges in this area.

5 Making decisions in uncertain times

In an era of climate change with all the uncertainties that it presents, the critical questions for the industry are:

- the optional timing of investments to augment water supplies,
- the optimal mix of climate dependent and independent water sources when considering investment options against an existing portfolio of water sources.

The development of real options theory in recent years has revitalised the field of investment evaluation under uncertainty.

More importantly, real options analysis offers the possibility of project evaluation under uncertainty (be this due to climate change, technological development etc) on an individual basis or as a portfolio of options. This offers the ability to evaluate quantitatively diversification options.

The urban water industry is currently evaluating the use of real options analysis as an extension of discounted cashflow analysis both for financial evaluations but also as a component of triple bottom line assessment.

6 Managing community expectations of high levels of services

There was a view going back some time that urban communities would continue to accept water restrictions in the national interest. Experience with water restrictions of long duration in some cities has changed community sentiment on the cost and inconvenience of restrictions.

Although there is still strong support for low level 'housekeeping' water conservation measures such as bans on watering during the day and hosing down paths, the reliance on ongoing, harsh and intrusive water restrictions to ensure demand/supply balances is meeting resistance in the community.

As urban communities become ever more affluent, they have higher expectations of the levels of service they receive from the water utilities. Being able to enjoy gardening and have an attractive and healthy garden surrounding their home is still an important part of urban life for many.

The yield of water supply systems is currently calculated on the basis that during certain dry periods complete outdoor water bans can be introduced. Experience over the last year shows that water restrictions of this severity are not well received in the community.

If total outdoor bans are no longer an option, water utilities will need to review yield calculations and this will impact on the level of infrastructure investment required due to the adoption of a higher standard of reliability of supply.

The way forward

continued

7 Delivering rural/Urban water trading

In the context of risk management, water trading between the rural and the urban areas of Australia still remains an attractive option for a number of cities.

Trading of this kind is one of the urban water outcomes in the National Water Initiative. In some instances, investment in upgrading old and leaking irrigation infrastructure is often funded by the urban community with the resulting water savings flowing to the cities.

Two examples of this approach are the Harvey Irrigation Upgrade scheme in Western Australia and the proposed Foodbowl Modernisation project in the Goulburn Valley in Victoria. In both these examples, the urban community received (or is expected to receive) a small proportion of the water saved through leakage reduction relative to the inadequate and inefficient rural irrigation infrastructure.

It must be remembered that in the context of the volumes of water used in irrigated agriculture, the cities really only require relatively small volumes of water.

8 Managing the water/ greenhouse gas outcomes

Because surface runoff is one of the first victims of climate change, it is incumbent on the water industry to be at the forefront of operating in a sustainable manner.

Given that virtually all the new sources of water are more energy intensive than traditional sources of water such as dams, the industry must develop ways to offset increase energy use through the generation of clean energy and look at every opportunity to reduce greenhouse gas emissions. This is already happening with each of the desalination plants announced being supplied with energy from greenhouse neutral sources such as wind farms.

9 Reforming institutional arrangements

There is little doubt that the challenges confronting the urban water industry have put pressure on the institutional and governance arrangements for water in each of the states and territories, and deficiencies have been exposed.

With the introduction of more capital intensive and sophisticated water supply systems, the need to capture ongoing economies of scale, **it is likely that institutional arrangements as they exist today in the states and territories will change into the future**.

The Queensland and Tasmanian governments are currently undertaking reform of the institutional arrangements for the provision of urban water services in those states.

10 Implementing future water conservation programs

Although water conservation programs will always be the foundation of water resource strategies for our cities, it is clear that within households great progress has been made and more can be done. However it needs to be recognised the next range of measures to be implemented in households are likely to be more expensive and more intrusive.

An important measure that could assist in further reducing per capita consumption of water would be to introduce mandatory minimum efficiency standards for domestic appliances.

The Commonwealth's Water Efficiency Labeling and Standards (WELS) scheme commenced in July 2006 and, has been an important contributing factor to continuing reductions in household water consumption.

Under the WELS scheme only minimum standards exist for toilets. This means that in all other appliance and fixture categories, water inefficient products are still able to be put on the market.

If mandatory minimum efficiency standards were introduced for washing machines and shower heads, this would greatly assist in further reducing household water consumption in a way that would not disrupt normal family life.

There is still much to be done in reducing the amount of water used in the commercial/industrial sector.

Voluntary programs aimed at reducing water use in cooling towers and fire protection systems are delivering significant savings. Many state governments now require large water using commercial and industrial enterprises to prepare water management plans with assistance from water utilities.

11 Understanding the implications of third party access

Urban water infrastructure in the capital cities has already been declared to be of 'national significance' which makes the urban water industry subject to the access provisions in Part III A of the Trade Practices Act. The New South Wales government has recently passed legislation regarding an access regime for urban water infrastructure in Sydney and the Hunter.

Although, there are no large examples of third party access to urban water infrastructure in Australia or anywhere else in the world, **it is likely that third party access will become an increasingly important issue as smaller sewer mining projects are developed across our cities**.

The pipe networks currently planned for South East Queensland, the Greater Melbourne area and Central Victoria also introduce the potential for third party access which will likely to be a significant issue in these areas.

Discussions on third party access to date have largely concentrated on the sewer system, as water markets mature and the understanding of the potential of third party access to open up new markets and introduce competition grows, applications for access to drinking water infrastructure are likely to follow.

Conclusions

- Climate change which is reducing inflows into storages and rapid population growth present significant challenges to the Australian urban water industry.
- The industry is responding by diversifying its portfolio of water supply options to include sources that are not depending on rainfall such as desalination and recycled water. The new sources of water developed for each of our cities and towns will vary depending on a range of factors. There are no silver bullets.
- The need to diversify sources of water and build water grids will result in approximately $30 billion investment in urban water infrastructure over the next five to ten years.
- Urban water prices will rise steadily over this period to pay for the new water infrastructure.
- The ability to deliver capital investment programs of this magnitude could be constrained by the ageing of the workforce in the industry and the more general skills shortage.
- The new sources of water being developed are more technically sophisticated and energy intensive compared to traditional sources such as dams.
- Higher energy use will need to be offset through the use of greenhouse gas neutral energy sources and the introduction of energy conservation programs.
- Given that protection of public health is a key driver for the industry, risk management will be imperative so that the community can continue to have the same confidence in the quality of the water produced by these new technologies as they currently have in the water that comes from rivers and dams.
- Experience over the last several summers indicates that ongoing harsh water restrictions will not be accepted by the community and the challenge is to develop reliable supplies of water for our growing cities in a sustainable manner.

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