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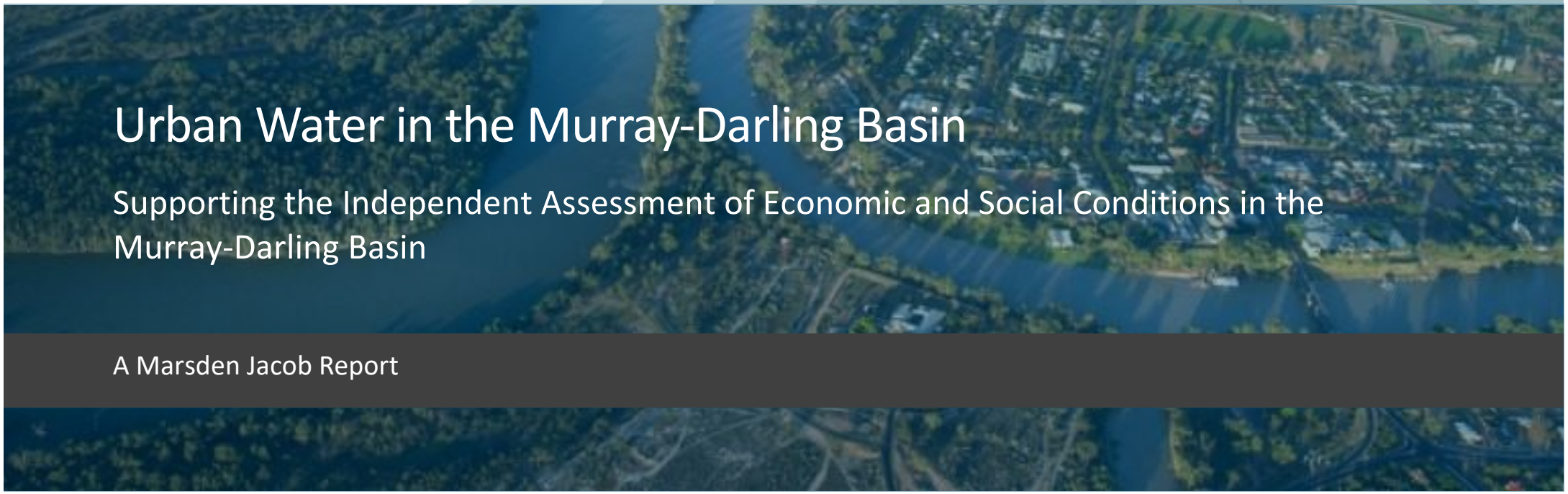

Urban Water in the Murray-Darling Basin

Supporting the Independent Assessment of Economic and Social Conditions in the Murray-Darling Basin

A Marsden Jacob Report

Prepared for Social and Economic Assessment Panel
Marsden Jacob Associates

This investigation has been commissioned by the Panel for the Independent Assessment of Social and Economic Conditions in the Murray-Darling Basin. The Panel has made this document available for public scrutiny as part of its commitment to transparency. The views in this report do not necessarily represent the views of the Panel. This is part of a series of literature reviews and research investigations that will help inform the Panel's eventual findings and recommendations.

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About Us
Marsden Jacob Associates are leading economics, public policy, markets and strategy advisors. We can help you shape the future wisely. We are a national practice of talented economists and policy advisors. We specialise in solving practical and real world problems relating to water, energy, environment, natural resources, agriculture, earth resources, public policy and transport. We work with a wide range of cross-disciplinary partner firms to deliver best project outcomes for our clients.

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Contents

Acronyms and abbreviations

ACT	Australian Capital Territory
BOM	Bureau of Meteorology
CHWN	Critical Human Water Needs
COAG	Council of Australian Governments
CSO	Community Service Obligation
ESCOSA	Essential Services Commission of South Australia
ICRC	Independent Competition and Regulatory Commission
IPART	Independent Pricing and Regulatory Tribunal
kL	kilolitres
LWU	local water utilities
MDB	Murray-Darling Basin
MDBA	Murray-Darling Basin Authority
ML	megalitres
nMDB	northern Murray-Darling Basin
NPR	National Performance Report
NSW	New South Wales
NWI	National Water Initiative
POS	Public Open Space
PWSR	Permanent Water Saving Rules
QLD	Queensland
SA	South Australia

sMDB	southern Murray-Darling Basin
SoO	Statements of Obligations
Vic	Victoria
WRP	Water Resource Plans
WSAA	Water Services Association of Australia
WTP	willingness to pay

Glossary

Consumption-based pricing	A service provision and payment scheme where the customer pays based on resources used.
Economic cost	A measure of cost that includes financial costs and opportunity costs. Opportunity costs are the benefits you could have received if you had chosen one course of action, but that you didn't because you went with another option.
Economies of scope	Savings gained by producing two or more goods, when the joint production cost of is less than the cost of producing each separately.
Levelised cost	An approach for measuring cost of (water) supply or conservation options on varying scales on an equivalent basis. The levelised cost is calculated as the ratio of the present value of projected capital and operating cost of an option to the present value of the projected annual demand supplied or saved by the option.
Lower-bound pricing	Pricing to recover, at least, the operational, maintenance and administrative costs, externalities, taxes, interest cost on debt, dividends (if any), and make provision for future assets refurbishment/ replacement (by way of a renewals annuity) (NWI definition).
Social cost	The cost of actions to society.
Upper-bound pricing	Pricing to recover operational, maintenance and administrative costs, externalities, taxes, provisions for the cost of asset consumption and cost of capital, the latter being calculated using a WACC [weighted average cost of capital] (NWI definition).
Willingness to pay	The maximum amount someone is willing to pay for a good or service.
Written down fixed capital base / written down value	The depreciated value of capital assets.

1. Introduction

At the request of the Minister for Water, The Hon David Littleproud, MDBA has convened an Independent Panel ('the Panel') to assess economic and social conditions in the Murray-Darling Basin ('the Basin'). The Panel's independent assessment is a critical opportunity to shape understanding of current economic and social conditions in the Basin, longer-term approaches for monitoring these conditions, and future Basin policy.

Marsden Jacob is supporting the Panel by delivering three discussion papers on Basin water consumption key trends and drivers. Our three discussion papers cover consumption trends and drivers in agriculture, by indigenous groups, and by urban water users in the northern and southern Basins.

The Panel has asked that our reports are concise, focus on trends and drivers since around 2000, and cover how water reform, weather and climate, technology, and prices have impacted on consumption. We were also asked to identify how trends and drivers may play out for water consumption by each group in the future, and how this may differ across Basin regions.

1.1 This discussion paper

This Marsden Jacob discussion paper focuses on urban water in the Basin. In agreement with the Panel, we have concentrated on five key questions (Table 1). The evidence base that we use in this discussion paper draws on reviews and performance reporting of national water reform, including [1-6], and our own experience and networks gained from working with Governments and Basin communities in urban water policy, economics, and governance evaluation and reform over the last two decades.

Table 1: Urban water questions posed by the Panel

Question	Section(s) where we answer this question
What is the history of water reform in the context of Urban water consumption and availability? Map the water reform points against the water recovery timeline we included in the literature review paper.	2
What does water consumption look like? How does it differ between utility sizes and regions? What are the key trends and drivers of urban water consumption and the sources used? How does this differ between regions and urban water utility size?	3
How has the weather and climate impacted availability and use, including water restrictions and supply constraints?	3.1, 3.2
What is the economic value of urban water under relevant scenarios including increasing restrictions?	3.2
What is the impact on urban water availability from competing water users (agriculture and industry)?	3.2
Where are there opportunities for reform. Can Marsden Jacob look at the impact of investing in recycling urban water to reduce reliance on rainfed water sources from the Basin?	4

2. Basin water reforms in the context of urban water consumption and availability

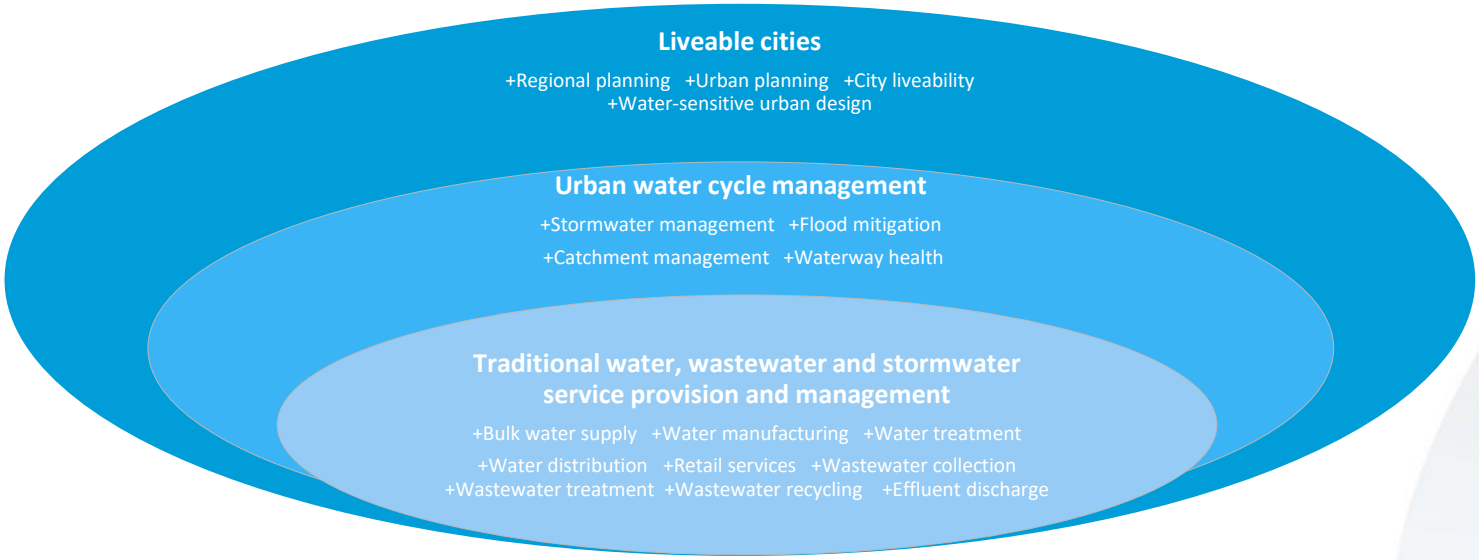
Urban water reforms in the Basin stem from the 1994 COAG Water Reform Framework. The 2004 National Water Initiative extended the Water Reform Framework, responding to overallocation and addressing issues emerging from the early stages of the Millennium Drought [1].

2.1 Urban water services

For this evaluation, we define the urban water services broadly. Our scope is consistent with how the former National Water Commission [5] and Victorian Government [7] define urban water services.

Urban water services range from the provision of potable (drinking quality) water and wastewater services to stormwater management and water recycling [1]. The urban water sector includes organisations and people working in policy, regulation and delivery of urban water services (Figure 1). It includes service providers across metropolitan and regional centres, and smaller towns and communities.

Figure 1: Australia's urban water sector



Source: Marsden Jacob, based on [5]

2.2 Urban water service objectives

While there is not a single statement of objectives for urban water in Australia, urban water system objectives and principles have been broadly understood for more than a decade [1, 5, 6, 8, 9]. Table 2 shows the key urban water objectives and principles set out by the National Water Commission [5] and the Productivity Commission [10]. All States and Territories generally agree with these principles, and reflect them in statements of urban water policy and planning objectives.

Table 2: Australian urban water sector objectives

National Water Commission	Productivity Commission
Outcomes for the urban water sector include: • Implementing pricing to encourage economically efficient and environmentally sustainable urban water infrastructure. • Delivering healthy, safe and reliable water supplies. • Economically efficient and environmentally sustainable use of urban water infrastructure. • Encouraging reuse and recycling of wastewater where cost-effective, and innovation in water supply, storage, treatment and discharge. • Facilitate water trading between and within the urban and rural sectors.	Governments should set an overarching objective for the urban water sector of delivering water, wastewater and stormwater services in an economically efficient manner. Doing this maximises net benefits to the community. Economically efficient urban water infrastructure means that water is sourced and distributed at the lowest possible social cost for fit-for-purpose and customer-defined service levels. It also means that investments to add to water supplies occur when the value of the extra water and water security to users exceeds the social costs of the investment. Efficiency also means that at the margin, water is allocated to those users and uses, including environmental uses, where its value is highest, and that decision-making responds to changing circumstances over time.

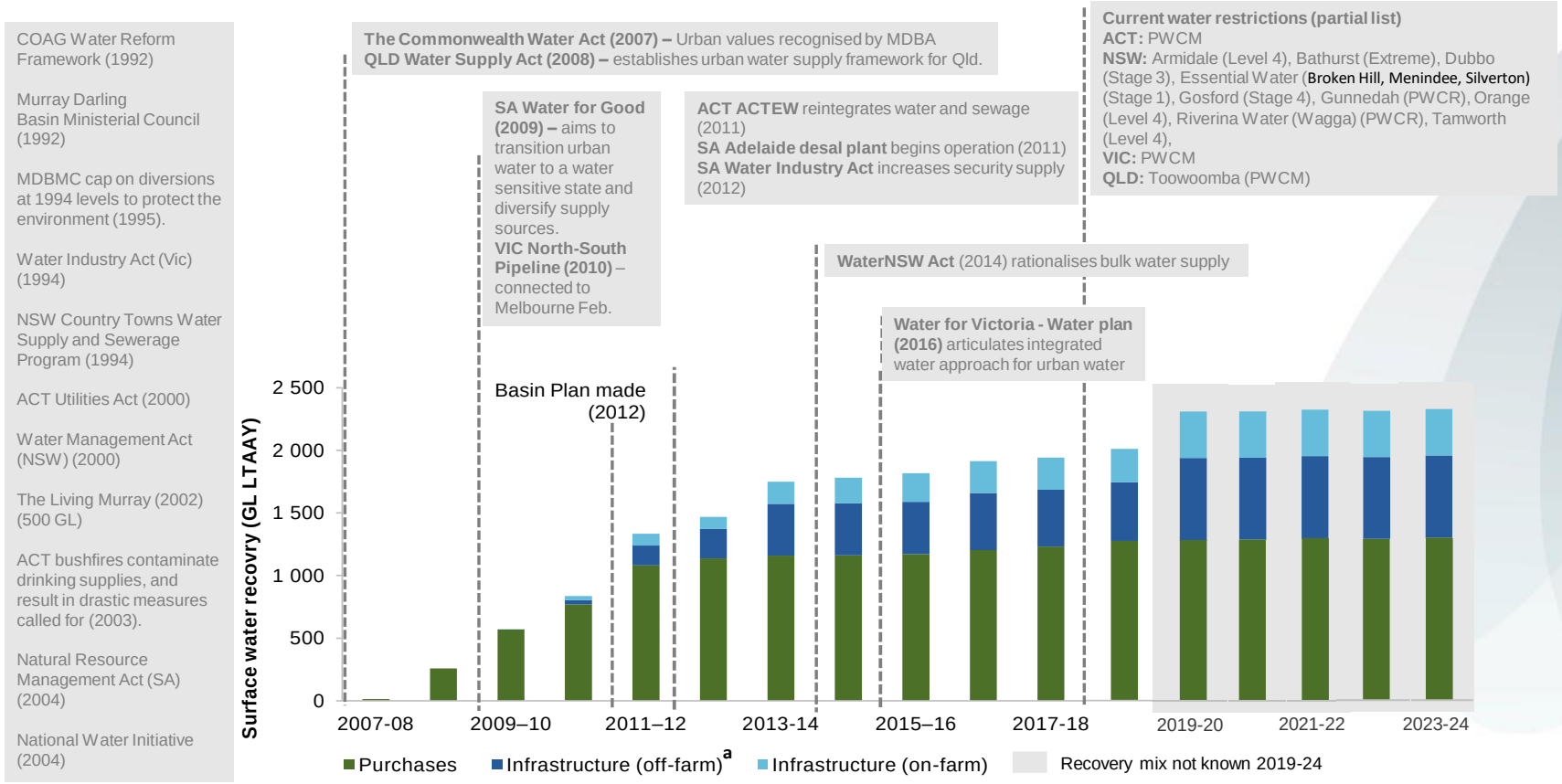
Source: [5, 7, 10]

2.3 Key Basin urban water reforms

This section draws on material in [1], unless otherwise stated.

Urban water reforms in the Murray-Darling Basin have occurred largely as part of national water reform across Australia. Key reforms are set out in a timeline below, mapped against water recovery. Figure 2 summarises reforms against the Basin water recovery timelines. We note that these urban water reforms are not generally directly linked to environmental recovery. The aim of the figure is to give the Panel a quick reference for how urban water reform maps against recovery timelines and volumes.

Figure 2: (Basin) urban water reform timeline 2001-24



Source: Marsden Jacob, adapted from [11]

National Water Initiative

The National Water Initiative (NWI) identified key outcomes for the Australian urban water sector, including those listed in Table 2. We discuss Basin regions' progress against these objectives in Chapter 4.

The Water Act 2007 and the Basin Plan

Critical Human Water Needs (CHWN) are established in the Water Act 2007 under s86A. s86A requried the Basin Plan to be prepared having regard to the fact that the Commonwealth and the Basin States have agreed that (1) critical human water needs are the highest priority water use for communities who are dependent on Basin water resources (86A(1)(a)), and that (2), to give effect to this priority in the River Murray System, conveyance water receives first priority from water available in the system (86A(1)(b)).

Under the Act, CHWN is the minimum amount of water needed to meet basic human needs. It also includes non-human needs, where a failure to meet these needs would cause too much damage to social, economic or national security. For example, this may include water for significant local industries or community uses such as firefighting [12].

The Basin Plan (Chapter 11) and Murray-Darling Basin Agreement establish processes to prioritise water for critical human needs in the River Murray System. This is done by setting the volumes required to meet and deliver CHWN and by establishing a tiered approach to water sharing in the River Murray System.

Volumes required to meet critical human water needs in the River Murray system are shown in Figure 3. Figure 4 shows tiered water sharing arrangements. A plain english explanation of the arrangements is provided on the MDBA site: a tiered approach to water sharing in the River Murray System. Figure 3 and Figure 4 are taken from this MDBA site.

Figure 3: Volumes required to meet and deliver critical human water needs in the River Murray system

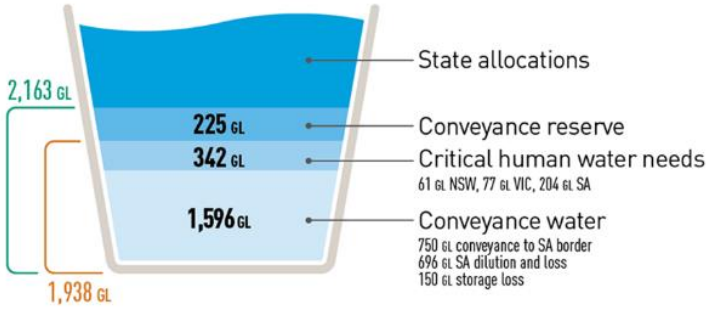
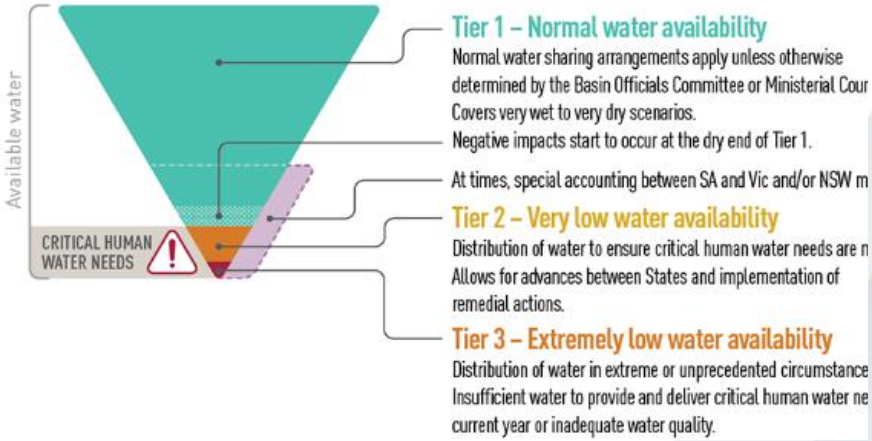


Figure 4: Tiered water sharing arrangements in the River Murray System



Source: MDBA site: a tiered approach to water sharing in the River Murray System

Water Resource Plans (WRP)

Basin communities that are not dependent on water from the River Murray System are subject to Chapter 10, Part 13 of the Basin Plan. This section requires that Water Resource Plans (WRPs) describe how CHWN will be met (for each WRP Area) during extreme events.

The power of Basin States to allocate water resources during extreme dry periods appears conditional upon the requirement under section 86A(1) of the Water Act and in section 10.51(1)(a) of the Basin Plan to ensure that regard is had to, and that management plans do not compromise, a Basin State's ability to meet critical human water needs [12].

For water resource planners, this means that they need to consider six issues [12]:

- what constitutes critical human water needs. This question includes addressing how Basin States will balance water resource allocation during extreme dry periods for core human consumption, while also preventing high social, economic or national security costs.

- what is in the national security interest when considering water allocation.
- what are the relevant high economic and social costs when considering water allocation.
- whether meeting critical human water needs as defined by Part 2A of the Water Act is applicable to all water resources within the Murray-Darling Basin.
- whether prioritising conveyance water for the River Murray System over the needs of Basin States to manage water resources conflicts with the objects of the Water Act.
- whether the obligation on Basin States pursuant to section 86A(1)(b) of the Water Act and section 10.51 of the Basin Plan conflict with Australia's international obligations in respect of the human right to an adequate standard of living and the human right to water.

These issues are currently unresolved in some WRPs. We discuss this further in Chapter 4.

2.4 Urban water structures and governance

Urban water structures and governance differ markedly across the Basin. Regional supplies in NSW and Queensland are delivered by a large number of smaller providers, including NSW Councils. South Australia and the ACT have single jurisdiction-wide providers covering metropolitan and regional areas. In Victoria, Lower Murray, Coliban, Goulburn Valley and North-East Water provide urban water in the Basin.

3. What urban water consumption looks like in the Basin

Urban water consumption and consumption trends differ across the Basin. Weather and climate have impacted availability and use. Many Basin communities have borne a high social cost of urban water restrictions.

3.1 Urban water consumption

Urban water data for the Murray-Darling Basin presented in this section are taken from National urban national performance report data (NPR), and data sourced directly from BOM. There are known issues with the urban water performance reporting data, including incomplete reporting, and inconsistent reporting. NPR data should be interpreted as order of magnitude estimates because of this.

Key Basin urban water consumption points are:

- **Total urban water consumption is less than 4 per cent** of total water consumption across the Basin. Table 3 shows urban water consumption and consumption as a percentage of total consumption in 2017-18 by surface water resource plan area. Table 3 includes surface and groundwater sources.
- **Urban water utilities supplied around 1.45 million customers in the Basin in 2016-17** including around 150,000 customers in the northern Basin and 1.3 million customers in the southern Basin. Around 1.2 million customers are served by water utilities that service 50,000 customers or more (Figure 5 and Figure 6).
- **Around 20 per cent of total urban water is supplied to Northern Basin customers** (Figure 7 and Figure 8). Annual urban water supply fell during the back end and during the breaking of the drought as restrictions were in force and storages took time to replenish.
- **Around 25 per cent of annual water supply comes from recycled water (Figure 9 and Figure 10).** Recycled water supply to customers has increased from around 30,000ML in 2006-07 to around 55,000ML in the decade to 2016-17. We understand that this figure includes commercial and agricultural supply. Recycled water supply in the northern Basin in 2016-17 totalled around

11,600 ML, up from 5,200 ML in 2006-07. Supply in the southern Basin increased to around 45,000 in 2016-17 up from 25,000ML in 2006-07. In the southern Basin, most recycled water supply comes from medium and larger suppliers.

- **Average annual residential water consumption ranges between 150-300 kL a year (Figure 11).** The marked differences in average residential consumption do not follow a northern-southern Basin divide. Over 2006-17, residential customers of medium sized suppliers in the southern Murray Darling Basin (comprising Albury City Council, Riverina Water, Queanbeyan–Palerang Regional Council, Lower Murray Water, and GWMWater) have had consistently had the highest average annual water supply per property, at above 300kL per connection since 2012.
- **Average annual residential bills for 200kL supply now exceed $1,000 on average** across the whole Basin (Figure 11). There are marked differences in average residential bills, from lows of around $400 a year for NSW Riverina Water customers (including supply to Holbrook, Lockhart, Urana and Wagga Wagga), to $1,800 for the same supply from Lismore City Council.
- **Quality of supply is variable, particularly in regional NSW.** For example, water quality complaints (Figure 14) are driven by complaints against Bathurst Regional Council, where complaints are mainly driven by water colour. Similarly, higher infrastructure leakage in the northern Basin is driven largely by high leakage from Tamworth Regional Council supplies.

Table 3: Town water consumption compared to total water consumption, by SWR area 2017-18 (ML)

	State	Individual	Urban	Environmental	Totals	Urban % total
Grand Total		**8,394,070**	**429,543**	**2,423,735**	**11,247,348**	**3.8%**
Warrego–Paroo–Nebine	Qld	9,767	-	3,347	13,114	0.0%
Condamine–Balonne	Qld	326,820	5,570	3,985	336,375	1.7%
Moonie	Qld	14,331	-	2,323	16,654	0.0%
Qld Border Rivers	Qld	113,394	-	8,482	121,876	0.0%
Queensland		**464,312**	**5,570**	**18,137**	**488,019**	**1.1%**
NSW Border Rivers	NSW	171,052	557	684	172,293	0.3%
Gwydir	NSW	353,196	4,927	43,680	401,803	1.2%
Namoi	NSW	499,041	18,941	5,357	523,339	3.6%
NSW Intersecting Streams	NSW	7,176	-	-	7,176	0.0%
Barwon–Darling Watercourse	NSW	18,092	3,420	-	21,512	15.9%
Macquarie–Castlereagh	NSW	426,748	21,645	70,145	518,538	4.2%
Lachlan	NSW	523,168	12,036	36,509	571,713	2.1%
Murrumbidgee NSW	NSW	1,974,352	47,540	187,927	2,209,819	2.2%
NSW Murray and Lower Darling	NSW	1,444,192	29,307	304,149	1,777,648	1.6%
New South Wales		**5,417,017**	**138,373**	**648,451**	**6,203,841**	**2.2%**
Northern Victoria	Vic.	1,061,050	42,343	420,501	1,523,894	2.8%
Vic. Murray	Vic.	1,389,950	65,639	374,960	1,830,549	3.6%
Wimmera–Mallee	Vic.	6,032	15,975	27,639	49,646	32.2%
Victoria		**2,457,032**	**123,957**	**823,100**	**3,404,089**	**3.6%**
SA River Murray	**SA**	**51,956**	**109,481**	**934,047**	**1,095,484**	**10.0%**
ACT	**ACT**	**3,753**	**52,162**	**-**	**55,915**	**93.3%**

Source: BOM provided on request

Figure 5: Total annual water customers '000 nMDB 2006-17

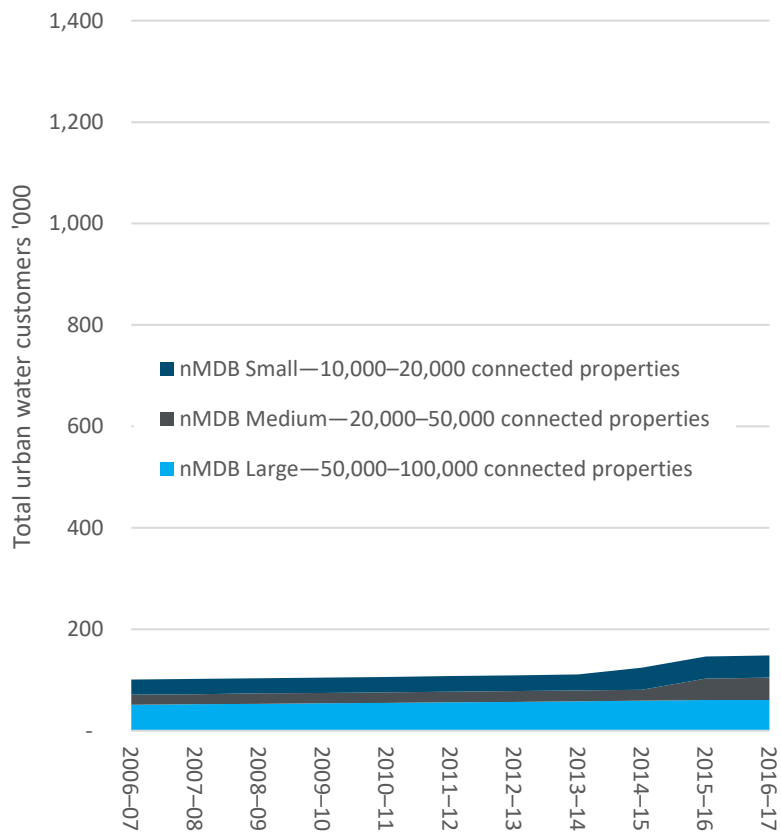
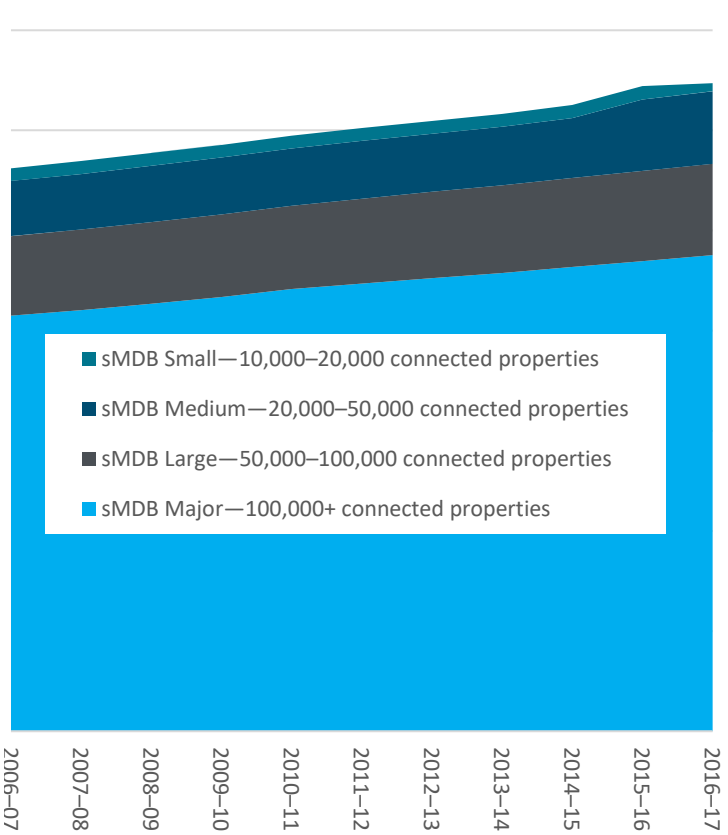


Figure 6: Total annual water customers '000, sMDB 2006-17



Source: National urban national performance report data (NPR)

Figure 7: Annual urban water supply (ML), nMDB 2006-17

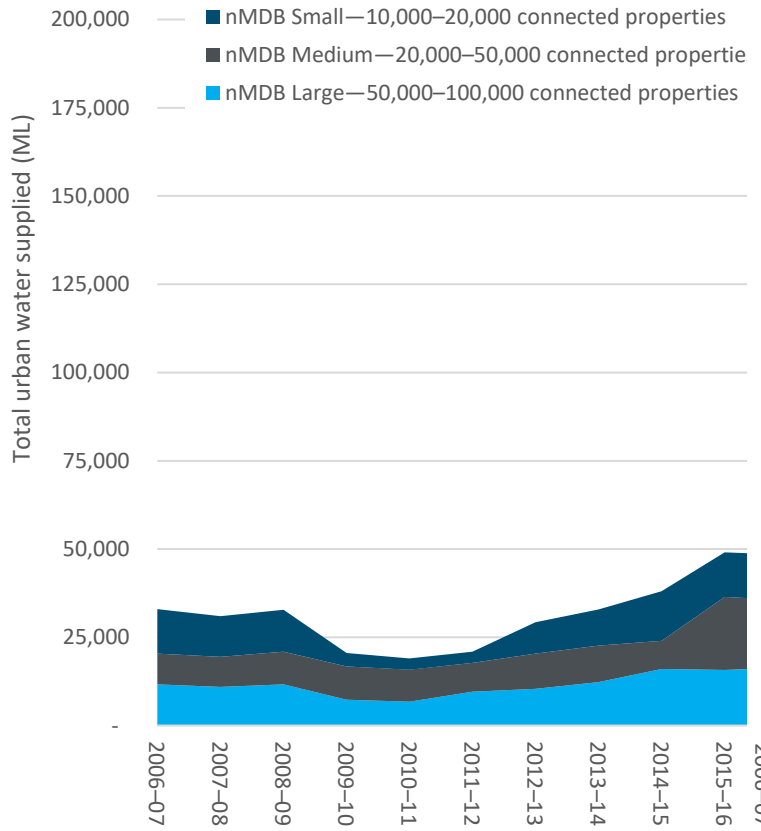
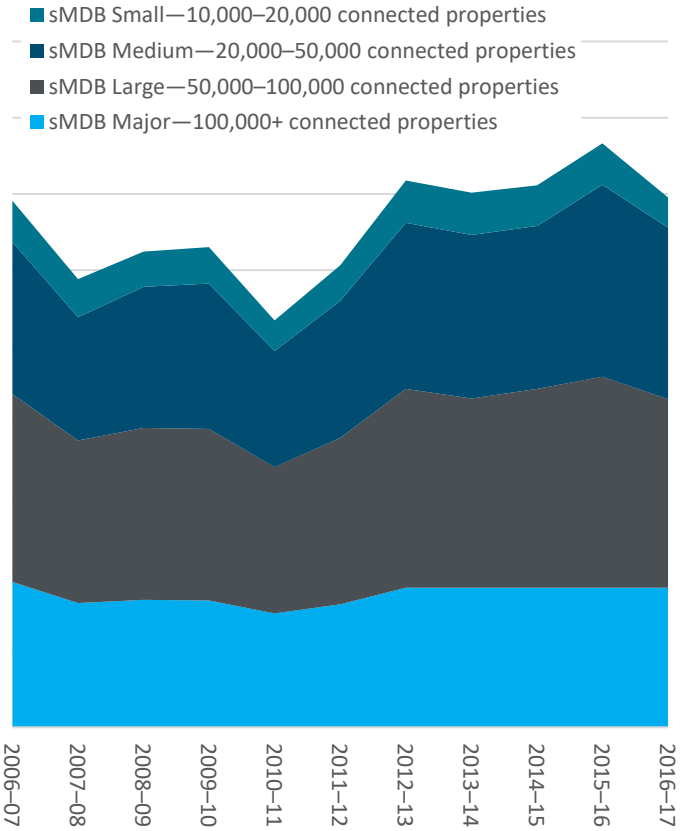


Figure 8: Annual urban water supply (ML), sMDB 2006-17



Source: National urban national performance report data (NPR)

Figure 9: Recycled water supply (ML), nMDB 2006-17

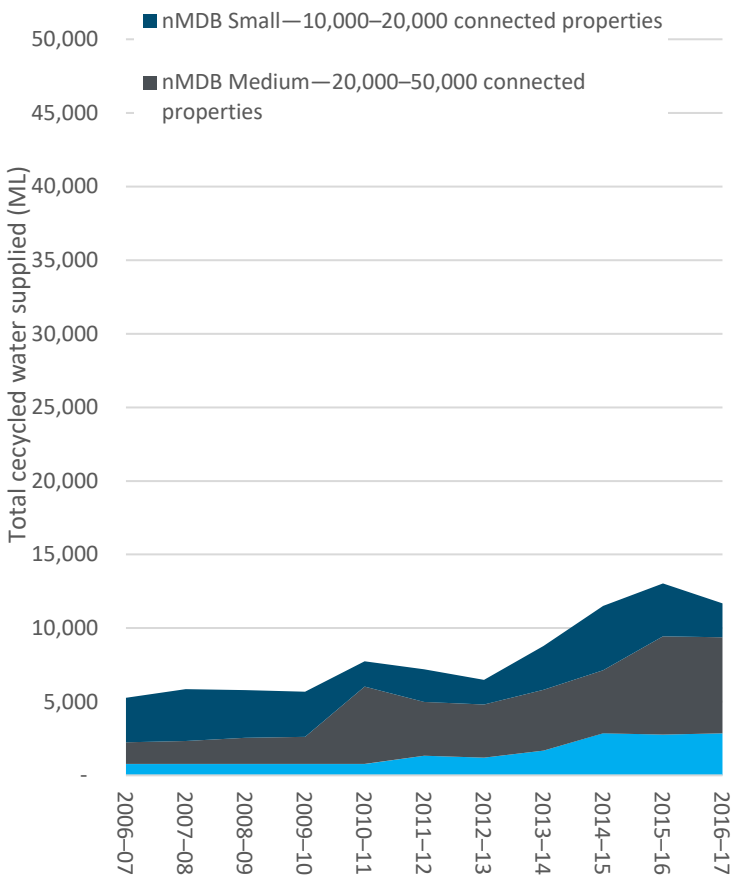
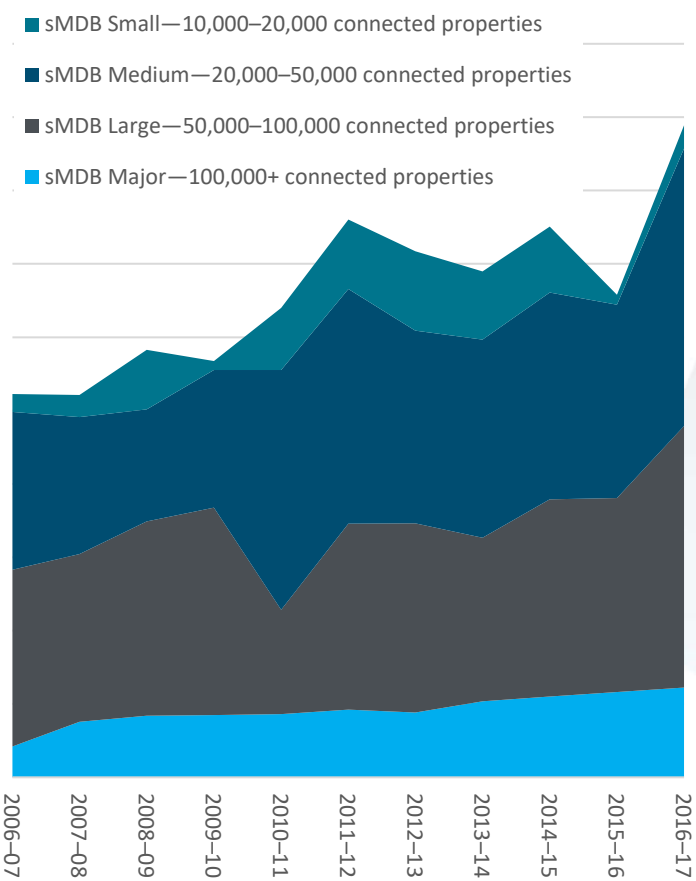


Figure 10: Recycled water supply (ML), sMDB 2006-17



Source: National urban national performance report data (NPR)

Figure 11: Average Annual Residential Water Supplied

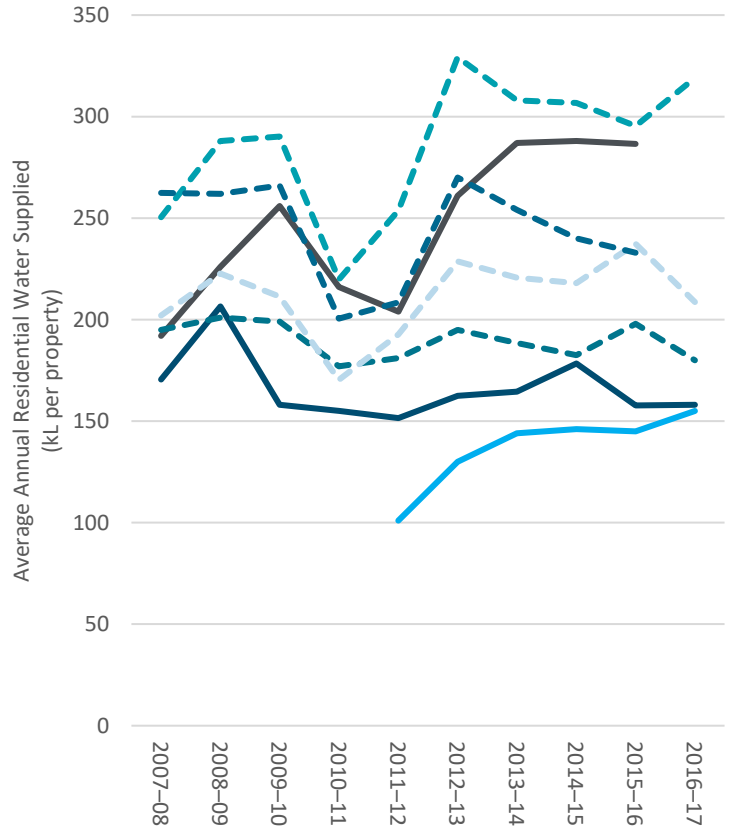
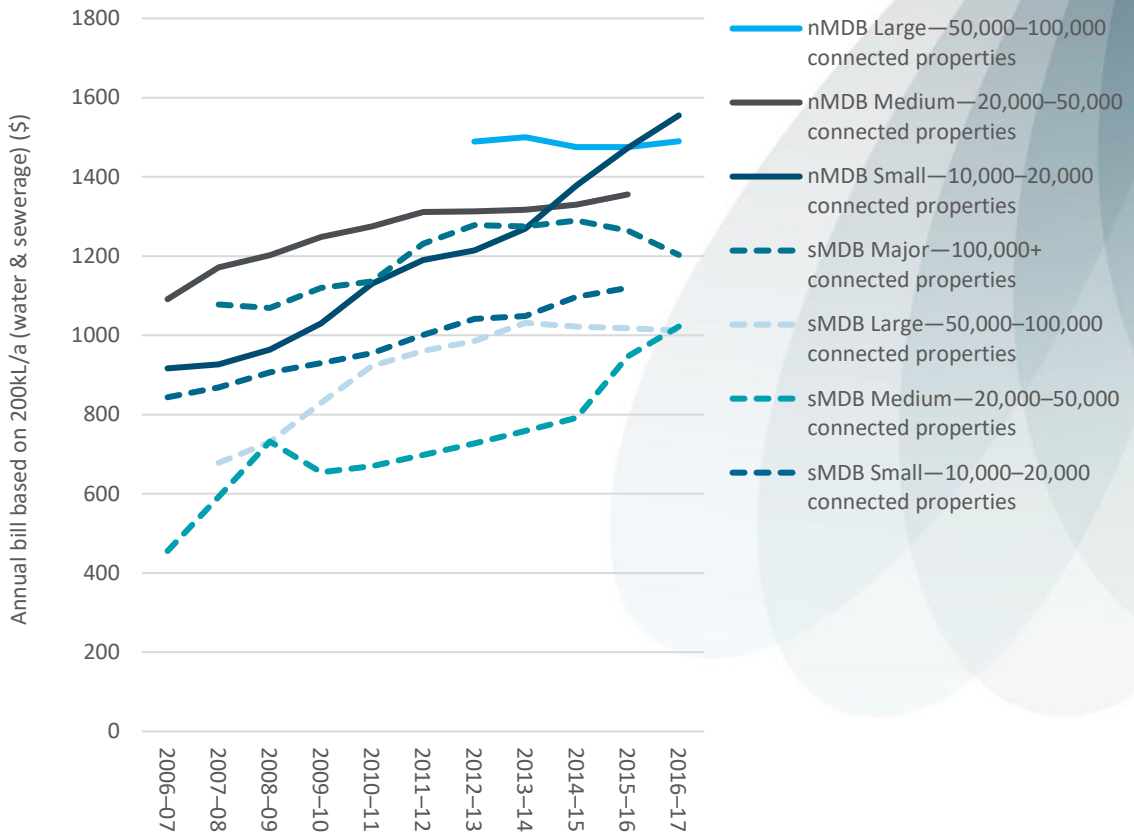


Figure 12: Annual bill based on 200kL, water and sewerage 2006-17



Source: National urban national performance report data (NPR)

Figure 13: Annual bill based on 200kL, water and sewerage 2015-17

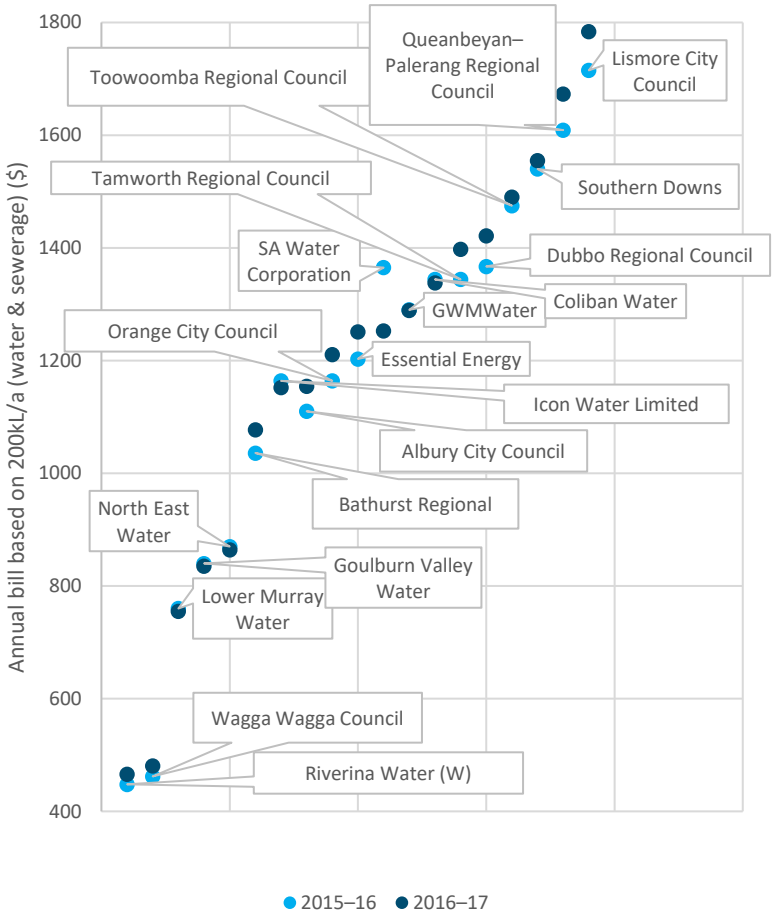
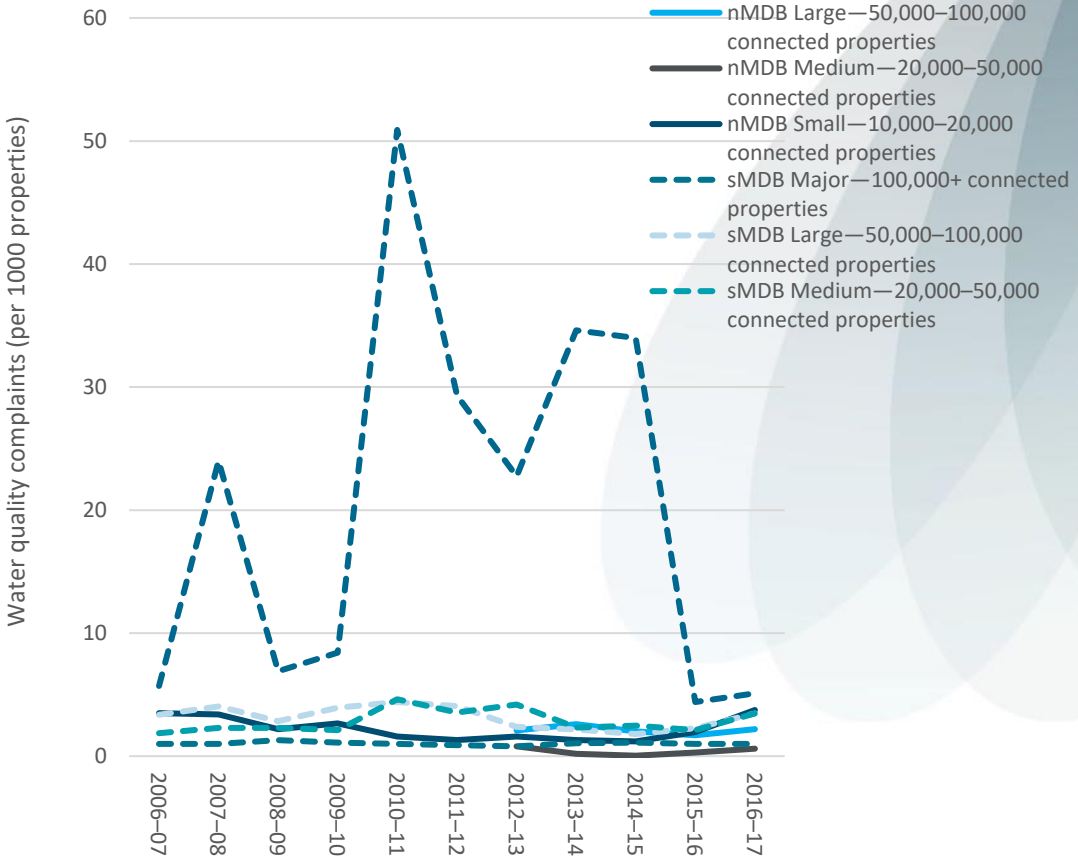


Figure 14: Water quality complaints (per 1000 properties) 2006-17



3.2 Urban water restrictions and their social cost for Basin communities

How weather and climate have impacted availability in the Basin, including restrictions

Towns and regional centers across the Murray-Darling Basin experienced water restrictions during the Millenium Drought, and are expericing restrictions again during the current drought. The impact of drought restrictions during the Millenium Drought can be seen in Figure 7, Figure 8 and Figure 11.

Figure 2 summarises current water restriction levels for some Murray-Darling Basin urban water providers, and Table 4 summarises restriction levels and shows how these vary markedly across urban water providers. The Bureau of Meteorology's Water Restrictions website provides access to current water restrictions information for the whole of Australia. There is currently no source that we are aware of that keeps a complete history of restrictions across the Murray-Darling Basin, or the rest of Australia.

The social costs of urban water restrictions in the Basin

Water restrictions impact different customer groups in different ways. Even within the one customer group (for example, residential customers) the costs can be different across individual customers because of the way that customers use water. For example, Stage 3 water restrictions in Victoria will impose different types of costs on residences depending on whether they are a house with a garden that needs watering, compared to an apartment.

For water businesses and Government, water restrictions are time consuming and costly to implement. Costs include advertising to raise awareness that restrictions are operating, educating water users on restricted uses, and reinforcing these messages as the duration of restrictions extends. Water corporations can experience short-term costs from a mismatch in capital and operational expenditure to manage water restrictions, and the capacity to recover those additional costs through regulated water tariffs.

It would be informative to understand the economic cost of water restrictions for all urban water customers across the Murray-Darling Basin. This is a substantial task beyond the scope of this current trends and drivers paper.

To provide a partial view, Table 5 summarises order of magnitude estimates of the economic cost of restrictions for residential and commercial water utility customers in Victoria, based on 2017 work by Marsden Jacob for the Victorian Government [13]. These estimates are the economic cost of a one-year water restriction, measured as the willingness to pay (WTP) to avoid the restriction. They provide a rough order of magitude understanding of the potential economic cost of water restictions for urban water customers in the Murray-Darling Basin.

These estimates of the economic cost of a one-year water restriction are based on household WTP to reduce each stage of water restrictions by one year, across a 20-year period. For example, the figures in Table 5 show that residential customers are willing to pay $260 if that results in Stage 4 restrictions being imposed for one rather than two years in every 20 years. The estimates can be applied to different planning horizons. Put differently, the economic cost of Stage 4 restrictions being in place for one year out of 20 is $260 per household.

Using these estimates, we can derive some estimates based on previous work and available data:

- **The cost of restrictions to Victorian MDB urban water residential customers during the Millennium Drought was in the order of $140 million over 2004-11.** This estimate is based on work that Marsden Jacob has completed previously, to estimate the cost of urban water restrictions for the Victorian Government using household-level restriction data (Figure 15).
- **The cost of restrictions to NSW MDB urban water residential customers in Dubbo, Armidale and Tamworth,** would be in the order of $30 million for residential customers alone for each year that they are on the equivalent of Victorian Stage 3-4 restrictions. For a two-year consecutive drought with Stage 3-4 water restrictions, the urban water social cost of restrictions rises to $60 million, and then $100 million after three years for these three NSW communities alone.

A rule of thumb per ML cost of urban restrictions

Estimating the economic cost of urban water restrictions provides a useful metric for looking at the trade-off from urban to other uses. A complete analysis is beyond the scope of this short paper as it requires estimates of the volumes of water saved through restrictions, and customer numbers impacted. As a rough rule of thumb, Marsden Jacob in 2017 estimated for the Victorian Government that the social cost of Level 3 water restrictions was in the range of $2,500-3,000 ML, increasing to $15,000-19,500 ML for Level 4 restrictions. We note that these estimates are for all Victorian households, not just Victorian MDB households.

Table 4: Water restrictions levels

	Stage 1 (PWCR)	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
ACT							
Sprinklers							
Hose watering				Greywater only			
Pool filling	Topping up only						
Car washing			Commercial washing				
Washing hard surfaces							
New South Wales							
Water restriction classification in NSW varies widely, and are set by the authorities responsible for water throughout the state.							
Queensland							
Sprinklers							
Hose watering							
Bucket watering							
Pool filling							
Washing hard surfaces							
South Australia							
Sprinklers							
Hose watering							
Bucket watering							
Pool filling		Permit required					
Car Washing	Bucket, commercial or trigger nozzle	Bucket or commercial					
Washing hard surfaces							
Victoria							
Lawn watering							
Sprinklers (manual and automatic)							

	Stage 1 (PWCR)	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
Hose / bucket watering							
Pool filling	<2kL or permit						
Car Washing	Bucket, commercial or trigger nozzle		Bucket window, mirror, or commercial				
Washing hard surfaces							

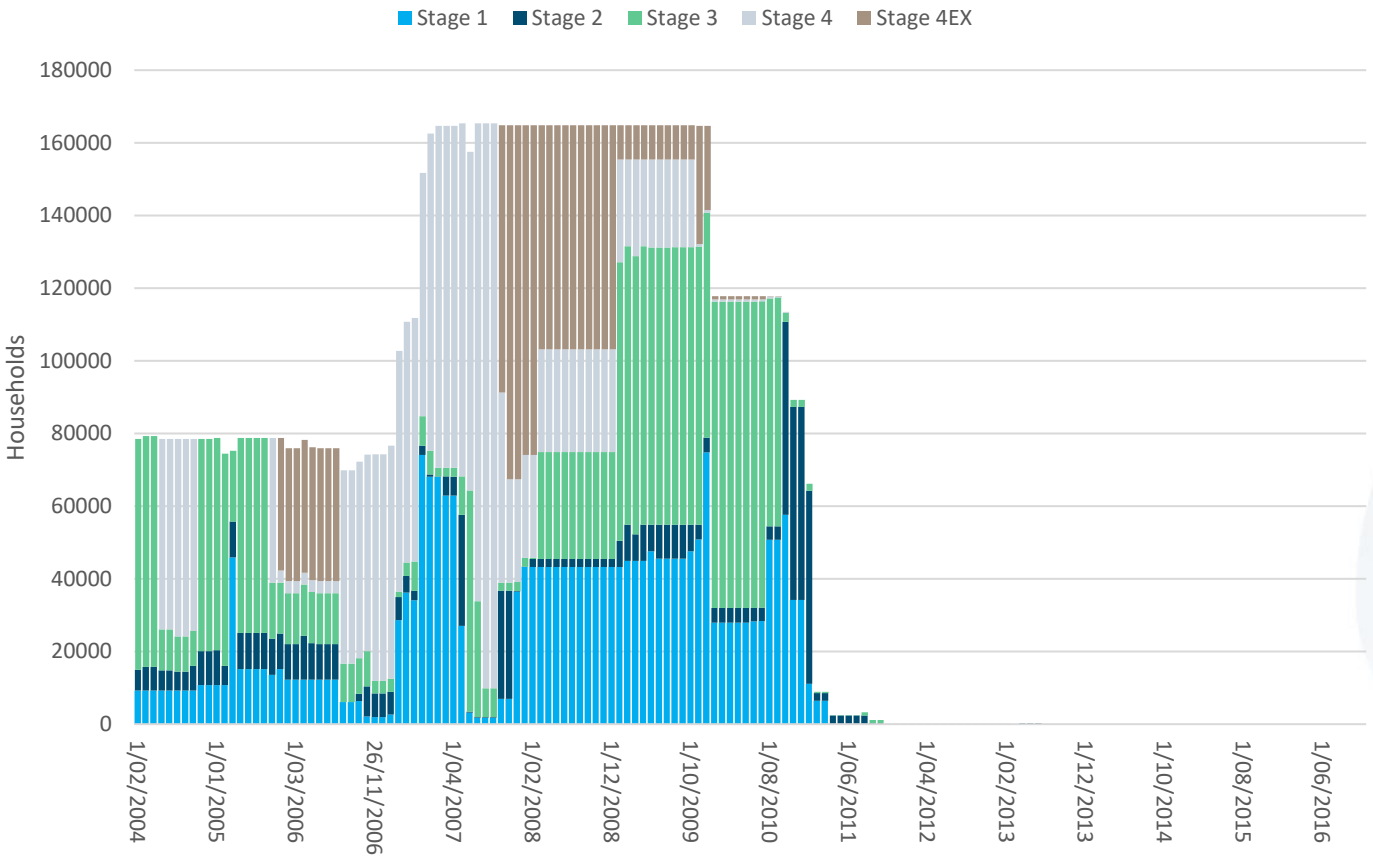
KEY
Allowed
Restriction on use (days and / or times)
Banned or banned without approval
Not relevant

Table 5: Estimated order of magnitude willingness to pay to avoid restrictions per year, per customer ($2019)

Description	Stage 1	Stage 2	Stage 3	Stage 4
Per household (including POS allowance)	0	35	65	265
Per town house (including POS allowance)	0	20	35	140
Per apartment (including POS allowance)	0	5	5	5
Per business	0	0	0	330

Source: Marsden Jacob analysis

Figure 15: Victorian MDB households on urban water restrictions 2004-16



Source: Marsden Jacob analysis. Data provided by the Victorian Government.

4. Urban water trends, drivers and reform opportunities

Urban water trends and drivers will create risks and opportunities for urban water suppliers in the Basin in the future. The challenges are well known, as are potential solutions.

The challenges and opportunities facing the Basin's urban water sector are well defined and detailed in recent publications, including four reviews by the Productivity Commission over the past decade [1, 6, 7, 10-12, 14-19]. As a result, we only provide a brief accounting of the issues here.

The overarching challenge facing urban water supply in the Basin is about balancing supply and demand efficiently and sustainably in a sector where there is increasing uncertainty [5], where the sector has been expanding beyond the scope of its traditional core water and wastewater supply roles, and where the focus is increasingly shifting to putting the citizen-customer at the centre of planning decisions. These trends and drivers create challenges and opportunities for the Basin's urban water sector going forward.

4.1 Urban water reforms

The Productivity Commission's review of progress against NWI objectives concluded that urban sector water reforms have achieved significant benefits. The introduction of consumption-based pricing (along with water restrictions and awareness campaigns during droughts) resulted in changed consumer behaviour and more efficient water use across Australia [1]. Consolidation of regional water providers has provided better service outcomes, where this has occurred.

In the Basin, the Productivity Commission identifies that there is unfinished business in three key areas [1] (Table 6). Progressing reforms in these areas could help to deliver better outcomes for regional urban water customers and water businesses and their shareholders. In particular, we agree that where lower-bound pricing is not achieved then it is preferable

that services are subsidised through transparent Community Service Obligations (CSO) rather than capital subsidies. NSW and Queensland regional utilities should also be subject to formal price regulation.

Table 6: Regional urban water unfinished business

NWI commitment	Basin Assessment	Comments
Best practice pricing and institutional arrangements		
Regional providers will achieve lower bound pricing and move towards upper bound pricing if practicable. If lower bound pricing is not practicable, services will be subsidised through a transparent Community Service Obligation (CSO).	Partially achieved	There is evidence of persistent underpricing in regional New South Wales Basin regions, and in Queensland to a lesser extent. The use of capital subsidies in regional New South Wales and Queensland is inconsistent with the NWI and is likely to lead to inefficient pricing. Greater transparency on pricing outcomes in regional Queensland is needed to assess consistency with the NWI.
Jurisdictions will consider the use of independent bodies to set or review prices, or price-setting processes, on a case-by-case basis	Partially achieved	Independent economic regulators set prices or revenues for providers in New South Wales (metropolitan providers only), Victoria, South Australia. Providers in regional New South Wales and regional Queensland are not subject to formal price regulation.
Proposals for investment in new or refurbished water infrastructure will be assessed as economically viable and ecologically sustainable prior to occurring	Partially achieved	Corporatisation and economic regulation supports more prudent investment decisions by many metropolitan providers. Ongoing use of capital subsidies in regional New South Wales and Queensland is likely to undermine the objective of economically efficient investment.
Urban water reform		
Achieving healthy and safe water supplies	Largely achieved	Drinking water quality generally meets existing guidelines. New South Wales, Victoria, South Australia all achieve good water quality results, with New South Wales in particular having made significant progress in improving regional drinking water quality over several decades.

NWI commitment	Basin Assessment	Comments
Pursuing water reuse, end use efficiency, water sensitive urban design and innovation	Largely achieved	Jurisdictions, both collectively and individually, have undertaken significant action in this area and substantially met their commitments under the NWI. Recent policy efforts have shown a greater focus on cost-effectiveness, and this focus should be maintained.

Source: [1]

4.2 Critical human needs

For communities that rely on the River Murray, the CHWN rules are generally viewed with confidence that these rules will ensure community needs can be met in extremely dry times [11]. There is sound reason to have this confidence, given that these rules were worked out during and drawing on experience from the last Millenium Drought.

There is an opportunity for greater clarity around CHWN in WRPs where Basin States are developing provisions for CHWN during extreme events. The Productivity Commission and others have cited a need for more clarity around how MDBA will assess the adeqacy of CHWN during extreme events [1, 12]. Clarity needs [1, 12] require:

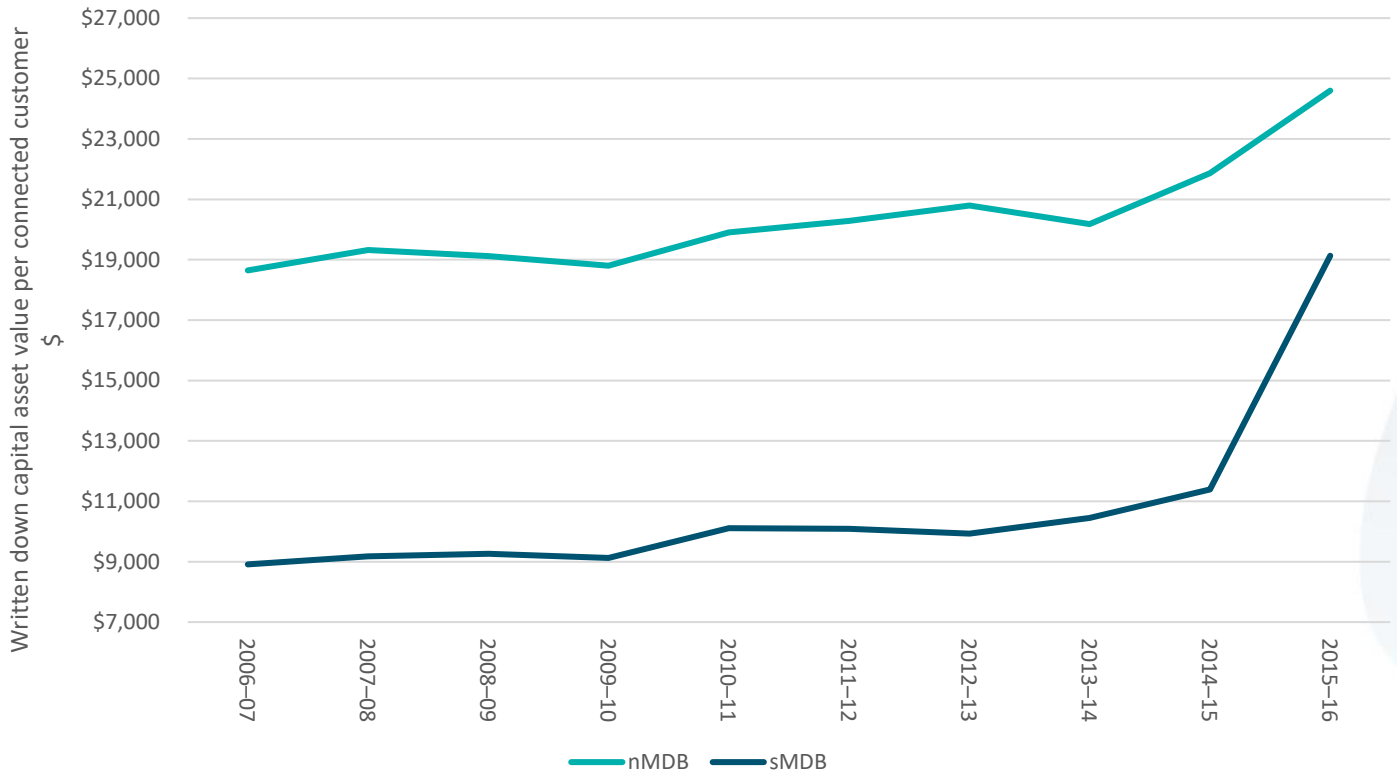
- The MDBA to provide more guidance on the implementation of Part 2A of the Water Act.
- The MDBA River Murray System Annual Operating Plan and the WaterNSW Lower Darling Operations Plan to evaluate any failures to meet predicted outcomes in the Lower Darling, and consider whether there are fundamental issues that should be addressed, through these plans or wider water-sharing arrangements.
- The MDBA and WaterNSW operating plans to interact effectively to manage the risks to the supply of CHWN in the Lower Darling.
- Extreme event provisions in the New South Wales Murray and Lower Darling WRP to describe how the MDBA, River Murray System Annual Operating Plan and the WaterNSW Lower Darling Operations Plan interact with each other and with provisions to meet CHWN.

4.3 Regional structure, infrastructure and sustainability

Regional service providers in NSW and Queensland are facing challenges. Smaller water operators are servicing small and sometimes declining populations. This means a smaller customer base to recover from, or a customer base that is not growing as quickly as capital base in many cases.

Figure 16 shows this impact for small water operators in the southern and northern Basin by calculating the average written down value of fixed water supply and sewage assets per connected customer. Assuming the BOM data is approximately right, Figure 16 shows that the written down fixed capital base per customer has climbed rapidly over the past couple of years. This capital base will need renewing or rationalisation in the future. To align with NWI pricing principles, regional water customers should at least pay lower bound costs towards the capital infrastructure replenishment. This could create affordability issues for regional urban customers.

Figure 16: Written-down value of fixed water supply assets ($000s) per connected customer, small water business—10,000–20,000 connected properties



Source: National urban national performance report data (NPR)

Local water utilities in NSW and Queensland have not consolidated operations in the same way that Victorian water businesses have. This is due in part to concerns expressed by stakeholders in these States that further amalgamation would cause local governments to lose 'economies of scope' from operating water businesses alongside other Council

infrastructure and service functions [1]. The Productivity Commission and others have encouraged further reform in this area.

4.4 Climate and population impacts and alternative supplies

If a warmer, drier climate happens in the future, regional Basin communities will have less water flowing into their dams, and will potentially need more water for essential use and to keep cities and towns green. More extreme events and greater risk of fire in water supply catchments will increase risks to conventional supply reliability [7].

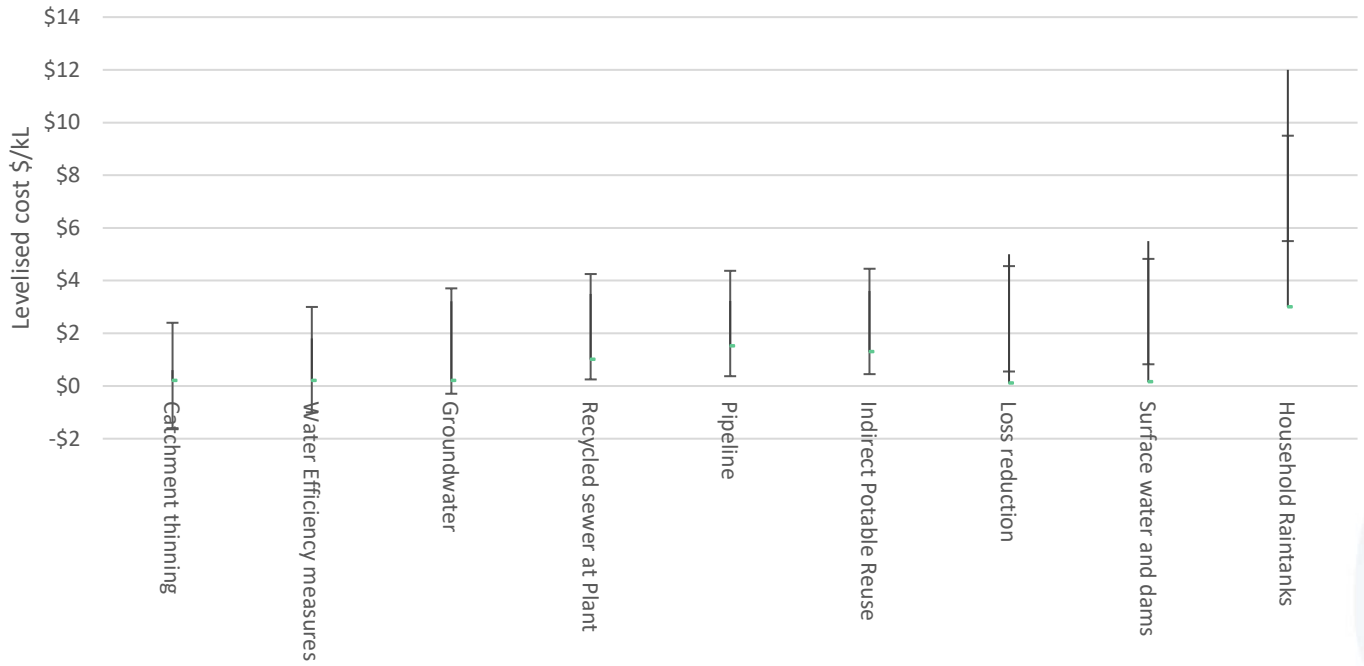
Regional water providers will be increasingly challenged in the future by climate change and the risks it poses for conventional rain-based sources. Reducing yield, reliability and security of rain-fed sources may increase the costs of servicing customers, while maintaining service standards.

The NWI called for States and Territories to pursue water reuse, end use efficiency, water sensitive urban design and innovation, where it is cost effective to do so. Adelaide, Melbourne, Sydney, Canberra and Brisbane are all shifting towards alternative supply sources as a means of diversifying away from rain-fed sources.

There are opportunities for many regional water providers to pursue greater levels of water reuse, end use efficiency and innovation in ways that are cost-effective. Figure 17 shows order of magnitude estimates of the levelised cost of supply by different sources for urban Australia, including regional suppliers, based on previous Marsden Jacob analysis. Note that the estimates are based on current yields for rain-fed sources, not future, potentially lower yields.

The key message from Figure 17 is that water efficiency measures, recycling and potable reuse are all potentially cost-effective and climate resilient water supply options. While many regional providers are reflecting some of these options in long term plans for supply security, a mix of institutional, governance and community attitudes are constraining their real potential as supply sources. Addressing these issues will help to ensure that all supply options are on the table, and that alternative supply sources are evaluated on a like-with-like basis to conventional supply sources.

Figure 17: Order of magnitude levelised cost of water supply, Australia



Source: Marsden Jacob databases and analyses

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Appendix 1 Urban water reform timeline

Year	Water reform	Context for urban water demand
1989	Victorian Water Corporation amalgamations	Water corporations are Victorian public entities that are responsible for the supply of water and sewerage services and are established under the Water Act 1989.
1992	IPART	Independent Pricing and Regulatory Tribunal of New South Wales established with oversight of urban water pricing.
1994	Council of Australian Governments Water Reform Framework	"The urban water sector has been subject to continuing reform processes since the early-1990s. These reforms aimed to improve the sector's management and governance and therefore the efficiency of service delivery" [1].
1994	*Water Industry Act 1994* Victoria	Provides the framework for the economic regulation of the Victorian water industry, including Statements of Obligations (SoO).
1994	NSW Country Towns Water Supply and Sewerage Program	Established to provide assistance to local water utilities (LWUs) that provide public water supply and sewerage services to urban areas of regional NSW. Completed projects on map.
1995	National Competition Policy	"Drove widespread corporatisation of water utilities to more clearly separate service provision from policy-making functions, required government-owned utilities to compete with private entities on a level playing field, and provided the underpinnings for price regulation" [1].
2000	*ACT Utilities Act 2000*	Establishes the Independent Competition and Regulatory Commission (ICRC) to issue licences and determine industry codes. Among other functions, ICRC determines price directions for urban water utilities.
2001	*Essential Services Commission Act 2001* Victoria	ESC established.
2003	*Safe Drinking Water Act 2003* Victoria	Victorian Department of Human Services given responsibility for the regulation of drinking water in Victoria, under the Act.

Year	Water reform	Context for urban water demand
2004	National Water Initiative (Council of Australian Governments [COAG])	Required further movements towards fully cost-reflective pricing and improvements to institutional arrangements in the urban water sector, while promoting policies in the areas of demand management, water sensitive cities and water recycling [1].
2006	*Water Governance Act 2006* Victoria	"Standardised corporation arrangements were implemented with the *Water Governance Act 2006*, which require each water authority to perform its functions as efficiently as possible, consistent with commercial practice (WSAA)
2007	*Water Act 2007* Commonwealth	Creation of the Murray-Darling Basin Authority which will have concern for the cultural, economic, social, Indigenous and other public interests.
2008	*Water Supply (Safety and Reliability) Act 2008* Queensland	Requires all water service providers to have a drinking water quality management plan in place and comply with the details of the plan. Queensland Department of Natural Resources, Mines and Energy (DNRME) becomes the water supply regulator under the Queensland *Water Supply (Safety and Reliability) Act 2008*. Chapter 2 of that Act provides a framework for the delivery of water and sewerage services throughout Queensland. It sets out certain requirements relating to water and sewerage service providers and the provision of services (water, sewerage, and irrigation). Chapter 3 provides a framework for the use and provision of recycled water.
2009	Water for Good Government of South Australia	Aims to transition South Australia to a 'water-sensitive state'. Aims to diversify our water supplies to reduce our reliance on the River Murray and other rain dependent water sources.
2010	*Public Health Act 2010* and the Public Health Regulation 2012 New South Wales	NSW *Public Health Act 2010* and the Public Health Regulation 2012 require drinking water suppliers to develop and adhere to a 'quality assurance program' (or drinking water management system) from 1 September 2014.
2010	Victorian North-South Pipeline	A 70-kilometre pipeline was connected to Melbourne in February 2010. It is the government's policy that it only be used in times of critical human need: when Melbourne's total water storages are less than 30% full on 30 November of any year. Desalination orders mean that this never occurs.
2011	ACTEW resumes from ActewAGL	ACTEW Board approved the reintegration of the water and sewerage business into ACTEW.

Year	Water reform	Context for urban water demand
2011	Adelaide Desalination Plant	In full operation, the plant can produce 100 gigalitres (GL) a year. This is about half of Adelaide's annual water needs.
2012	Murray–Darling Basin Authority (MDBA) releases the Basin Plan	Part 10 Chapter 11—Critical human water needs. 11.03 Amount of water required to meet critical human water needs (Act paragraph 86B(1)(a)) 11.04. Conveyance water required to deliver water for critical human water needs (Act paragraph 86B(1)(b)).
2012	*Water Industry Act 2012* South Australia	The Water Act provides increased security and accountability across the water industry to ensure that water service delivery is safe, reliable, affordable and environmentally sustainable. The Water Act appoints the Essential Services Commission of South Australia (ESCOSA) as the independent regulator for urban and regional water and sewerage services, as in the gas and electricity industries.
2013	*Water Act 2000* amendments Queensland	Aboriginal party or Torres Strait Islander party may, in the area of the State for which the person is an Aboriginal or Torres Strait Islander party, take or interfere with water for traditional activities or cultural purposes.
2014	*WaterNSW Act 2014* New South Wales	NSW rationalises bulk water supply for two-thirds of the water used in NSW under a state-owned corporation called Water NSW. Regulated by IPART Coverage through the merging of the Sydney Catchment Authority and State Water Corporation
2016	Water for Victoria - Water plan	Water for Victoria released
2019	Water restrictions	Water restrictions in Australia Bureau of Meteorology: water restrictions by region **NSW** • Armidale – Level 4 from May 2019 • Bathurst – Level 3 from 26 November 2019 • Cobar – Stage 5 • Dubbo – Level 2 from Saturday 1 June 2019

Year	Water reform	Context for urban water demand
		• Dubbo – Level 2 from Saturday 1 June 2019 • Gosford – Stage 4 from 1 October 2006 • Goulburn had Stage 5 water restrictions imposed from 1 October 2004, and went on to win a National Water Conservation Award for Excellence due to the water that had been conserved. From 5 July 2007, Goulburn relaxed its water restrictions to Level 3. • Griffith – Stage 2 introduced on 27 November 2007 • Leeton – Level 3 introduced on 9 October 2007. Lowered to Level 2 on 1 November 2008 • Newcastle-Lower Hunter – Level 1 from 16 September 2019 • Orange – Level 5a from early 2010 • Taree – summer water saving restrictions • Wagga Wagga – Permanent Water Conservation Measure **South Australia** Documented Level 2 Water Restrictions came into effect in July 2003 for suburbs and towns across Greater Adelaide which were supplied by the River Murray and Myponga Reservoir. These were upgraded to Level 3 in January 2007. As of 1 December 2010, all public water supply customers were placed under the same Water Wise Measures, currently set to expire in January 2023. **Victoria** Central Highlands Water PWSR 2010-11 Goulburn Valley Water PWSR since 2009 Lower Murray Water PWSR since 2010 Search here **Queensland** Toowoomba Gladstone – no water restrictions

Source: [16, 20]