

9

Water

Water supports almost every part of our lives, from the functional – clean, reliable drinking water and safe wastewater services – to the social – providing green spaces and clean waterways – and the environmental – sustaining natural life, enhancing biodiversity, and supporting natural habitats of flora and fauna. Access to clean water in nature is also integral to the Australian way of life and helps to draw tourists from around the world to our pristine beaches, harbours, reefs, rivers and other natural habitats.

Water can be expensive to store, transport, treat and manage. Infrastructure required to manage water is typically fixed and long-lived, raising the importance of getting investment decisions right for users, communities, utilities, investors and the economy.

Water infrastructure can be split into urban and productive components that provide essential services for people and industries:

- Urban water includes potable supply and wastewater services, as well as a range of integrated water-cycle components such as desalination, recycling and stormwater in cities, towns and remote communities. Depending on the region, bulk water services may be separate to or part of retail urban service providers.
- Productive water includes bulk water storage, delivery metering and control assets. Productive water markets also include the provision of licensing, allocation and trade of water from surface and groundwater sources, as well as entitlements for environmental and cultural purposes.

Beyond these services, many Australians – particularly in rural and remote areas – rely on small, localised or onsite systems. These assets include discrete rural water bores, reservoirs, pumping stations, septic tanks and other treatment and disposal systems for residential purposes, as well as a range of local on-farm dams, levees and other storages for productive users.







9.1 Introduction



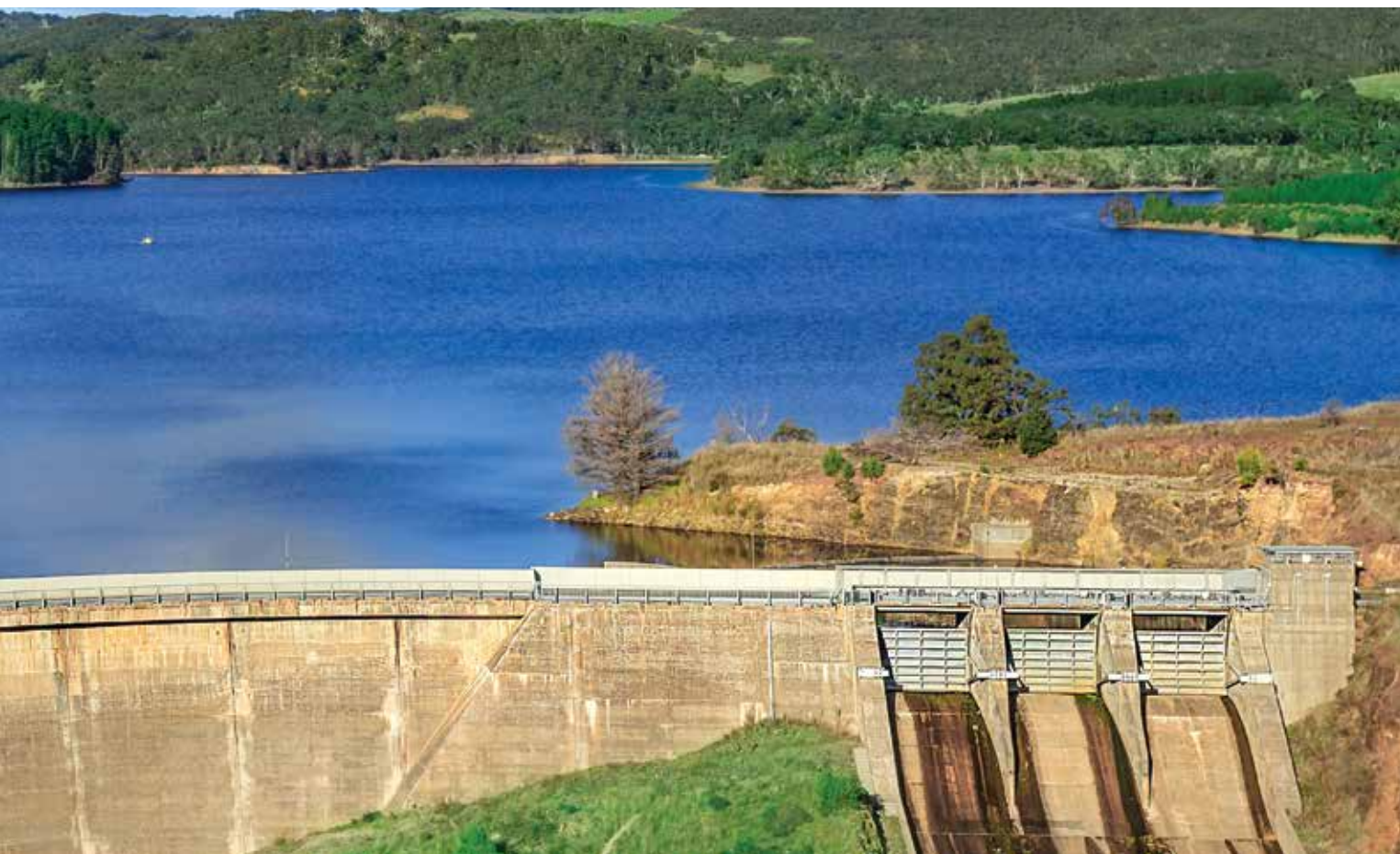
The state of the water sector

Australia's water sector has typically performed well in meeting the needs of businesses and households over many years across most of the country. For many users, safe, reliable and affordable water is largely taken for granted, as a result of these past successes. Many industries, including agriculture, mining and manufacturing, have used efficiently-provided, productive water to support growth and productivity, particularly in regional areas.

However, the sector faces unprecedented risks and challenges. Climate change, population growth, ageing assets, and competing interests will ramp up pressure for limited resources. Advances in technology, markets and planning can help to overcome these challenges, but many will require changes in laws and regulations to unlock benefits.

The true value of water is poorly understood by users and many in the sector. Unreliable and incomplete evidence undermines the effectiveness of decisions, and community confidence in water managers. Overcoming the challenges facing the water sector and preparing for the future will require a shift in planning and decision making to ensure the long-term interests of a range of stakeholders are protected.

Water services in some parts of the country do not meet an acceptable standard. Advances in urban water in metropolitan areas risk leaving large parts of the country behind. There are significant barriers and costs for delivering safe and reliable water and wastewater to all Australians. Without action, these barriers could drive further inequality, and undermine progress towards national targets and commitments.

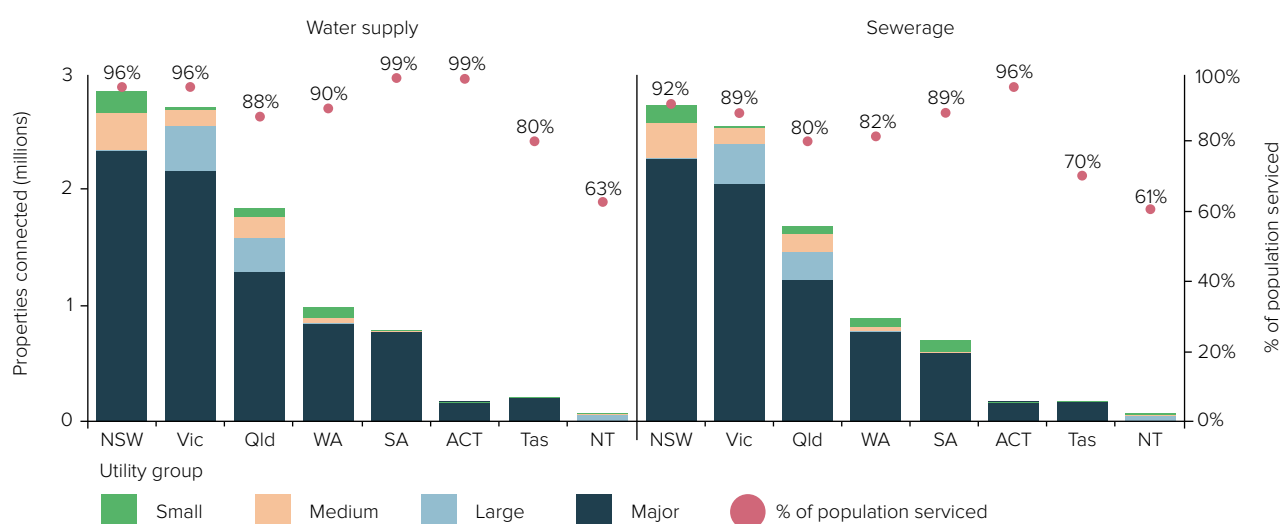


The scale of the water sector is immense

The Australian water sector provides essential services to almost all people and businesses. Across the Australian economy, users consumed around 16,500 gigalitres of water in 2016-17 – enough to fill Sydney Harbour 33 times.¹ Water and wastewater services are delivered by around 196 businesses and local governments in Australia's cities and towns. There are also a range of smaller licensees that provide local and specialised services, including in remote communities.² Figure 1 gives a national picture of water services across the country.

Australia's urban water sector generates annual revenue in excess of \$15 billion and directly accounts for 0.75% of Australia's GDP.³ Urban water costs are shared across the total water and wastewater supply chain, comprising bulk water supply (21% of total cost share), water treatment (11%), water transport (24%), wastewater transport (24%), wastewater treatment (16%) and retail (4%).⁴ The household sector contributes 51% of total costs for water supply,⁵ while consuming 12% of the water,⁶ in part due to the additional costs of treatment and supply for potable use.

Figure 1: A national picture of water services



Source: Bureau of Meteorology (2019), New South Wales Department of Primary Industries (2017) and Essential Services Commission of South Australia (2020)⁷

By contrast, industries spent \$4.9 billion on water supply in 2016-17, which represents around 46% of total costs,⁸ while consuming 88% of water.⁹ Of this, the agricultural sector consumes 62% of the total national volume (10,300 gigalitres, enough to fill four million Olympic swimming pools each year)¹⁰ while contributing 6% of total costs for water supplied.¹¹ Of this, 9.7 million megalitres were used to irrigate crops and pastures.¹² However, this water supports over \$15 billion in value from irrigated agriculture each year.¹³ By comparison, around 2,100 gigalitres are recovered by the Murray-Darling Basin Authority each year and retained in the system, to improve the health of the river system.¹⁴

The vast majority of urban water assets remain publicly owned. However, private participation in the urban water sector has grown considerably over recent years, with private operators providing services to utilities of all sizes. For example, Sydney Water outsources around 90% of capital expenditure and 70% of operating expenditure to private suppliers.¹⁵

The water sector has a strong record of meeting users' needs

Many Australians rarely think of where their drinking water comes from, or where their wastewater goes. Fewer still understand the water required to put food on their plates, or to create the many other goods and services that they rely on.

This is a product of the success of our water sector, which has provided high quality services to most users over many decades. We have been a leader in the development and application of environmental and health standards – such as the Australian Drinking Water Guidelines.¹⁶ This has been achieved in spite of difficult geographical and climatic conditions, and urban built environments that have grown in scale and evolved considerably over time.

This success has also been the product of past reforms, triggered by the 1994 COAG Reform Framework – as part of the broader National Competition Policy agenda – and the National Water Initiative in 2004. Developments in water markets, particularly the southern Murray-Darling Basin, have underpinned steady growth in the value of economic activity supported by water.

Recent events have undermined confidence in water management

Australians have come to expect a high quality of water services. Perhaps for this reason, issues that have emerged or taken on added significance since the last Audit have come as a shock to many people. These include concerns about running out of drinking water in some regional towns, fish deaths in parts of the Murray-Darling Basin, and rising bills to pay for expensive infrastructure upgrades. For many, this may be the first time they have considered risks to Australia's water services, or the potential impacts of poor water management on their personal or business needs.

These events are no reason to lose faith in the capacity of the water sector to provide high quality services, reliably and efficiently in future. However, they do provide a reminder to governments and service providers. These events also provide impetus for renewed efforts to progress important reforms to ensure Australians can continue to receive reliable services in the future, and know that water is being managed in a way that balances competing needs and mitigates risks efficiently.

Reports over recent years provide guidance on how to ensure water services continue to meet Australia's needs into the future. Notably, the Productivity Commission undertook inquiries into reform of the water resources sector,¹⁷ and a five-year assessment of the *Murray-Darling Basin Plan*.¹⁸ Infrastructure Australia also released a report that called for reform of the urban water sector to ensure the long-term interests of users are protected from mounting risks and rising costs over the coming years and decades.¹⁹



The sector faces unprecedented risks and challenges

As with other forms of infrastructure, the water sector has faced mounting challenges from factors such as population growth, climate change and changing user expectations.

However, of all the forms of infrastructure, the potential risks and costs of climate change are greatest in the water sector. The water sector relies heavily on rainfall to replenish storages, streams and groundwater, and on vibrant ecosystems to support a reliable water cycle. Higher temperatures can also increase the volume of water in storage lost through evapotranspiration. Extreme weather events such as floods, cyclones and bushfires, as well as rising sea levels and increased coastal inundation, can also damage assets or disrupt wastewater treatment processes. These bring heightened risks for the health of our waterways, management of wet weather flows and contaminants in residential areas.

Meeting growing demand is also a major challenge. The costs of augmenting water supply close to major cities present issues with managing water security efficiently. There is rising demand for Australia's agricultural products, increasing the call on water for production. While water markets can direct water to its most productive use, a further extended period of drought could put the viability of some of Australia's water-intensive agricultural products in doubt.

These risks are compounded by the age and condition of many water, wastewater and stormwater assets. Many are reaching the end of their lifecycle, and are approaching their full capacity or were designed and built many decades ago, for a nation of a different scale and distribution than it is today. This presents an opportunity to transform the way water and wastewater services are delivered – moving from a capture, use and dispose approach to an integrated water-cycle management where we use, recycle and reuse water resources.

The value of water and wastewater services is not well understood

While we all value water as a vital part of our daily lives, few understand its true value. In part, this is due to a lack of exposure to the full costs of the water we consume – both directly through our taps, and indirectly through our food and other products. Similarly, the value of wastewater services and the role existing systems play in safeguarding the environment are not well appreciated by users.

This lack of understanding of the value of water impacts user behaviours. Australians consume an average of 82,000 litres of freshwater per person each year.²⁰ A further 80 litres of water per connection every day on average are lost by utilities before it even reaches our homes. For small utilities, this figure is around 110 litres per day.²¹



Water markets help to attribute value to productive water, and direct it to higher-value uses. However, these transfers are not without their own issues. Moving water between uses and locations shifts economic activity, often also shifting jobs and opportunities for growth. Water moving out of some irrigation districts can leave stranded assets, or bring changing requirements for other forms of infrastructure, such as transport and telecommunications, to support changes in economic activity and supply chains.

Compounding this lack of understanding, much of the information on water we use is not transparent, reliable or expressed in terms that users can understand. Many governance and regulatory processes lack clear objectives focused on long-term user interests.²² In rural water markets, developments in allocation and trading has come at the expense of complexity and community understanding, leading to many stakeholders feeling excluded from decision making or upset with operators' and regulators' decisions.

Each jurisdiction has separate agencies responsible for the economic, environmental and health regulation of urban water and wastewater services. The independence and accountability of these agencies vary.²³ Lines of accountability between governments, regulators and service providers are often muddled – and in some cases all entities report to the same water minister. In some jurisdictions, ministerial interference in price setting has caused some community concern. These issues make it difficult to plan for the future, to provide users with confidence that decision making is robust, and to communicate long-term plans to users.

Water services in some parts of the country do not meet acceptable standards

Water services across the country are not available equitably, and the gap between users at each end of the spectrum is growing. Services in many cities are evolving and improving, propelled by strong revenue bases and access to new technologies that reduce costs for service providers and improve the customer experience.

It is a different story in many remote communities. In some of the most isolated parts of the country, including those with some of the most economically and socially disadvantaged populations, water services do not meet standards that urban residents would expect. Independent audits of compliance in remote communities are relatively infrequent, often limited in scope, and rarely publicly disclosed.

Many remote communities are home to a high proportion of Aboriginal and Torres Strait Islander people, meaning poor standards of water and wastewater services compound historical hardships and reinforce disadvantage. A lack of access to clean water and sanitation can worsen existing health issues and increase risks of disease and infection.

There is clear evidence that services in many of these remote communities do not meet United Nations' Sustainable Development Goal (SDG) 6: clean water and sanitation for all,²⁴ and work against the achievement of broader national objectives, including the Australian Government's Closing the Gap targets.

In this chapter

This chapter examines the key trends impacting the water sector across urban and productive markets, and in different parts of the country.

9.2 Changes facing urban water identifies a number of mounting challenges posing risks to service delivery, particularly population growth in our cities, the impacts of climate change and increasing concerns over the health of our waterways. In addition to these external factors, water, wastewater and stormwater assets across many parts of the country are ageing. Failure to address these challenges is likely to add to costs or compromise service quality.

9.3 Sustainable water for liveable cities explores how water is fundamental to liveability in our cities, and its importance will grow over coming years. However, density and changing expectations require a rethink of how water services are provided. Changing how we use water and exploring alternative water sources can help to meet our future needs.

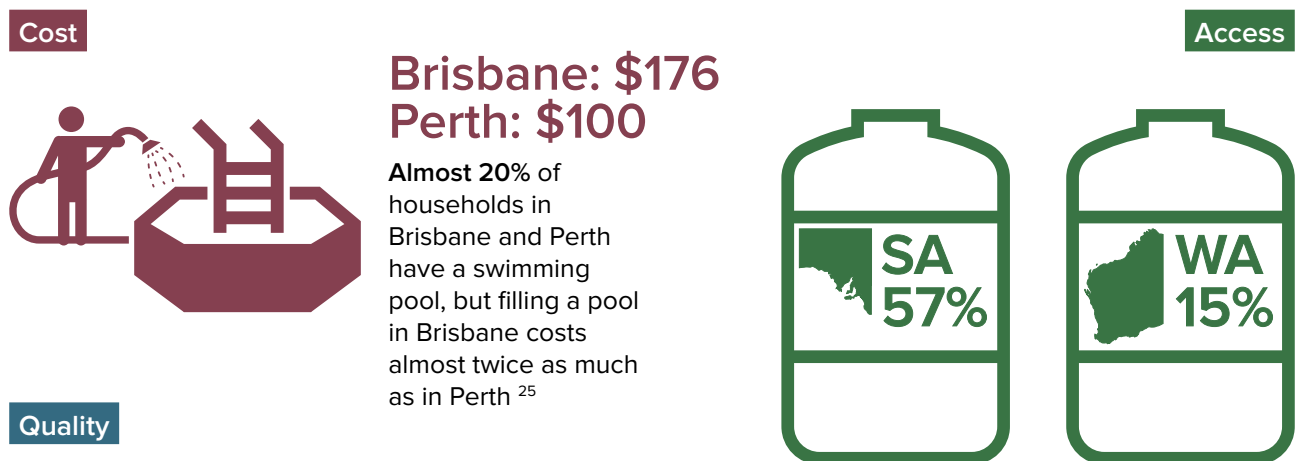
9.4 Water and wastewater in regional and remote communities discusses how these services play a vital role in supporting regional and remote communities – including smaller towns, rural communities and remote areas – as vibrant, sustainable and attractive places to live. However, service providers in these areas face growing challenges, including rising costs and resilience risks. Critically, we cannot be sure that

services are meeting acceptable standards in remote communities, meaning Australia is not meeting UN Sustainable Development Goal 6.

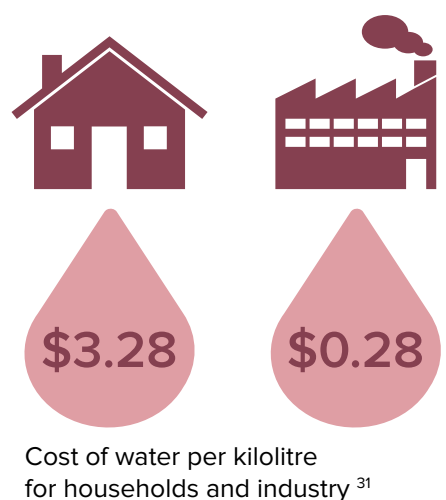
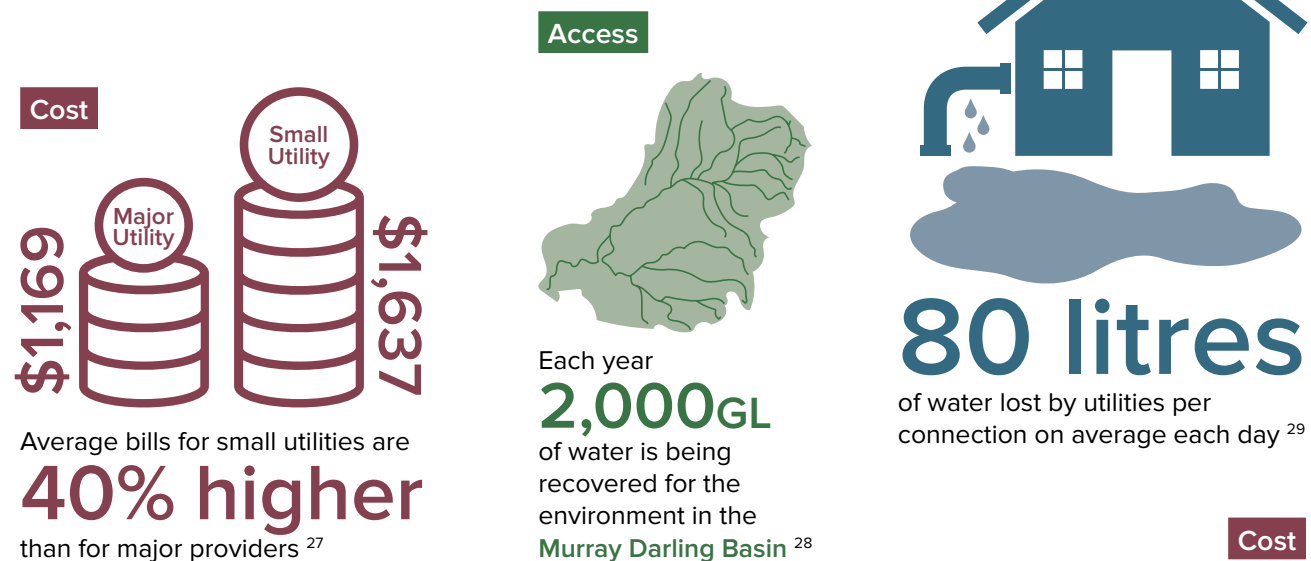
9.5 Water oversight, regulation and decision making explains how the value of water is not well understood, and that this is leading to poor decision making. Evidence on water is incomplete, unreliable and does not adequately reflect outcomes that matter to users. Also, governance and decision making in the water sector are not meeting best practice and are not adequately preparing Australia for the future.

9.6 Balancing competing needs for water seeks to understand that while water reforms have brought some benefits, a fair and sustainable balance between competing needs for water has not been achieved in many parts of the country. A lack of transparency in water management and the complexity of water markets is undermining social licence and confidence in decision making. But there are opportunities to use water to unlock new economic activity. The southern Murray-Darling Basin water market has supported growth and productivity improvements in local industries, and water could help to unlock growth in other parts of the country.

Performance of the sector



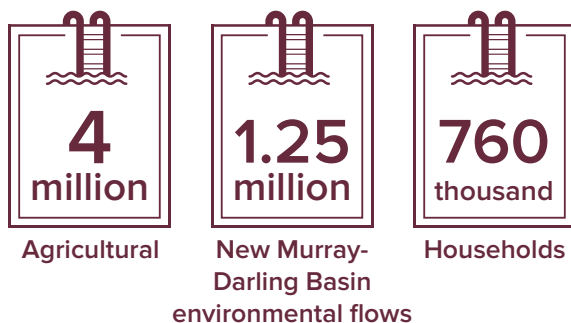
Proportion of households with water tanks ²⁶



Scale of the sector

Customer

Annual water consumption in Olympic swimming pools ³²



Asset



18% increase in **recycled water supplied** by major utilities over the past 4 years ³³

Industry

The water sector

contributes \$13 billion in value add, 0.97% of GDP ³⁴



\$13b

Asset



Unknown

The age and condition of urban water assets across the country

Customer



104% increase

in distributed water use by agriculture between 2008-09 and 2016-17 ³⁵

Industry

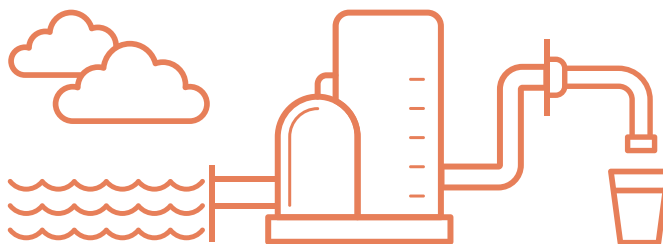
Typical cost shares in water and wastewater supply chain:

Bulk water supply **21%**
 Water treatment **11%**
 Water transport **24%**
 Wastewater transport **24%**
 Wastewater treatment **16%**
 Retail **4%** ³⁶

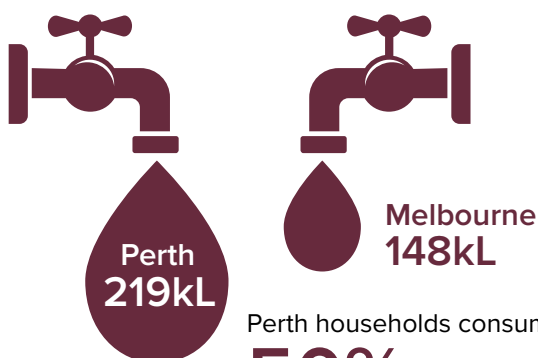


Asset

36% of Perth's water supply is from desalination ³⁷



Customer



Perth households consume

50% more

water than Melbourne households ³⁸

Industry



27,000

people employed in water supply, sewerage and drainage services, adding

\$18.9 billion to the economy ³⁹

9.2 Changes facing urban water

At a glance

This section outlines key challenges our water infrastructure will face in coming years:

- Climate change affects water supply patterns and threatens our assets.
- Population growth has consequences for our water security and infrastructure.
- Older assets need to be replaced and upgraded.

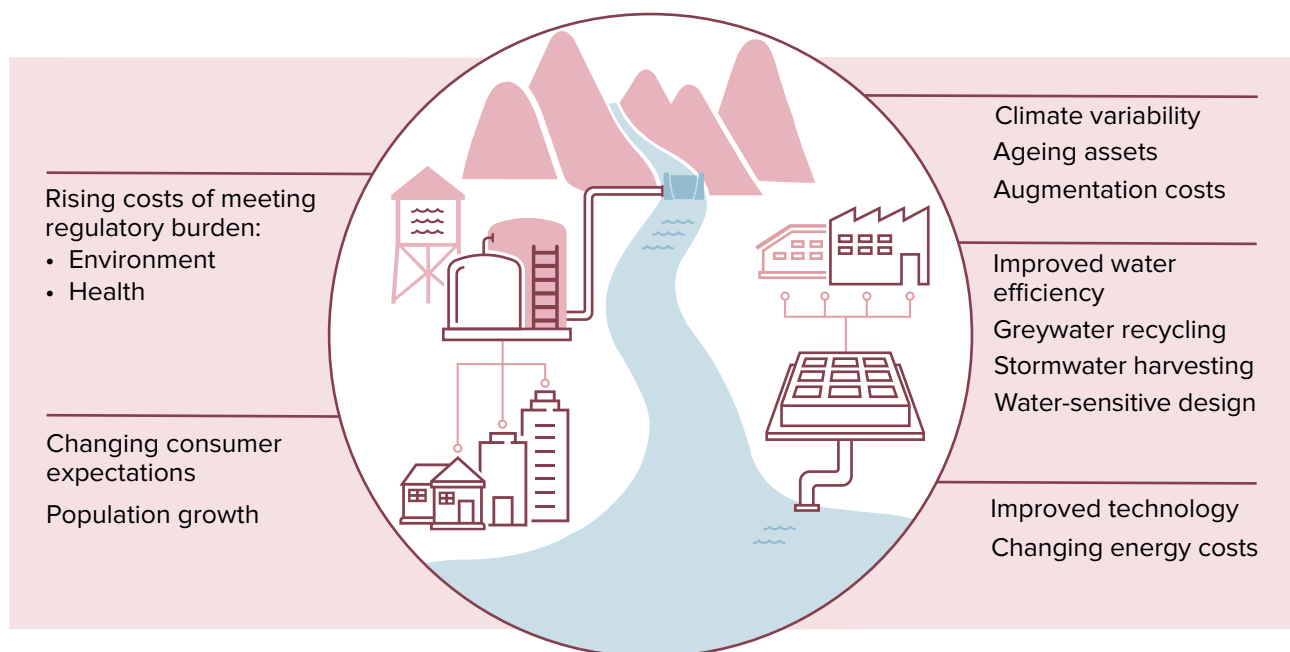
Failing to address these issues could lead to higher costs and a decline in service quality.

The urban water sector faces a range of challenges

Users in urban areas typically receive high-quality water and wastewater services. This reflects the success of metropolitan water utilities in overcoming the unique challenges of Australian geography and climate, and providing safe, clean, reliable and affordable water, wastewater and integrated water-cycle services.

However, urban water faces a number of substantial challenges over coming years. In order to continue to provide safe, reliable and affordable services, the urban water sector will need to adapt to the changing needs of Australia's cities and towns. As shown in Figure 2, these challenges include a changing climate, population growth and densification in cities, ageing assets, increasing concern over the health of our waterways, and shifting community expectations.

Figure 2: A snapshot of factors influencing urban water bills



Population growth is ramping up pressure on limited water supplies

While climate change is tightening water supplies in many parts of the country, our population has grown rapidly, with growth concentrated in urban areas. This trend is likely to continue, with the population of all capitals projected to grow faster than the balance of their respective state or territory.⁴⁰ Impacts will be felt most in the south-eastern regions, where the joint factors of population growth and climate change are expected to be most pronounced.

Water planning on the basis of long-term population growth projections is problematic, with the growth of our major cities consistently underestimated. Analysis by the water industry in 2010 projected that water consumption in Australia's six largest cities would increase 39% by 2026 and 64% by 2056 – a total increase of around 1,000 gegalitres each year.⁴¹ However, these estimates were based on population projections that were on average 18% lower than the most recent estimates by the Australian Bureau of Statistics (ABS).⁴²

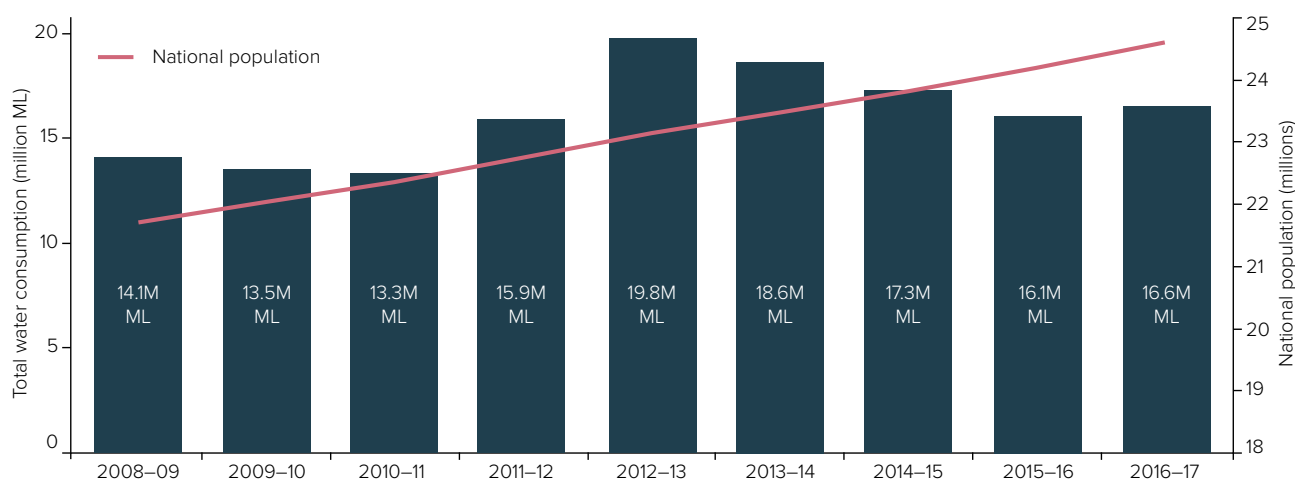
Australia has the highest per capita surface water storage capacity of any country in the world.⁴³ As at January 2019, capital city water storages were at between 48% (Perth) and 88% (Hobart).⁴⁴ Sydney's combined water storage has dropped 40% over the last two years.⁴⁵

This does not fully reflect the water security position of Perth and Hobart. Groundwater extraction provides around 40% of water for Perth, while only around 10% of its water comes from surface water.⁴⁶ The majority of Hobart's water supply is sourced directly from rivers, with only a small portion sourced from surface water.⁴⁷ Pressure on water supplies has been eased by Australians consuming less water since 2012-13 as reflected in Figure 3.

Most Australian cities have sea water desalination capacity, which was built between 2007 and 2012 in response to the Millennium Drought. Most of this capacity has been underutilised since construction, with the exception of Western Australia, where it provides approximately half of Perth's supply and is being used to replenish aquifers as part of a broader integrated water supply scheme.⁴⁸ Drier conditions over recent years have led a number of other major cities' utilities to initiate supply – or prepare for initiation – from their desalination facilities, including in Adelaide, Melbourne and Sydney. This is likely to ramp up over the coming years as water storage levels decline and water utilities prepare for drought.

Existing storages, groundwater and surface water – supported by desalination facilities – are expected to be able to cater for demand in the medium term. Governments and utilities will need to look beyond traditional surface water and bulk water storage options to continue to cater for growth and demand, because of limited potential new sites and their inability to adapt to climate variability. However, there is significant scope to adapt to growing demand through increased water efficiencies and a diverse portfolio of water supply sources.

Figure 3: Decrease in water consumption since 2012-13 has eased pressures on supply



Source: Australian Bureau of Statistics (2019)⁴⁹

Climate change is affecting patterns of water supply

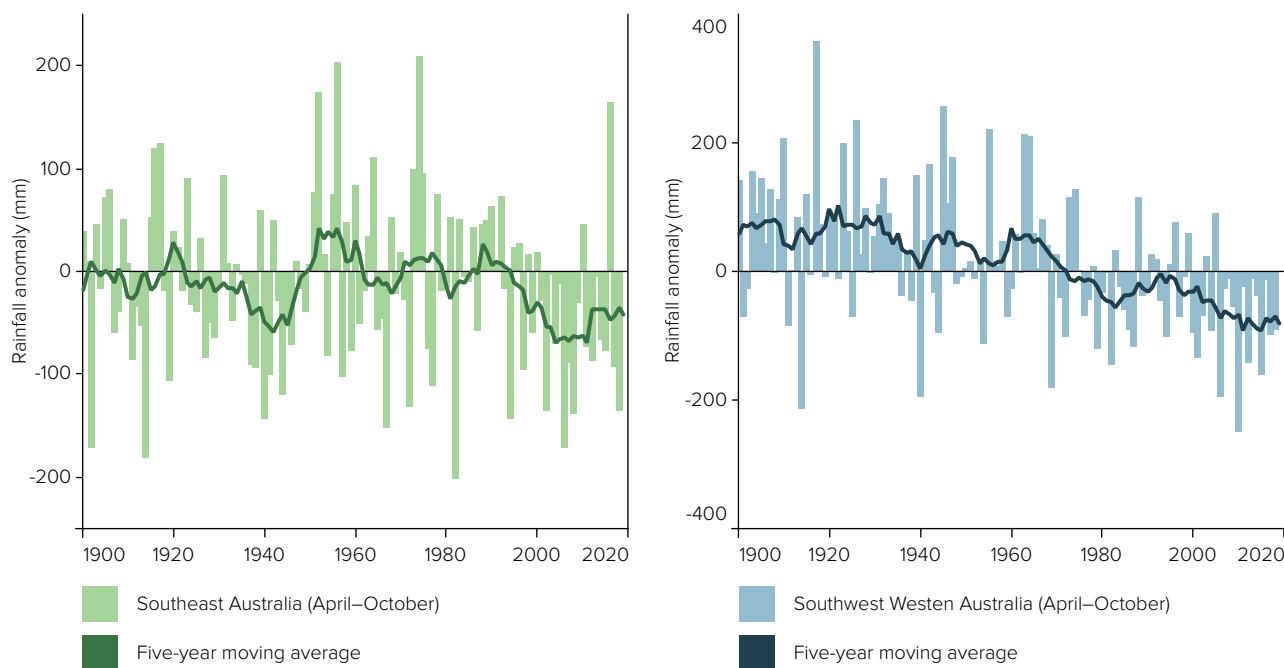
Climate variability and change is having a substantial and growing impact on Australia's water sector. In particular, southern regions are experiencing progressive drying that cannot be explained by natural variability alone. Southeastern regions and southwestern Australia have experienced significant longer-term rainfall decline over the past half-century, particularly during the cooler months. Notably, south-west Western Australia has recorded a 26% decline in rainfall over the last two decades against the long-term average. Northern Australia, on the other hand, has become wetter across all seasons.⁵⁰

This is having substantial impacts on southern water storages (Figure 4). The reduction in average winter rainfall in south-west Australia has caused a 50% reduction in runoff over the last half-century,⁵¹ while declining streamflows have been observed across

southern and southeast regions, including Sydney, Melbourne, Perth and Adelaide.⁵² This trend is expected to worsen over the medium to long term.⁵³

Reduced streamflows will provide less water into bulk water storages, while changed rainfall patterns will place a higher reliance on rain events in the warmer months, which are typically drier.⁵⁴ Groundwater could also be at risk of reduced recharge from lower runoff and less infiltration as supply is increasingly expected to come from heavy rainfall events. Warm, dry weather also drives higher water consumption and the potential for over-extraction of groundwater by communities and agricultural producers during times of surface water shortage.⁵⁵ There is also increasing concern over the impact of degraded catchments and regrowth in water supply catchments after bushfires. Increased infiltration into the soil and increased water use by developing vegetation can significantly reduce water runoff into bulk water storages.

Figure 4: Winter rainfall has declined in southwestern and southeastern regions over recent decades



Source: Commonwealth Scientific and Industrial Research Organisation and Bureau of Meteorology (2018)⁵⁶

Climate change also poses heightened risks for assets

The risks of climate change extend beyond water security, and include the impacts of more extreme weather events on water and wastewater assets.

Across most parts of the country, rainfall events are likely to increase in frequency and each event is expected to become more intense and concentrated across fewer rainfall days.⁵⁷ This brings increased risks of floods from very short duration rain events. These can test the capacity and resilience of assets – most particularly stormwater systems, treatment plants and sewerage networks – and bring risks to public health from poor raw water quality and increased wet weather overflows from sewers.

Bushfires in water supply catchments and large flooding events can present a significant risk to water supply quality as debris and sediments are washed into rivers and dams. This results in poor raw water quality, which can reduce the water supply capacity of water treatment processes and in more severe events, water treatment plants may need to be turned off for up to several days until raw water quality improves, interrupting water supply to customers.

Increased temperatures – and particularly very hot days – increase evaporation from storages. Combined with nutrient runoff from heavier rainfall events, hotter weather also increases the risk of bacterial contamination and blue-green algal outbreaks.⁵⁸

Older assets will require a step change in replacement and upgrade

Compounding the challenges of climate change and population growth, the water and wastewater infrastructure networks in our cities were largely designed and built many decades ago for very

different cities of a much smaller scale. This infrastructure has served Australia well, but with so much of Australia's water and sewerage network built over the first three-quarters of the twentieth century, utilities are expected to require an increasing level of investment to replace ageing assets.

More people living in multi-unit dwellings in established areas of cities introduces some efficiencies in water and wastewater service provision by making better use of existing assets, however this also places increasing pressure on legacy trunk network assets.

Preventative maintenance and changes to household demand behaviour could delay major investments in urban water and wastewater infrastructure. However, sooner or later, the renewal and augmentation of these assets is likely to come at significant cost. Assets in major cities are likely to be most costly, since urban development has made accessing and upgrading trunk assets difficult, and construction will cause disturbance to local businesses and residents. Some utilities may struggle to finance the upfront costs of these renewals, and users may be faced with rising bills to fund upgrades over time.

Timing is critical. Failure to renew these assets could attract significant financial and economic costs, but it is important to ensure users are not hit with unnecessary upfront costs. Investing too soon could fail to extract maximum value from existing infrastructure. On the other hand, ageing assets will lead to higher operational and maintenance costs, and the impact of a failure in trunk water and wastewater infrastructure in fast-growing cities is likely to be significant. Transparent reporting on these assets will be critical to ensuring asset renewal processes are efficient, and so that governments, utilities and regulators are accountable for their decisions.

168. Opportunity

Imminent renewals of ageing assets bring an opportunity to rethink how water and wastewater services are delivered, and to use technology to improve efficiency and levels of service. Renewals could help to avoid overinvestment in large, long-lived traditional water and sewerage assets, and make the system more adaptable to future trends and shocks.

When this will impact:



Where this will impact:





Failing to address these challenges could lead to rising costs for taxpayers and users

Household water and sewerage bills across the country are generally affordable. However, pricing restrictions mean that many users do not appreciate or pay the true cost of the water they consume, or for disposal of the wastewater they create. Also, as with the electricity sector, the water and wastewater assets are typically expensive and long-lived, with significant investment in long linear assets required in coming years. Efficiently meeting future needs will be essential to minimise the impact on household budgets. Without action by governments, regulators and utilities, bills could rise substantially over the next five to 20 years.

With the value of water poorly understood, governments have been reluctant to embrace the pricing reforms that are required to properly reflect the cost of provision and support rational investment. Prices that better reflect the cost of water provision assist in managing demand for water and encourage operating cost efficiencies, facilitate investment, and provide a better basis for private sector participation in the urban water sector.

The combined impacts of climate change, population growth, rising community expectations and ageing networks mean that costs of providing services are likely to put upward pressure on household budgets over coming years. Infrastructure Australia's *Reforming urban water* report found that these factors could have significant impacts on users' bills if not addressed – without action, bills could rise by around 50% in today's money within 10 years, and double by 2040.⁵⁹

169. Challenge

The urban water sector faces considerable risks, including the impacts of climate change, population growth, ageing assets, and changing needs and expectations from users. Failure to adequately address these challenges could lead to rising water bills, as well as exposing users to risks of declining service quality and reliability.

When this will impact:

0-5

5-10

10-15

15+

Where this will impact:



9.3 Sustainable water for liveable cities

At a glance

Governments and service providers are increasingly aware of the role water plays in sustaining our communities. As urban areas become denser, household water costs will rise, as will the demand for lakes, rivers and fountains to refresh our public spaces.

This section outlines how smarter use and planning can unlock potential in our cities:

- Existing water bodies, such as dams and reservoirs, can double as recreational spaces.
- Decision-makers can coordinate better to include water assets in our urban planning.
- Households can use water more efficiently.
- We can use recycled water to reduce pressure on potable supplies.

Water underpins the liveability of our cities

Water is critical to the liveability of our cities and towns. Drinking water sustains life, while access to water allows for sanitation and hygiene, and stormwater management reduces the impact of extreme weather events. Access to waterways improves our sense of wellbeing and provides recreation opportunities. It also supports green infrastructure such as playing fields, parks, gardens and tree canopies. Green space and bodies of water also reduce the urban heat island effect, making cities and towns more habitable without artificial cooling.

There is evidence that many Australians place a high value on water in the urban environment:

- People value access to open space and are prepared to pay up to 16% more for a house with greater access to open space.⁶⁰
- City residents place a high value on stormwater projects that restore stream quality, with Sydney and Melbourne residents willing to pay between \$104 and \$278 per year on average.⁶¹
- Many households have also invested in local harvesting and reuse systems. For example, the proportion of suitable dwellings with a rainwater tank rose from 24% in 2007 to 34% in 2013. This growth was largely attributed to water restrictions, strengthened building regulations, government rebate schemes, and a stronger desire to conserve water and reduce bills.⁶²

Australians' desire for increased liveability has partly resulted in urban encroachment on water and wastewater assets. This encroachment is becoming an increasingly important issue for water service providers. Gradually, land use buffers around major water and wastewater assets have been reduced due to urban development. For example, the wastewater treatment plant at Macquarie Point in Tasmania was relocated due to development opportunities, increased liveability aims and investment potential around the Museum of Old and New Art in Hobart.⁶³

Smarter use of water could unlock new recreational spaces in cities

Urban densification is shifting demand for water in our cities. Greater urban density brings a reduction in private open space, and increased demand for public space. Access to quality open space is an important driver of standard of living in dense urban environments. Green space and tree canopies refresh the air and are known to enhance mental wellbeing. Parks, public gardens and sporting fields allow for community interaction, exercise and reflection.

With growing demands on our public recreational space, options for broadening access to previously restricted bodies of water could provide public benefits without significant capital cost. This may be particularly relevant where urban expansion has seen new residential communities develop in proximity to what had previously been relatively remote dams and reservoirs, or for dams that provide secondary sources of storage. Through engagement with local Aboriginal and Torres Strait Islander communities, it may be possible to provide access in urban areas for cultural purposes.

Rehabilitation of degenerated waterways can also provide for multiple sources of recreation, such as swimming and boating where they were not previously feasible because of safety and public health concerns. An example is Lake Parramatta in New South Wales, which was reopened for public recreation in 2015 after being closed for 72 years due to poor water quality.⁶⁴

Water could be better integrated in urban planning

Water reforms have focused water service providers on financial efficiency and regulatory compliance, which has delivered good financial outcomes. However, policy and regulatory frameworks do not adequately identify where the costs and benefits of broader economic and social outcomes lie and how costs should be shared with these beneficiaries. This affects how water is integrated in broader urban planning.

Australia's three levels of government present further challenges to delivering liveable communities. The Australian Government has a strong influence in the planning and growth of major cities without necessarily having a regulatory or legislative mechanism facilitating direct intervention. State, territory and local governments share many aspects of the planning process, often without effective coordination. Delivery and regulation of water services regions is largely fragmented across levels of governments, undermining coordinated and consistent decisions about water's role in place-making and planning.

Responsibility for infrastructure and services is generally allocated on a sector basis, such as transport, land-use planning and water. The current approach to land-use planning focuses development primarily around transport nodes, leaving water service provision and access to waterways as an afterthought. This was highlighted in Infrastructure Australia's *Planning liveable cities: A place-based approach to sequencing infrastructure and growth*, which identified the need to improve planning and delivery processes to accommodate growth, particularly through integration and coordination of strategic metropolitan plans.⁶⁵

Some governments are seeking to address this issue, for example:

- The South Australian Government included water as a principle for planning and design as part of the broader reform of land-use development and planning in the SA Planning Commission's *Natural Resources and Environment Policy Discussion Paper*.⁶⁶
- In Western Sydney, the Greater Sydney Commission is exploring water-centric development. This approach puts water features, such as waterways, as the focal point for urban planning, with transport nodes and access to other facilities planned around it.⁶⁷



170. Opportunity

In increasingly dense cities, water will need to play a growing role in supporting our cities as desirable places to live, work and visit over coming years. Better understanding water's role in urban environments could enhance quality of life, open new spaces for recreation, natural regeneration and cultural practices.

**When this
will impact:**



**Where this
will impact:**



Households could use water more wisely

Australian water consumption rates remain high by world standards. While this reflects our relatively harsh climate, it is also a function of a historical reluctance to live within our means in terms of the water demands of city planning, garden design and lifestyle choices.

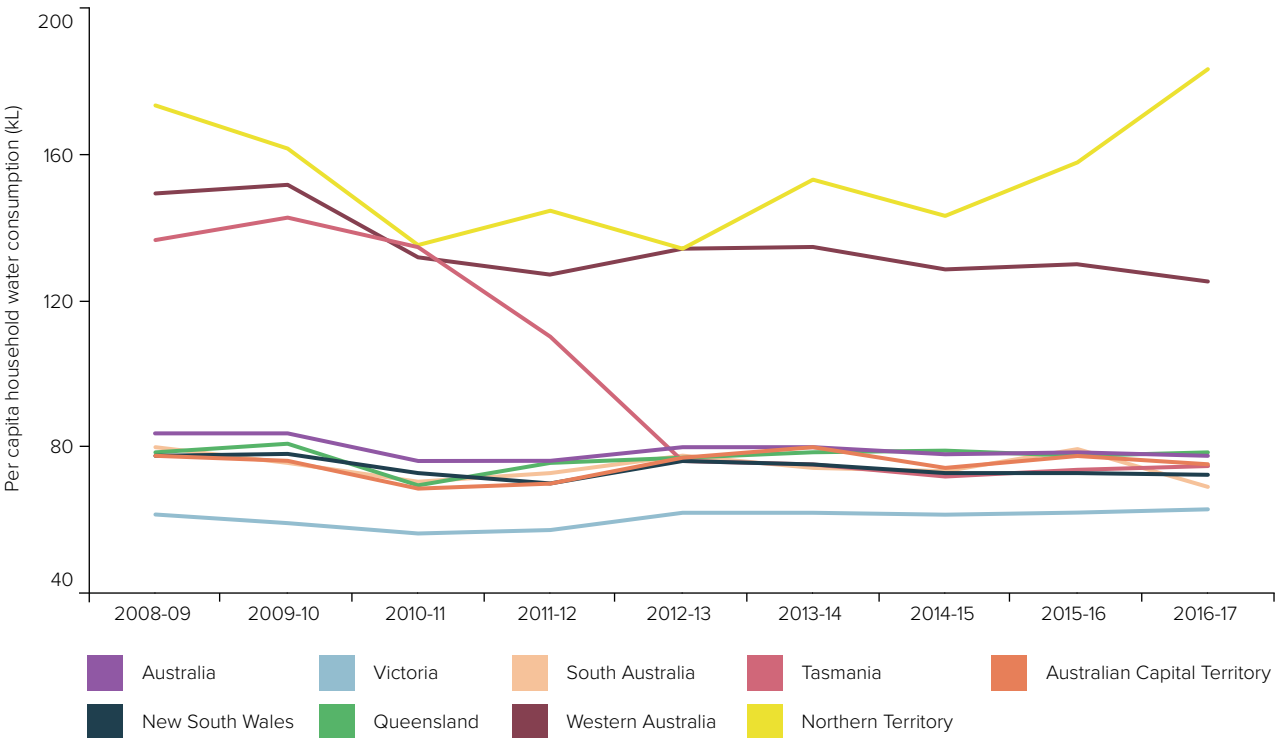
The consumer response to water restrictions and ongoing curtailing of consumption under ‘water-wise’ rules demonstrates that we are capable of changing behaviour in the face of a water supply crisis. Australian household water consumption fell 16% over four years to 2008-09⁶⁸ in response to the Millennium Drought.

However, water restrictions can have adverse impacts on some urban areas, particularly through limited water for outdoor use. When dry and brown, gardens and lawns can be hotter than concrete

pavement. Keeping green spaces green, especially during drought, creates a difficult trade-off between water efficiency and liveability.

While there have been some improvements in household water efficiency, these have tapered off as water security risks – and the public awareness campaigns that came with them – eased. As Figure 5 shows, after declines to 2008-09, capital city water use per person remained relatively stable across the eight years to 2015-16. New South Wales, Queensland, South Australia and the Australian Capital Territory display similar usage patterns, but there remain large discrepancies between jurisdictions – households in Sydney and Perth use almost 50% more water than in Melbourne.⁶⁹ Large changes in water use behaviour are possible. Tasmanians almost halved their water use over the period, during which volumetric pricing was introduced.⁷⁰

Figure 5: Per capita water consumption by households has remained stable over recent years



Note: Values shown are total water consumption by households (excludes consumption by industry) divided by the estimated population.

Source: Australian Bureau of Statistics (2019)⁷¹

Recycled water can play a greater role in supporting liveability

There is scope for making better use of recycled and grey water and stormwater sources in urban areas. Household systems that allow for greater use of non-potable water by households for outdoor use, flushing toilets and other activities, could preserve potable water for applications that require it. Advancements in stormwater harvesting technologies allow for greater use of stormwater for non-potable applications in urban areas, such as water for sporting fields, gardens and nurseries.

The primary shortcomings of decentralised recycled water schemes are their fragmentation and high capital cost from duplicative distribution and reticulation networks. As potable reuse of recycled water grows, there is a risk that decentralised infrastructure to treat and deliver recycled water to customers will become redundant. Direct potable reuse could provide an additional non rainfall-dependent water resource that is cheaper to produce than desalination and a more flexible part of water networks than decentralised schemes.

With direct potable reuse, recycled water is injected directly to the water supply distribution system, either downstream of the water treatment plant, or into the raw water supply immediately upstream of the water treatment plant.⁷² More than three-quarters of water industry participants consider that recycled water can be treated and managed to a level that is suitable for potable supply.⁷³

Recycled water for potable reuse is typically less costly to produce than desalinated water.⁷⁴ The process for both potable reuse and desalination is through reverse osmosis, which uses energy to push water through fine membranes. The difference in costs stems from the higher energy costs to treat seawater. Despite the potential benefits of potable reuse, some members of the community remain concerned about risks to public health. Further community engagement is likely to be required to support social licence for potable reuse.⁷⁵

Examples of integrated water cycle management

A range of decentralised recycling schemes are in place in Australia, such as in Kwinana for industrial use in Western Australia, the Virginia Scheme for agricultural use in South Australia, and Gippsland Water Factory serving industrial and agricultural purposes in Victoria. Even where not producing potable water, such schemes can be valuable in conserving high-quality water for household use, providing environmental flows and recharging groundwater, and improving public perception of recycled water use.

There are also limited examples of dual reticulation recycled water schemes for households. Thirty-two thousand properties in Rouse Hill in Sydney's north west are connected to a third pipe scheme that provides recycled

water for gardens and toilets, preserving fresh water for drinking, cooking and showering.⁷⁶ South East Water in Victoria operates a recycling scheme that, as well as servicing agricultural users, provides 11,000 residential customers with water for gardens, toilets and laundries.⁷⁷

Water Corporation in Western Australia has been operating Australia's first full-scale Groundwater Replenishment Scheme since 2017, a potable reuse scheme where treated wastewater is further treated to drinking water standards, and recharged into Perth's deep aquifers.⁷⁸ This scheme currently supplies 2% of Perth's water needs.

171. Opportunity

Governments and utilities have not fully explored options for greater efficiency by households and industry, including potable reuse. More efficient household usage and industry service provision could provide substantial benefits for users at low cost.

When this will impact:



Where this will impact:



9.4 Water and wastewater in regional and remote communities

At a glance

This section looks at service standard gaps outside cities. Less populated areas face unique challenges, and not addressing them could harm communities and the economy. A lack of data makes it hard to track performance or identify problems. Since isolated communities occupy some of Australia's most arid regions, water security is also a key concern.

As challenges increase, so will the costs. Water bill revenue from small communities will not be able to cover this, and small utilities also lack the expertise or the funding incentives to overcome these challenges.

Remote water services in some areas do not meet acceptable standards, and Aboriginal and Torres Strait Islander communities are strongly affected by the shortfall.

Regional water and wastewater utilities face considerable challenges

Water and wastewater utilities in less populated regional and remote communities – including smaller towns, rural communities and remote areas – face service delivery challenges that are unlike those faced in metropolitan areas and smaller cities like Bendigo, Newcastle and Townsville. Regional utilities typically serve relatively small customer bases, many of which are dispersed over large areas. In some areas, the population is declining, which means that already small customer bases are shrinking. Many regional utilities are situated in areas with lower than average rainfall or streamflow, and have limited or no connection to other utilities or water sources.

In regional New South Wales and Queensland, urban water and wastewater services are provided by local councils. Many of these utilities serve relatively small populations, including 115 utilities in New South Wales and Queensland that have fewer than 10,000 connections. Of these, at least 48 utilities have fewer than 1,500 connections (Figure 6).⁷⁹

This presents challenges for urban water delivery in regional areas keeping pace with the advancements in cities. Whereas large cities may seek to enhance liveability through water supply and invest in a

range of new technologies to benefit users and built environments, regional utilities are unlikely to have the same capacity to invest and develop.

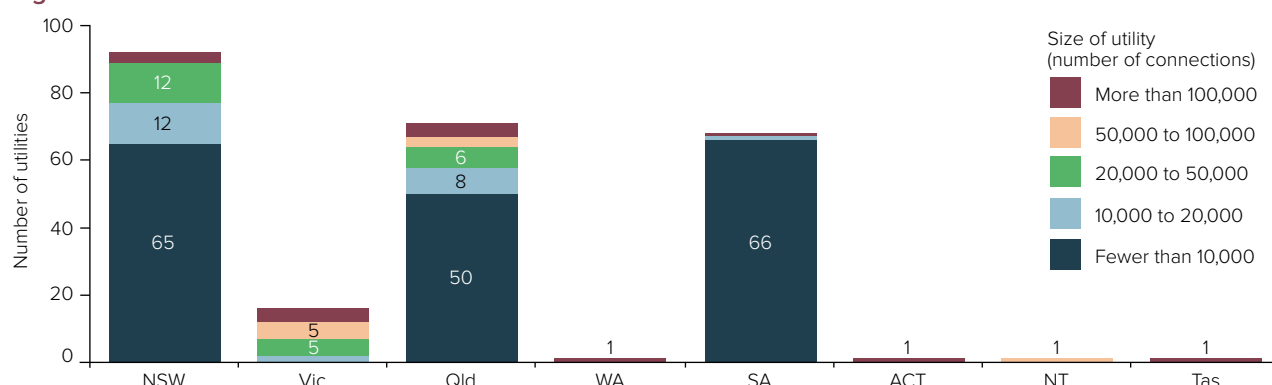
Failure to address looming challenges in regional areas could see heightened water restrictions for users, decreased utility of recreational spaces such as parks and waterways, and adverse impacts for business activity and investment. Overcoming gaps in service standards outside of our cities will be integral to the sustainable growth of their populations over the long term.

Water security is a key concern in regional areas

Many regional utilities rely on a single supply source, with no physical link to neighbouring utilities' bulk water supply. Unlike metropolitan areas located on the coast, climate-independent supply sources like desalination are generally not viable sources of supply in inland regional areas.

Water resource planning seeks to establish the amount of water available for consumptive and non-consumptive purposes. However, challenges remain for regional communities to fully participate in complex water planning processes. Overlapping federal, state and territory planning and regulatory processes add to this complexity.

Figure 6: Australia's smallest utilities are in Queensland and New South Wales



Source: Productivity Commission (2017) and Essential Services Commission of South Australia (2020)⁸⁰

Urban water authorities are increasingly becoming active participants in water markets, both as buyers and sellers. In average and wet years, some regional urban water providers are selling into the allocation (temporary) market. However, during low allocation water years, regional utilities are more likely to enter the market to buy water allocations to supplement urban supply. An example of this occurred in 2008-09 when the South Australian Government bought temporary water allocations to secure urban water supplies for Adelaide.⁸¹ While the market provides opportunities for some regional providers to augment supply in the short-term, there is a challenge around the capability of service providers to make informed market decisions that optimise supply security and cost.

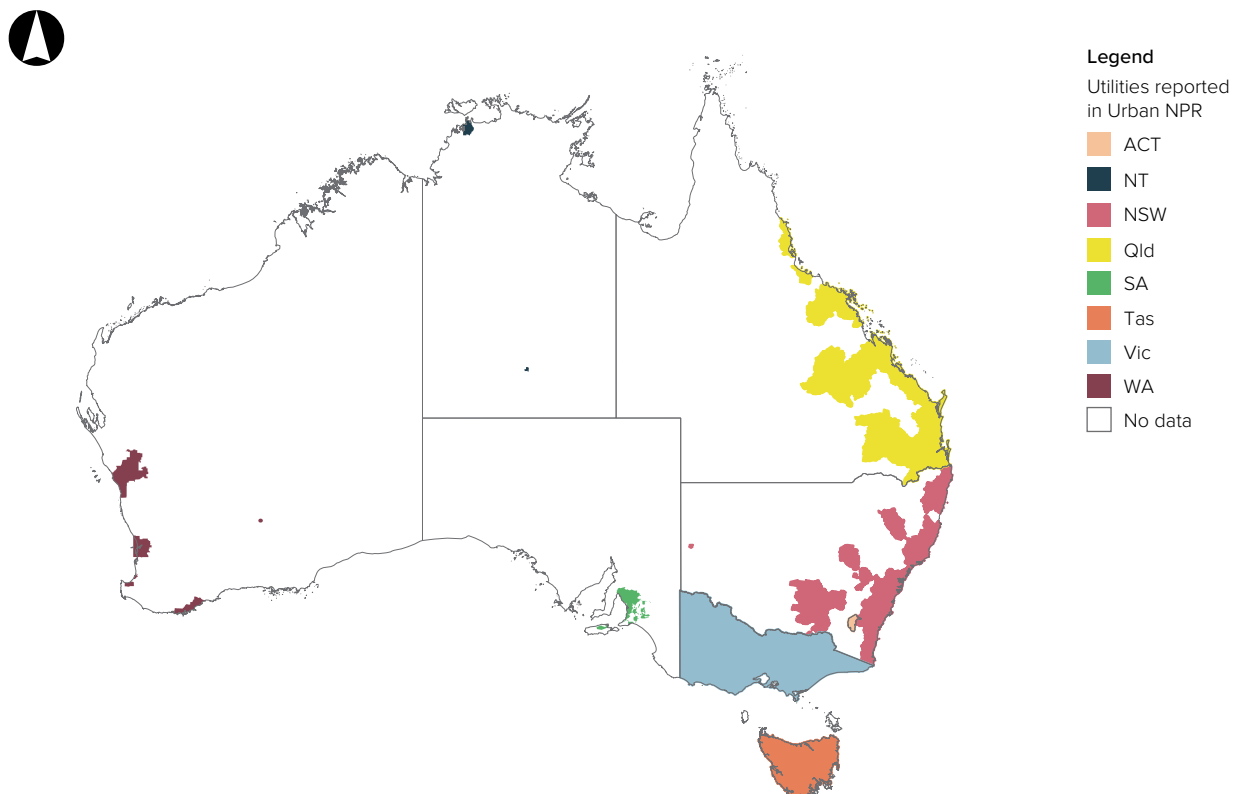
Constraints on water security directly relate to constraints on development and quality of life in regional areas. Without appropriate supply diversification and planning, water security could become a significant driver of regional settlement patterns, particularly in the coming decades as climate change impacts manifest.

Information on services in many areas is inadequate

Despite the importance of providing safe, reliable and efficient services to small towns, rural communities and remote areas, tracking expenditure and benchmarking the performance of smaller regional utilities is not possible. Where monitoring of expenditure and performance does occur, the results are not always published.⁸² Utilities with fewer than 10,000 connections are not included in the Bureau of Meteorology's *National performance report*, and those utilities that do report often provide unreliable and inconsistent data, as shown in Figure 7.⁸³

Given the significant challenges facing many utilities, the focus of many regional and remote service providers on day-to-day operations is understandable. Many local water managers are performing well under difficult circumstances. However, a lack of reliable reporting makes it difficult to identify where problems are most immediate, understand the most efficient way of meeting challenges, and plan to meet each utility's needs over the long term.

Figure 7: Large parts of Australia are not covered in the *National Performance Report*



Source: Bureau of Meteorology (2019) and SA Water (2020)⁸⁴

A lack of scale and expertise compounds regional challenges

Many regional areas lack the expertise to overcome the challenges they face. Smaller councils find it difficult to attract and retain skilled staff, and to keep pace with advances in regulation and asset management. Many utilities lack the capacity to invest in technologies that save costs or improve services.

Industry collaboration across regional areas has helped to overcome these challenges. Queensland and New South Wales have implemented collaborative initiatives such as the Queensland Water Regional Alliance Program and voluntary collaborations such as the Central NSW Councils. These alliances allow resources to be pooled to undertake research projects and collaboration initiatives to reduce costs, improve efficiency and plan for future needs.⁸⁵ In other jurisdictions,

governments have amalgamated utilities to build economies of scale:

- Between 1982 and 1994, Victoria moved from over 400 local utilities to 15 – and then further rationalised to 13 in 2005.⁸⁶
- In Western Australia and South Australia, single water corporations deliver water and wastewater services to the majority of the population.
- In Tasmania, utilities were progressively rationalised from 21 prior to 2009 to the present TasWater in 2013. The legacy of this history is still reflected in Taswater's asset base, which includes 47 water treatment plants, which dwarfs the inventory of Sydney Water (9 water treatment plants) – which serves over nine times the customer base.⁸⁷

172. Challenge

Regional and remote utilities face considerable challenges, including reliance on a single source of supply, limited resources, a lack of scale and unreliable information on services. Failing to adequately address regional water challenges could lead to heightened quality or reliability risks and a deterioration of liveability in regional and remote areas.

When this will impact:



Where this will impact:



Funding regional water needs efficiently is a growing challenge

The scale of investment required is likely to be substantial. For example, analysis undertaken in regional Queensland has forecast increasing failure of water mains commencing in the 2020s and peaking in the 2040s as these pipes approach the end of their useful life. At current renewal rates, it would take over 170 years to replace the mains alone, which make up approximately 38% of the 42,000 km of water mains and 22% of the 33,500 km of sewer pipes owned and operated by regional Queensland Councils.⁸⁸

Average costs of service provision per connection in regional areas are already higher than metropolitan areas. Median capital expenditure on water infrastructure per property for small utilities in 2016-17 was \$293 – almost double that of major utilities (\$151 per property).⁸⁹

This cost discrepancy is likely to grow. Many regional and remote utilities are faced with ageing water and wastewater infrastructure. In some cases, assets no longer comply with environmental and health standards. Greater investment in maintenance and renewal of water and sewage networks will be required to maintain and improve levels of service. Increasing electricity costs and more stringent environmental regulations are also placing additional upward pressure on service delivery costs.

The National Water Initiative requires full cost recovery for water and wastewater services to ensure the financial viability of water service providers. However, this national agreement acknowledges that cost recovery for some small communities, particularly those in rural and remote areas, may not be practical or achievable. Full cost recovery has, and will likely continue, to remain out of reach for many regional water and wastewater utilities.

Capital grants have been provided to utilities that clearly require support to fund new infrastructure. However, a lack of reliable data on the performance of all regional utilities – particularly in terms of cost recovery measures – makes it difficult to identify which utilities have the greatest requirement for grant assistance. The Productivity Commission found that capital subsidies in New South Wales and Queensland have also funded infrastructure in larger regional towns and cities that could have been funded through user charges. These subsidies are inconsistent with the National Water Initiative pricing principles.⁹⁰

While capital grant programs to regional areas have a role to play in maintaining service standards, a lack of robust and independent economic or pricing regulation could lead to inefficient investment. Grant funding for specific capital projects also raises risks of over-investment in new assets when other options such as demand management or targeted maintenance programs to extend the life of existing assets could be more efficient and beneficial to local users.

173. Challenge

Many regional and remote utilities face mounting costs to maintain, renew or upgrade ageing water and wastewater assets, but have limited funding through grants or revenue. Where funding is provided, it is often inefficient or lacks transparency. Failure to provide sustainable funding could lead to declining reliability and quality for regional customers, heightened risks of asset failure, and a mounting funding backlog.

When this will impact:



Where this will impact:



Services in some remote areas do not meet acceptable standards

Remote communities are unique and challenging environments for service provision. Many are predominantly or entirely home to Aboriginal and Torres Strait Islander peoples.⁹¹ Of the approximately 1,000 discrete Indigenous communities in remote areas, more than three-quarters have a population of fewer than 50 people.⁹²

Reliable and safe drinking water and wastewater services are vital for the wellbeing and long-term sustainability of these remote communities. This includes meeting remote communities' needs to maintain hygiene and to limit the spread of disease. In turn, this can reduce the cost of providing health services. Water and wastewater services are also critical to meeting broader policy objectives, and to underpin progress towards a number of Closing the Gap targets.⁹³

Water and wastewater assets in some remote communities are poorly maintained, routinely fail, or provide services at a standard below their intended design. In 2014-15, around 19% of Aboriginal and Torres Strait Islander households in areas classified as very remote lacked access to working facilities for washing clothes or preparing food. Around 6% lacked access to working facilities for washing.⁹⁴ Leaks and blockages can take weeks or months to be fixed due to a lack of technicians or parts and limited access to some communities, particularly during the wet season. There is evidence of poor maintenance of existing wastewater treatment facilities.⁹⁵

Water quality monitoring in many areas is also inadequate. Across the country, Australian Drinking Water Guidelines provide clear guidance on standards for service providers,⁹⁶ but independent audits of compliance in remote communities are relatively infrequent and often limited in scope. When they are undertaken, their findings are rarely publicly disclosed, and often fail to take into account local water needs, which may vary depending on cultural values and preferences.

The value of water to communities can have strong indirect benefits. Improved access to swimming pools in remote Aboriginal communities, such as Jigalong and Burringurrah, has created significant health, societal, educational and emotional benefits for children.⁹⁷ In the Northern Territory, Queensland, South Australia and Western Australia, drinking water in remote communities is predominantly supplied from groundwater sources. Many of these groundwater sources have high concentrations of naturally-occurring minerals and chemical contaminants that affect water quality.⁹⁸

As a result, many remote communities have water quality levels that fail to meet the Australian Drinking Water Guidelines. For example, over a two-year period between 2012 and 2014, at least one remote Aboriginal community in Western Australia (of those which were tested) failed to meet the Australian Drinking Water Guidelines each month, with either E.coli or Naegleria bacteria detected in the water source.⁹⁹



Australia is not meeting Sustainable Development Goal 6

There is clear evidence that services in many of these remote communities do not meet United Nations' Sustainable Development Goal (SDG) 6: clean water and sanitation for all.¹⁰⁰ SDG 6 includes commitments to:

- achieve universal and equitable access to safe and affordable drinking water for all
- achieve access to adequate and equitable sanitation and hygiene for all
- support and strengthen the participation of local communities in improving water and sanitation management.¹⁰¹

Failure to meet the Goal has occurred despite the Australian Government being a signatory to the SDGs. Reporting has indicated that 100% of the population have access to safe water and sanitation, however this is acknowledged by the Australian water industry as inaccurate.¹⁰² These issues predominantly impact Aboriginal and Torres Strait Islander peoples.

Australian representatives provide advice to other Asia-Pacific countries on how they can meet SDG 6,¹⁰³ while issues with access to clean water and sanitation persist in our own backyard. Our overseas outreach programs are evidence that the Australian water industry and governments have the skills, expertise and resources required to do better by our own people, to address these issues, and to ensure Australia meets its international commitments by 2030.

174. Challenge

Some remote communities, many with predominantly Aboriginal and Torres Strait Islander populations, do not have access to reliable and safe water and wastewater services, while monitoring is often inadequate. Failure to address these issues will erode social and physical wellbeing, reinforce disadvantage, and undermine our national and international commitments and objectives.

When this will impact:

0-5

5-10

10-15

15+

Where this will impact:



9.5 Water oversight, regulation and decision making

At a glance

Water infrastructure is expensive, but its value is poorly understood. Decision making suffers from:

- poor performance reporting and data collection
- inconsistent governance and pricing
- a lack of transparency and user engagement
- weak long-term planning for our urban water supply.

This section discusses the impacts of these challenges and how we can address them.

Water infrastructure decision making requires more rigour

Water and wastewater infrastructure are capital intensive and long-lived. Water is expensive to store, treat and deliver and a high proportion of costs are fixed. It is therefore critical that the value of water infrastructure investments is defined and assessed and that investment decision making is sound. This means ensuring that the right water infrastructure is in place in the right locations at the right scale and at the right time.

The National Water Initiative, developed in 2004, provides objectives and guidelines for urban water management across the country. However, there is evidence that these principles have declining relevance. For many utilities in fast-growing cities, the National Water Initiative no longer provide useful targets for ongoing improvements. For some smaller regional utilities, principles such as full cost recovery may not be meaningful targets. In 2017, Infrastructure Australia called for a new urban water reform agenda, and amendment of the National Water Initiative to focus solely on rural water.¹⁰⁴

Contrary to National Water Initiative objectives, some capital grant programs have funded water infrastructure projects that do not demonstrate economic viability. This is despite funding being available to support planning and feasibility assessment of projects, and guidelines for project funding requiring a robust business case and demonstrated economic merit in order to proceed to full funding.¹⁰⁵

Identifying, quantifying and communicating the benefits of water infrastructure remains an area where further improvement is warranted. Better decision making on water infrastructure requires a better understanding of the benefits these projects can bring, and communication of these benefits through business cases.

Urban water performance reporting and data is not fit for purpose

Urban water data is compiled at the federal level by the Bureau of Meteorology through the annual National Performance Report (NPR) Framework, in collaboration with state and territory governments and the Water Services Association of Australia. The Bureau of Meteorology is currently undertaking a review of the NPR Framework.¹⁰⁶

The NPR largely focuses on network statistics, as opposed to measuring outcomes that matter to users. As the NPR Framework was agreed to over a decade ago, it no longer reflects contemporary sector objectives such as outcomes-based economic regulation, including utilities' performance in customer service and satisfaction. The structure and format of the NPR also makes it difficult to measure and report on Australia's progress against macro-level outcomes, such as the United Nations' Sustainable Development Goals. NPR indicators have not evolved with the changing needs of the urban water sector.¹⁰⁷

Information on the age, condition and capacity of urban water assets is limited. In most cities, this information is not publicly reported in a consistent manner. This makes it difficult to understand the challenges facing individual utilities, the relative priority and timeframe for replacing or upgrading ageing assets, or the total challenge facing Australia through ageing urban water infrastructure.

Accurate information on assets and service performance is important to ensure governments and operators make better decisions around the mix of preventive maintenance, repairs and replacement to get more out of existing assets for longer, and best match customer service levels with their willingness to pay.

175. Challenge

Information on water and wastewater services is not nationally consistent, reliable, insightful, or reflective of outcomes that matter to users. Inadequate information undermines effective decision-making, hides issues that impact users and limits understanding of the value of water and wastewater services.

When this will impact:

0-5

5-10

10-15

15+

Where this will impact:



Engagement is not sufficiently embedded in decision making processes

Decision making that incorporates community input and includes clear levels of service targets around water restrictions, sewer overflows, waterway health and triggers for future investment are important to allow adequate lead time to balance supply and demand, meet users' needs and minimise costs.

There remains significant scope for improving engagement across most utilities, many of which do not routinely and meaningfully embed users' interests and views in their decision making.

Historically, many utilities have focused on infrastructure-based solutions, which are then funded by users or through capital grants. In some cases, non-infrastructure solutions may have resulted in lower costs to the user. This is partly driven by a lack of appropriate oversight of utilities' investments, outdated approaches to service delivery, and a disconnect between decisions and customer preferences.

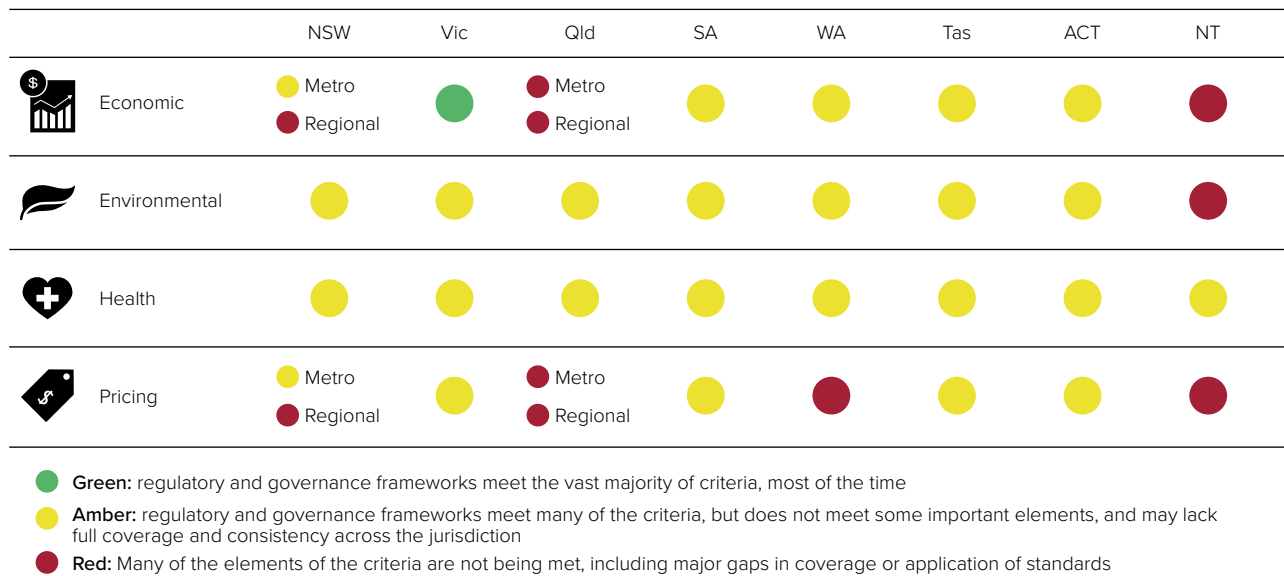
Consideration of customer preference has historically not been well captured within investment decision-making for utilities. This has started to change in Victoria, with an increased focus on customer engagement through regulatory frameworks, such as the performance, risk, engagement, management and outcomes (PREMO). The PREMO model places greater emphasis on the relationship between the utility and its customers. Utilities must demonstrate how forecast expenditure aligns with customer-driven outcomes and preferences.

Governance, regulation and pricing of urban water services can be improved

The separation of policy making, regulatory oversight and service delivery roles in the urban water sector was agreed under the 1994 Council of Australian Governments (COAG) Water Reform Framework. This agreement clarified the responsibility of governments to set clear, measurable and coherent policy objectives, with water authorities given the autonomy and incentives to make decisions that meet these objectives. This agreement also determined that service providers are to be monitored by, and accountable to, independent regulators.

In response to the 1994 COAG agreement, water utilities in metropolitan areas were corporatised but wholly-owned by government, as they remain today. The result is a notional separation which, in practice, is characterised by inherent conflicts as a result of governments being the shareholder, rule setter, operator and service provider.¹⁰⁸ Consequently, governance arrangements for urban water services do not always prioritise users' long-term interests, particularly where customer interests are mixed with other, short-term priorities. Even where arrangements are clear, these responsibilities can be blurred during challenging times, such as when there are concerns over water security or where bills are rising.¹⁰⁹

Infrastructure Australia's 2017 *Reforming urban water* paper found that no jurisdiction meets best practice across all forms of economic, environmental and health regulation, as shown in Figure 8.¹¹⁰ Across much of the country, regulation of regional and remote water delivery is weaker and of a lower standard than in metropolitan areas. Despite being agreed over two decades ago under the 1994 COAG Water Reform Framework, the fundamental principle of full cost recovery for urban water pricing is not being met universally across the urban water sector.¹¹¹

Figure 8: Infrastructure Australia traffic light summary of best practice regulation

Source: Infrastructure Australia analysis of Aither (2017) and Frontier Economics and Arup (2017)¹²

There is also a lack of clarity concerning the division of responsibility across the supply chain of water services. Water, wastewater and stormwater services in metropolitan areas are delivered by a combination of state government and local government owned water service providers, and local councils. Coordination between agencies is mixed, which frustrates the achievement of integrated water cycle management solutions.

The line between water-cycle functions are likely to be blurred over the next five to ten years. Advances in water treatment technology, as well as the challenges of growth, development and rising expectations for liveability are likely to drive water businesses and governments to reimagine the role of the water business. Providing clarity around the roles of governments, regulators and operators are likely to be vital for guiding decisions that are efficient and align with user preferences and willingness to pay.

176. Challenge

No jurisdiction meets best practice regulation and governance in urban water. Key issues include a lack of focus on user objectives, and limited coordination, accountability and independence of decision making. Issues with urban water oversight ultimately leads to poorer outcomes for users over the long term, and, without action, is likely to lead to rising bills in many areas.

When this will impact:

0-5

5-10

10-15

15+

Where this will impact:



Long-term urban water supply planning remains a challenge

Efficient investment in urban water supply security is in all users' interests. The costs of building and operating infrastructure will eventually be passed on to households, either directly as higher water bills, or through higher taxes or reduced government spending in other areas. A key challenge for the urban water sector is to minimise the long-term costs of maintaining an appropriate level of water supply security, while accommodating the uncertainty and pressure placed on urban water supplies by population growth and climate change. There are also other looming challenges such as the cost of managing wastewater systems under increasingly stringent environmental regulations.

Despite undergoing an extended period of drought at the beginning of the century, known as the Millennium Drought, Australia's urban water sector has largely failed to embed the lessons from this experience into planning and decision-making frameworks. With large parts of the country drought-declared and the onset of another El-Nino phase, this presents major issues for governments and utilities to manage over coming years.

In response to the Millennium Drought, governments made rushed decisions, based on mounting water security risks, to fund expensive desalination and water recycling schemes in Sydney, Melbourne, South-East Queensland and Adelaide at a combined cost of more than \$10 billion. A lack of proactive planning in water security plans meant that there

was insufficient time and capacity to pursue alternative supply options prior to committing to fund these investments. The Productivity Commission has assessed the majority of the investment in desalination capacity as potentially unnecessary or ill-timed.¹¹³

These assets have largely sat idle over recent years. The exception is Perth, where the desalination plant supplies around 48% of their water supply needs.¹¹⁴ However, they have provided an effective form of insurance against drought. After years of sitting idle, the Melbourne desalination plant has provided 76 gigalitres of potable water over the past three years, and the Victorian Government has ordered a further 125 gigalitres for 2019-20 in response to dropping water storages.¹¹⁵ The Sydney Desalination Plant also entered 'restart mode' in January 2019, and provided the first delivery of desalinated water in March 2019, as Sydney's combined dam levels dropped below the 60% trigger.¹¹⁶

Desalination is typically regarded as one of the most expensive forms of water supply, meaning it should be one of the last options considered. By contrast, many solutions that have little or no cost, including more adaptive pricing, disaggregated water meters and providing accurate usage data to users have not been fully explored in the water industry. Ensuring all options are on the table, and can be deployed when required, is likely to be essential for governments and operators to effectively and efficiently ensure secure supply over the long term.

177. Challenge

National objectives have not been updated since the Millennium Drought, despite clear lessons for the water sector during this period, and the need for long-term proactive and adaptive strategies to efficiently meet future needs. Being unprepared for another major drought could lead to reactive expenditure on additional supply assets, adding further costs to user bills and taxes.

When this will impact:

0-5

5-10

10-15

15+

Where this will impact:



9.6 Balancing competing needs for water

At a glance

Although water reforms have brought some benefits, many parts of the country have not reached a fair and sustainable balance between competing water needs.

This chapter considers the large role water plays in our economy, and how changing demands will impact some regional industries in the coming years. If we better study and plan for the coming changes, we can access large benefits and economic growth.

Water reforms have brought some benefits, but issues remain

Progress on water planning has been made over the past 30 years of rural water reform. Federal and state governments began implementing a number of initiatives that were specifically aimed at addressing environmental water needs in the 2000s.¹¹⁷ This included making provisions for environmental water in water planning instruments (water plans). Jurisdictions have also progressively introduced a cap-and-trade system. This approach identifies environmental water requirements, defines the total pool or share of water available for consumptive use in a given system, and provides a mechanism by which water within the consumptive pool could be re-allocated over time and between competing users.¹¹⁸

Despite substantial progress, issues with water management remain. Balancing economic, social, environmental and cultural needs for water in a manner that is scientifically robust and transparent remains a fundamental water policy challenge.

The implementation of water plans, which provide the framework for balancing competing needs for water, has been patchy.¹¹⁹ Some plans have been in place for many years, and are scheduled for review. Many surface water and groundwater plans still do not reflect best practice science and economics, and are failing to adequately balance the water needs of all stakeholders – particularly for environment and cultural purposes.¹²⁰

Extreme drought in recent years has resulted in outcomes that are inconsistent with the objectives of the National Water Initiative and the Murray-Darling Basin Agreement. For example, several fish death events occurred in New South Wales during December 2018 and January 2019. The cause of these events was a mix of extreme drought and excess upstream diversion of water for irrigation.¹²¹ In particular, decisions made by the New South Wales Government just prior to the initiation of the Murray-Darling Basin Plan (Basin Plan) enabled irrigators in the Barwon-Darling to access water

during and immediately after low-flow periods,¹²² which are likely to have exacerbated recent events. While events like this have occurred in the past, they have undermined public confidence in water management in the Murray-Darling Basin.

There are opportunities to better understand and integrate the social, cultural, and Indigenous water needs in regional Australia and the establishment of possible partnerships between environmental water managers and Aboriginal and Torres Strait Islander communities. Based on the recent federal Government commitments to improve water access for Aboriginal and Torres Strait Islander peoples in the Murray-Darling Basin,¹²³ these programs and initiatives could be extended across regional Australia.

The sustainability of water sharing arrangements for groundwater resources also need further consideration. Given increasing demand (and climate pressures) on surface water resources, groundwater use may increase in some parts of the country. As the interaction between surface water and groundwater use is still not fully understood, further research is required to ensure the sustainable use and management of both types of water resources.¹²⁴

Water management in the Murray-Darling Basin remains a challenge

The Basin Plan is the most significant Australia rural water reform, developed as a requirement of the Australian Government's *Water Act 2007*.¹²⁵ Progress has been made in the Murray-Darling Basin to address over-allocation, with over 2,000 gigalitres of water recovered for the environment through a mix of entitlement purchases and infrastructure investments.

Despite these achievements, the Basin Plan remains controversial and debate over the implementation has created significant uncertainty for all users and stakeholders. Shortcomings in the water management compliance and enforcement system have also been exposed,¹²⁶ and have undermined confidence in the Basin Plan.

Many of these issues have manifested in the unregulated Barwon-Darling system, which includes the Menindee Lakes, where fish death events recently occurred.¹²⁷ In July 2017, serious concerns were raised about the appropriateness of water sharing plan rules in the Barwon-Darling along with compliance with licence conditions.¹²⁸ This prompted a number of investigations,¹²⁹ and has resulted in a series of commitments made by the New South Wales Government aimed at enhanced metering and compliance, improved transparency and greater protection for environmental flows.¹³⁰ There have also been Basin-wide agreements aimed at enhancing compliance reflected in recent Murray-Darling Basin Ministerial Council agreements.¹³¹

Compounding this challenge is the lack of quantitative evidence of the outcomes that have been achieved through an extended period of water reform. To properly assess the benefits of water reform and inform next steps, there is an opportunity to move beyond a focus on actions, to a quantitative assessment of outcomes.

A lack of transparency on the science, data and modelling assumptions that informs decisions about trade-offs between competing uses of water in the Murray-Darling Basin has clouded the debate and slowed progress. While balancing economic, social, environmental and cultural needs for water in the Murray-Darling Basin is complex, there is an opportunity to better communicate decision making in order to facilitate productive discussions between irrigators, urban users, Indigenous communities and environmental groups.

Restoring the balance in the Murray-Darling Basin

To meet the requirements of the Basin Plan, the Australian Government is recovering water entitlements to restore the balance between consumptive water use and the environment in the Murray-Darling Basin. The basin-wide water recovery target was set at 2,750 gigalitres (expressed as a long-term average annual yield) when the Basin Plan was introduced in 2012 but was subsequently reduced to 2,680 gigalitres in June 2018 following a review of the northern Basin's environmental water requirements.¹³²

The recovery of water entitlements by the Australian Government is conducted in accordance with the Australian Government's *Water Recovery Strategy*, which was released in June 2014. Under the strategy, the Australian Government has committed to prioritising infrastructure investment and has legislated a 1,500 gigalitre cap on surface water purchases.¹³³

The rapid expansion of water buybacks between 2008 and 2012, coupled with ongoing drought, led to considerable community opposition. Many community groups noted considerable hardship and that the viability of some irrigation districts was undermined as a result of these buybacks.¹³⁴

As of 30 November 2018, the Australian Government has recovered or contracted 2,118 gigalitres of surface water against the 2,680 gigalitre water recovery target.

This equates to over 2,700 gigalitres in water entitlements that have been recovered across many of the 150 water entitlement classes that exist across the Murray-Darling Basin.¹³⁵

Overall, the Australian Government has dedicated \$13 billion to implement the Basin Plan and associated activities, of which \$10 billion has been allocated to environmental water recovery.¹³⁶ To date, the Australian Government has spent \$2.36 billion on direct water entitlement purchases and over \$4 billion on infrastructure funding projects (in exchange for water entitlements).¹³⁷

Significant work remains to fully implement the Basin Plan. There is ongoing debate about the best ways to meet the remainder of the water recovery target, and significant uncertainty associated with the sustainable diversion limit adjustment mechanism and associated projects. The Productivity Commission's recent assessment cast doubts over whether the Basin Plan can be fully implemented by 2024.¹³⁸

However, the Basin Plan has provided the opportunity to better balance the needs between consumptive use and the environment in the Murray-Darling Basin while increasing the productivity of irrigated agricultural producers and the efficiency of water delivery systems.



178. Challenge

Striking an efficient and sustainable balance between competing needs from Australia's water resources has proved problematic. Progress against past reform efforts has been significant but patchy. Failure to strike an appropriate balance in water management can lead to substantial and lasting economic, social, environmental and cultural costs.

When this will impact:



Where this will impact:



Water markets underpin substantial economic activity

Despite ongoing challenges and recent criticism, some benefits of water reform are evident in productive water markets. Water markets have become an integral part of Australia's regional economies and underpin production and growth in these regions. The structure of the Australian water markets and the various water products emerging from these markets allow agricultural producers and other industries to flexibly meet their water requirements and balance risks and returns.¹³⁹

Australia's water markets in the southern Murray-Darling Basin are considered some of the world's most sophisticated in their capacity to support economic activity. Water markets there have provided a valuable and important tool to support business operations and manage the risks of water supply variability.

The southern Murray-Darling Basin is experiencing an investment boom in permanent horticulture,¹⁴⁰ and cotton – a development that is also spreading outside the Murray-Darling Basin to Tasmania,¹⁴¹ and northern Queensland. As a result of this investment boom, the value of water entitlements in the southern Murray-Darling Basin has tripled over the last three to five years. In 2017-18, the total market value of all major surface water entitlements on issue across the southern Murray-Darling Basin was estimated to be approximately \$17 billion,¹⁴² up from just over \$7 billion in 2013-14.¹⁴³

Changing water demand will impact some regional industries

The growth in permanent horticulture and cotton is a sign that the water market is working effectively in moving water to higher valued uses, as intended through various water reform agreements. However, changes in water demand are leading to concerns about the availability of sufficient water to meet water demands of perennial horticultural developments in dry periods, and there is limited information on water demand by industry upon which investors and existing businesses can make informed decisions.

To meet the needs of new permanent horticulture in the southern Murray-Darling Basin, water will likely be sourced from industries with a lower willingness to pay for water (such as dairy and rice) and this will require both short and long-term adjustment within irrigation areas. Thus, the rate of change in agricultural production and cropping changes and its impact on irrigation and water delivery infrastructure within existing irrigation areas (e.g. Goulburn-Murray Irrigation District and Murray Irrigation Limited) needs to be considered.¹⁴⁴

The change in crop types and movement of water use between regions, combined with the requirement to deliver large volumes of environmental water, has changed historic water demands and usage patterns. This has particularly increased the complexity for river operators in the Murray River to meet competing water demands at critical peak irrigation periods and in the context of physical constraints in the system such as the Barmah Choke.¹⁴⁵ Irrigators downstream remain concerned about the likelihood of any shortfall in peak demand and how it will be met.

Despite these challenges, water markets are active and information about these markets is generally available. Available information is generally transparent enough to inform investment, although there are information asymmetries between water market participants and intermediaries, and there is a lack of consistency in the way that the state governments record and publish water trade data. In addition, water market participants in some jurisdictions frequently have to endure extensive trade processing times, particularly if trades involve more than one jurisdiction.

Ensuring that the market functions effectively and that reliable water market information is readily available will be particularly important in the short-term given the extreme drought conditions which have led to a rapid increase in allocation prices in the southern Murray-Darling Basin (up to \$700 per megalitre in the Murrumbidgee in January 2019). If drought conditions prevail, they will increase adjustment pressure across a range of irrigation businesses and industries.

179. Challenge

Changes in water demand over coming years could affect economic activity and infrastructure requirements in some regional areas. These changes may be exacerbated in drier years. In communities where there is a decline in economic activity, unemployment could rise and some assets may be underutilised or stranded, reducing productivity and growth.

When this will impact:

0-5

5-10

10-15

15+

Where this will impact:



Better evidence on water could underpin growth and employment

The rapid investment boom in irrigated agriculture in Australia has been highly concentrated in the Murray-Darling Basin where water resources are scarce. As water prices increase in the Murray-Darling Basin, investors are increasingly looking elsewhere in Australia for opportunities. As a result, there is potential for growth in both existing and new irrigation regions where water and associated infrastructure and supply chains are available and conditions are conducive for investment.

However, the challenge is in identifying viable opportunities and providing access to or augmenting existing water infrastructure whilst aligning it with broader infrastructure requirements and business needs. Meeting this challenge often requires significant planning, assessment and coordination. Investors in irrigated agriculture will consider a host of factors when deciding where to invest in irrigated agriculture (not just water costs) and all conditions must be conducive to achieving a reasonable risk weighed return on investment.

This challenge is highlighted in parts of northern Australia where water resources often remain untapped. This under-development is partially driven by the inability to identify suitable industries that can thrive in challenging climatic conditions, as well as a

lack of infrastructure to support new businesses and associated supply chains. Although northern Australia is ideally located to the emerging Asian markets and has an abundance of water – which remains largely unallocated – further research is required to determine appropriate crop types and growing techniques to develop viable and sustainable agricultural industries.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO), has conducted extensive research into the appropriate crop types and growing techniques in the Ord region of northern Western Australia and the Northern Territory, that has illustrated that some industry development is feasible. In the Ord region, expansion in irrigated agriculture has occurred since 2012, when an additional 7,400 hectares was released for irrigation. Also, further soil and water investigations near Kununurra identified an additional 8,900 hectares suitable for fodder or perennial crop production.¹⁴⁶ In 2014, the Western Australian Government contributed to the expansion of irrigated agriculture in the Kimberley by providing resource assessment information for 9,070 hectares of the Mantinea Development area, 30 km north-west of Kununurra.¹⁴⁷ Despite the valuable work by the CSIRO, opportunities for growth will require further consideration of broader regional development plans and strategy to realise these opportunities.

180. Opportunity

Water infrastructure could help to unlock economic opportunities, supported by evidence-based assessments that take into account potential benefits, costs and risks for industry, local communities and the environment. Further evidence on water-led opportunities could help to identify productive investments that can support growth, employment and broader public benefits.

When this will impact:

0-5

5-10

10-15

15+

Where this will impact:



9.7 Challenges and opportunities

Changes facing urban water

168. Opportunity

Imminent renewals of ageing assets bring an opportunity to rethink how water and wastewater services are delivered, and to use technology to improve efficiency and levels of service. Renewals could help to avoid overinvestment in large, long-lived traditional water and sewerage assets, and make the system more adaptable to future trends and shocks.

When this will impact:



Where this will impact:



169. Challenge

The urban water sector faces considerable risks, including the impacts of climate change, population growth, ageing assets, and changing needs and expectations from users. Failure to adequately address these challenges could lead to rising water bills, as well as exposing users to risks of declining service quality and reliability.

When this will impact:



Where this will impact:



Sustainable water for liveable cities

170. Opportunity

In increasingly dense cities, water will need to play a growing role in supporting our cities as desirable places to live, work and visit over coming years. Better understanding water's role in urban environments could enhance quality of life, open new spaces for recreation, natural regeneration and cultural practices.

When this will impact:



Where this will impact:



171. Opportunity

Governments and utilities have not fully explored options for greater efficiency by households and industry, including potable reuse. More efficient household usage and industry service provision could provide substantial benefits for users at low cost.

When this will impact:



Where this will impact:



Water and wastewater in regional and remote communities

172. Challenge

Regional and remote utilities face considerable challenges, including reliance on a single source of supply, limited resources, a lack of scale and unreliable information on services. Failing to adequately address regional water challenges could lead to heightened quality or reliability risks and a deterioration of liveability in regional and remote areas.

When this will impact:



Where this will impact:



173. Challenge

Many regional and remote utilities face mounting costs to maintain, renew or upgrade ageing water and wastewater assets, but have limited funding through grants or revenue. Where funding is provided, it is often inefficient or lacks transparency. Failure to provide sustainable funding could lead to declining reliability and quality for regional customers, heightened risks of asset failure, and a mounting funding backlog.

When this will impact:



Where this will impact:



174. Challenge

Some remote communities, many with predominantly Aboriginal and Torres Strait Islander populations, do not have access to reliable and safe water and wastewater services, while monitoring is often inadequate. Failure to address these issues will erode social and physical wellbeing, reinforce disadvantage, and undermine our national and international commitments and objectives.

When this will impact:



Where this will impact:



Water oversight, regulation and decision making

175. Challenge

Information on water and wastewater services is not nationally consistent, reliable, insightful, or reflective of outcomes that matter to users. Inadequate information undermines effective decision making, hides issues that impact users and limits understanding of the value of water and wastewater services.

When this will impact:



Where this will impact:



176. Challenge

No jurisdiction meets best practice regulation and governance in urban water. Key issues include a lack of focus on user objectives, and limited coordination, accountability and independence of decision making. Issues with urban water oversight ultimately leads to poorer outcomes for users over the long term, and, without action, is likely to lead to rising bills in many areas.

When this will impact:



Where this will impact:



177. Challenge

National objectives have not been updated since the Millennium Drought, despite clear lessons for the water sector during this period, and the need for long-term proactive and adaptive strategies to efficiently meet future needs. Being unprepared for another major drought could lead to reactive expenditure on additional supply assets, adding further costs to user bills and taxes.

When this will impact:



Where this will impact:



Balancing competing needs for water

178. Challenge

Striking an efficient and sustainable balance between competing needs from Australia's water resources has proved problematic. Progress against past reform efforts has been significant but patchy. Failure to strike an appropriate balance in water management can lead to substantial and lasting economic, social, environmental and cultural costs.

**When this
will impact:**



**Where this
will impact:**



179. Challenge

Changes in water demand over coming years could affect economic activity and infrastructure requirements in some regional areas. These changes may be exacerbated in drier years. In communities where there is a decline in economic activity, unemployment could rise and some assets may be underutilised or stranded, reducing productivity and growth.

**When this
will impact:**



**Where this
will impact:**



180. Opportunity

Water infrastructure could help to unlock economic opportunities, supported by evidence-based assessments that take into account potential benefits, costs and risks for industry, local communities and the environment. Further evidence on water-led opportunities could help to identify productive investments that can support growth, employment and broader public benefits.

**When this
will impact:**



**Where this
will impact:**



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