

Department of Planning, Industry and Environment

NSW Water Strategy

August 2021



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Acknowledging Aboriginal people

The NSW Government acknowledges Aboriginal people as Australia's first people practicing the oldest living culture on earth and as the Traditional Owners and Custodians of the lands and waters. We recognise the intrinsic connection of Traditional Owners to Country and acknowledge their contribution to the management of landscapes, water and other natural resources across NSW.

NSW Department of Planning, Industry and Environment understands the need for consultation and inclusion of Traditional Owner knowledge, values and uses in water planning to ensure we are working towards equality in objectives and outcomes. The department is committed to continuing future relationships and building strong partnerships with Aboriginal people.

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Contents

Minister’s foreword	4
<hr/>	
Our water, our future	6
<hr/>	
We know how vital water is	7
We have reformed how we manage water in NSW—but there is more to do	7
The NSW Water Strategy will prepare NSW for the future	8
Integrated water cycle management strategies	13
Sharing and managing our water	16
<hr/>	
Water is essential to our environment, economy and communities	17
We need to do things differently	19
We need to do more with less to support economic growth	24
Our water resources and how we share them	26
<hr/>	
How is water shared in NSW?	30
The NSW water sector	32
Recent water reforms	35
NSW Water Strategy: Towards 2050	38
<hr/>	
What we need to achieve	39
Priority 1: Build community confidence and capacity through engagement, transparency and accountability	42
Priority 2: Recognise First Nations/Aboriginal People’s rights and values and increase access to and ownership of water for cultural and economic purposes	56
Priority 3: Improve river, floodplain and aquifer ecosystem health, and system connectivity	66
Priority 4: Increase resilience to changes in water availability (variability and climate change)	80
Priority 5: Support economic growth and resilient industries within a capped system	96
Priority 6: Support resilient, prosperous and liveable cities and towns	106
Priority 7: Enable a future focused, capable and innovative water sector	128
How will progress be evaluated and reported?	132
<hr/>	
Monitoring, evaluation and reporting of water management outcomes	133
Implementing the NSW Water Strategy	133
Attachments	134
<hr/>	
Attachment 1	135
Attachment 2	147



Melinda Pavey
Minister for Water, Property and Housing

Minister's foreword

Water is our most vital resource and is essential to our health and wellbeing. Every person in NSW—wherever they live—has a right to a secure water supply in their communities that is fit for purpose to build successful industries, support jobs growth and make our cities, towns and regions attractive places to live.

Water is also critical to a healthy natural environment, supporting diverse ecosystems and habitats that maintain our unique native flora and fauna. Wetlands, estuaries and other waterways across NSW are both internationally-significant environmental assets and important visitor attractions for regional communities. Water also sustains the parks, bushland, open spaces and recreational activities that we all enjoy.

Water is deeply entwined with Aboriginal culture—providing food, kinship, connection, stories and healing. Healthy waterways are essential to the culture and wellbeing of Aboriginal communities across NSW.

We live in the driest inhabited continent on earth and, right across the nation, our water resources are under increasing pressure from a growing population, changing industry and community needs and a more variable and changing climate. In NSW, we have also recently been dealing with an extended period of very severe drought, followed by severe and destructive flooding in some parts of the state.

The NSW Government has taken action to improve how we share, manage and use water. But, as the recent drought has shown us, water supplies are vulnerable in some places and many of our waterways are in a stressed state.

We need to plan ahead and better prepare ourselves for a future where water sources, services and supplies are likely to come under even greater stress.

The NSW Water Strategy is the first 20-year water strategy for all of NSW and it will put water on the same footing as other essential state resources and services, such as transport. This means that, as we plan for the future in our cities, towns and regions, water will be ‘front and centre’ in the land use, infrastructure and investment decisions we make, ensuring forward-thinking and integrated planning for both drought and flood management.

At the state-wide level, this strategy proposes more than 40 actions across seven priority areas, focused on improving the security, reliability, quality and resilience of the state’s water resources—and on continuing to rebuild community confidence in water management in NSW. The strategy includes commitments to work with Aboriginal communities to increase their access to water and new actions at the landscape and catchment scale to improve river and ecosystem health.

It includes fresh approaches to reduce risks to town water and sewerage services, use water more efficiently, diversify sources of water supply and increase resilience to a changing climate in our cities and towns. Under our new Town Water Risk Reduction Program we are working collaboratively with councils and local water utilities to understand what can and should be done to reduce risks in regional NSW.

We are also making more information and data readily and easily available to the public, piloting new technologies and innovative solutions to increase our water options and we are making sure that the state’s water workforce has the skills and capabilities it needs to meet future challenges—especially in regional NSW.

These initiatives are in addition to other new policy work that we are consulting with the community about, such as the current review of coastal harvestable rights.

The NSW Government will also continue to protect statutory rights and water entitlements, noting that compensation may be payable in certain circumstances.

The NSW Water Strategy is the overarching state guide for a suite of 12 regional and two metropolitan water strategies to maintain the resilience of the state’s water services and resources over the coming decades. These place-based strategies will identify the right mix of infrastructure, policy and planning decisions for each region. The NSW Government is already making significant investments in regional water infrastructure, and these strategies will provide the blueprints for future investments.

To support these strategies, we have invested in new modelling methods and datasets that give us a much better understanding of likely future climate conditions—an important advance in water planning for NSW.

We have listened to the many community members and stakeholder groups who provided us with valuable feedback during consultation on the draft Strategy. Your feedback has helped strengthen the NSW Water Strategy, and we look forward to working with you on its implementation.

Together, this suite of strategies will make sure we have the organisational arrangements, information, skills and tools we need to tackle the challenges facing our water resources over the long term. They will set a clear direction towards achieving our vision for NSW as a place where sustainable water resources are available for thriving people, places and ecosystems, both now and for future generations.



Our water, our future

Water is our most precious and valuable resource.

The NSW Government is taking action to improve the security, reliability, quality and resilience of the State's water resources, while improving our landscapes and river health.

We are committed to ensuring that communities in regional and metropolitan NSW have the water they need to thrive, grow and enjoy—now and for future generations.

Photography

Image courtesy of Destination NSW.
Lachlan River, Condobolin.

We know how vital water is

Across NSW—from our smallest towns to our big cities, from our coasts to mountains and outback—people, communities and businesses know how vital water is to our way of life and wellbeing.

Every person in NSW has a right to expect access to safe drinking water for use at home and water security in their communities to sustain job creating businesses and healthy natural environments. This is particularly important for regional NSW, where economies are often built on water essential industries such as agriculture, food processing and manufacturing, resources and tourism.

Our rivers, creeks, wetlands, floodplains, estuaries and groundwater sources support almost every aspect of our daily lives: from the water we drink and use in our homes to water for crops and activities that support our industries and economy. They are also vital environmental assets, sustaining natural ecosystems and habitats that not only support our unique flora and fauna, but also help to make our lives healthier and more productive and our communities more attractive and amenable places to live.

Water is also at the heart of Aboriginal people's connection to Country and culture, and First Nations are acknowledged as the traditional custodians of all of NSW's water resources. First Nations and Aboriginal people have rights and a moral obligation to care for water under their law and customs.

Like many places around the world, our water resources are coming under increasing pressure from a combination of population growth, changing industry and community needs and a more variable and changing climate. In NSW, we have also been dealing with an extended period of severe drought, followed by severe flooding in some places.

Wherever we live in NSW, we all know the value of clean, safe and healthy water resources—and their importance to the future of our communities and our state. To secure our water future, we need to work together and start preparing now for the challenges ahead.

We have reformed how we manage water in NSW—but there is more to do

The NSW Government has put in place plans for sharing water and established clear water rights and a market for trading these rights. These reforms provide for the sustainable, equitable and efficient allocation of water and for achieving better economic, cultural, social and environmental outcomes.

But the recent drought, which followed on quickly from the Millennium Drought, exposed vulnerabilities in regional and metropolitan water services that we cannot ignore. Addressing and minimising future water service risks to NSW communities requires some fundamental changes in thinking about how we access, manage and use water. We need to ensure that we have the right organisational arrangements in place to lift the performance of the water sector across NSW to ensure high-quality water service delivery for the critical needs of communities and the

environment, and to improve our resilience to extreme events including drought, bushfires and flooding.

This includes managing our landscapes and catchments better to keep water in the landscape, improve the health of our river and groundwater systems, manage flood risk and improve community and industry resilience to drought. This means working with communities on land management initiatives to support sustainable land use practices that harness the knowledge of local people.

We also need to improve how we plan for water in the landscape and manage the impacts of flooding through flood risk management, emergency management and land use planning to mitigate the impacts of floods on lives and livelihoods.

We need to be thinking longer term. We need to prepare now for a future where water sources and services may come under even greater stress. We need to use the knowledge we have gained during recent droughts and floods to find smarter, better ways of managing our water resources and landscapes and improving water service delivery to communities.

We need to make decisions now about how, where and when to direct water-related investment and infrastructure.

While we can't predict the future, we can develop plans to achieve our objectives that are flexible and can adapt to future uncertainties. We can do this by contemplating how robust our plans may be under a range of plausible future scenarios.

The NSW Water Strategy will prepare NSW for the future

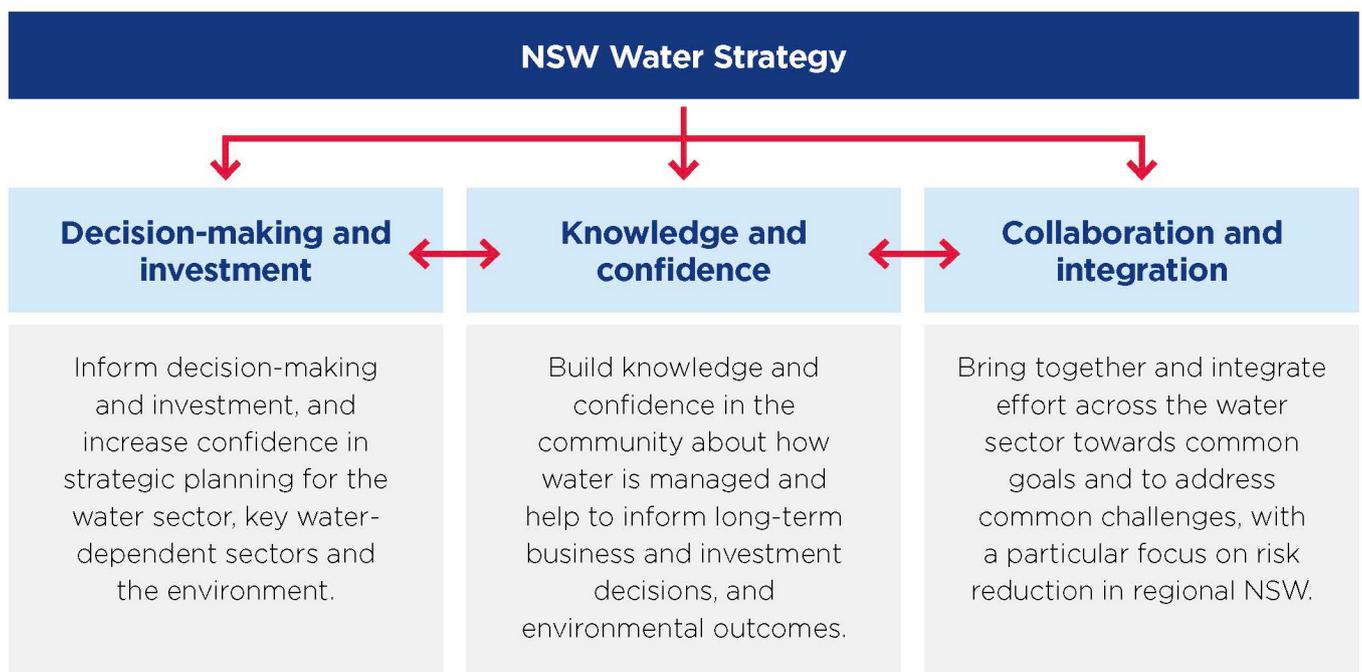
The NSW Water Strategy is the first 20-year water strategy for all of NSW, and it will put water on the same footing as other essential state resources and services, such as transport.

The NSW Water Strategy will tackle the key challenges and opportunities for water management and service delivery across the whole of the state and set the strategic direction for water service delivery and resource management in NSW over the long-term. It will:

- **set high level objectives and principles** to guide water service delivery and management across NSW

- **build on the progress made** from previous reforms and set the direction to keep improving
- **identify key challenges, opportunities, strategic priorities and actions** for the whole of NSW
- **clearly articulate the water management and service delivery framework and policy context for NSW**, including how the Murray-Darling Basin Plan and state-wide, regional, metropolitan and local strategic water policy and planning frameworks work together.

Figure 1. What the NSW Water Strategy will do



A comprehensive set of integrated water strategies for NSW

The NSW Water Strategy is part of a suite of long-term strategies being developed by the NSW Government to maintain the resilience of the state’s water services and resources over the coming decades. This state-wide, high-level strategy works in tandem with 12 regional water strategies and two metropolitan water strategies, the Greater Sydney Water Strategy and the Lower Hunter Water Security Plan.

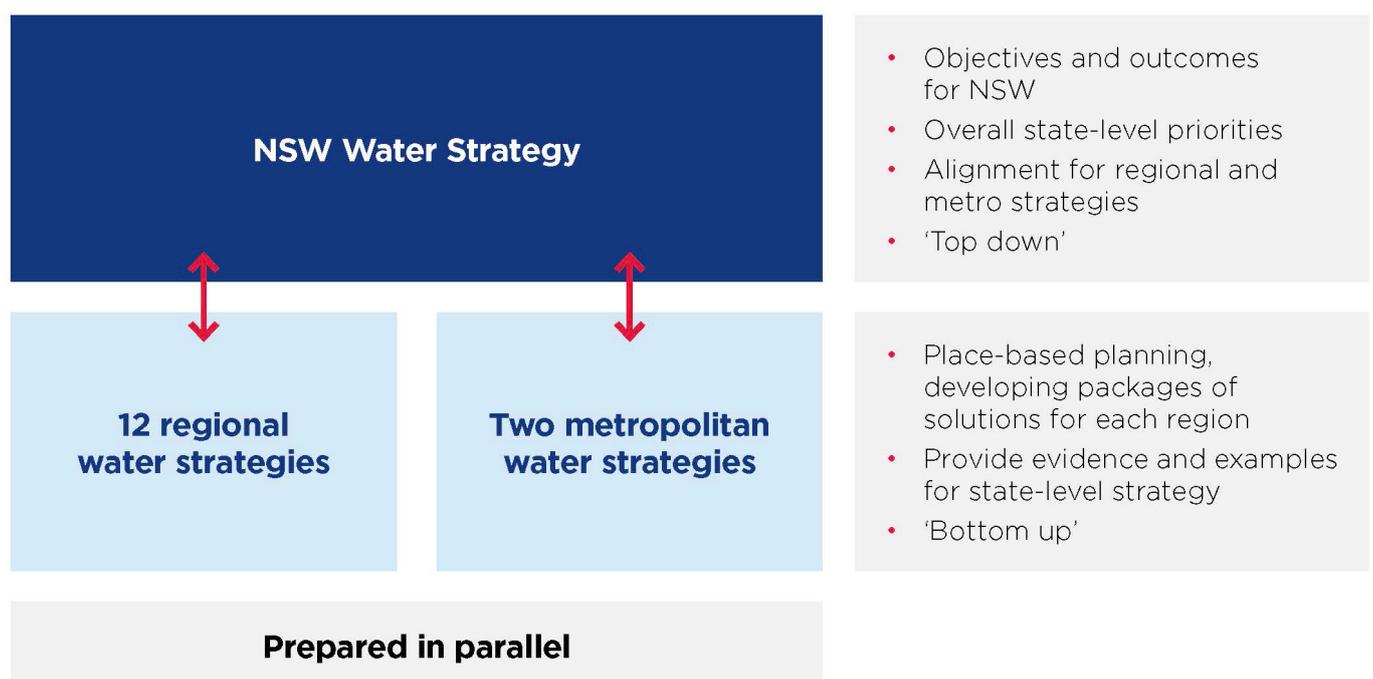
These strategies will set the direction for and inform the best mix of water-related policy, planning and infrastructure investment decisions over the next 20 to 40 years. They aim to balance different and changing water needs and make sure that households, businesses, towns and cities, communities and the environment have access to the right amount of water for the right purpose at the right times. Building on the NSW Government’s record of action and reform in water management, these strategies bring together all the knowledge, tools, experience and solutions we have—and apply the best and latest evidence—to use and share our water wisely, responsibly and sustainably into the future.

Additionally, the development of an Aboriginal Water Strategy and Groundwater Strategy are key actions from the NSW Water Strategy that will apply state-wide and complement these place-based strategies.

The NSW Water Strategy and the regional and metropolitan water strategies do not replace statutory instruments (such as water sharing plans). They set the agenda for water management and service delivery into the future and are designed to contribute to water management outcomes aligned with the objects and principles of the *Water Management Act 2000*, the NSW Government’s priorities and NSW’s commitments under the Murray-Darling Basin Plan, the National Water Initiative, and other commitments such as the *Great Artesian Basin Strategic Management Plan*.

The NSW Water Strategy and the regional and metropolitan water strategies are being developed in parallel (Figure 2). This allows us to make sure there is alignment between the overall state-level priorities in the NSW Water Strategy and the place-based solutions being developed for each region. It also allows the NSW Water Strategy to be informed by the evidence and examples that are emerging through our work with communities at the regional level.

Figure 2. How the NSW Water Strategy and regional and metropolitan water strategies interact



Regional water strategies

Twelve new regional water strategies are being developed by the NSW Government that will bring together the best and latest climate evidence with a wide range of tools and solutions to plan and manage the water needs in each NSW region over the coming decades. The strategies look out over the next 20 to 40 years and determine how much water a region will need to meet future demand, the challenges and choices involved in meeting those needs and the actions available to manage risks to water availability. The strategies will aim to balance different water needs, inform investment decisions, and deliver the right amount of water, of the right quality for the right purpose at the right times.

Regional water strategies will set out a long-term 'roadmap' of actions to deliver five objectives:

1. **Deliver and manage water for local communities**—improve water security, water quality and flood management for regional towns and communities
2. **Enable economic prosperity**—improve water access reliability for regional industries
3. **Recognise and protect Aboriginal water rights, interests and cultural values**—including Aboriginal heritage assets
4. **Protect and enhance the environment**—improve the health and integrity of the environmental systems and assets, including by improving water quality
5. **Affordability**—identify least cost policy and infrastructure options.

The regional water strategies are being developed in stages, with the aim of having a final strategy in each region by the end of 2022. Each strategy will go on public exhibition with opportunities for feedback and discussion. The final strategy for each region will include a final package of actions approved by the NSW Government and a plan for implementation with clear time frames and defined roles and responsibilities for delivering each action.

Metropolitan water strategies

The Greater Sydney Water Strategy will replace the existing Metropolitan Water Plan 2017 and provide confidence in the security of Greater Sydney's water supply to 2040 to support economic growth, environmental protection and community wellbeing. It will support delivery of the *Greater Sydney Region Plan* and identify the best value and most affordable investment pathways for water infrastructure decisions. It will be based on an integrated water cycle management approach, consistent with the National Water Initiative, and identify any policy or regulatory changes required for implementation.

Development of the Greater Sydney Water Strategy is being guided by customer feedback, with public exhibition and consultation planned for the third quarter in 2021.

The Lower Hunter Water Security Plan will also be consistent with the National Water Initiative and will include a portfolio of supply and demand measures to ensure there is enough water to supply homes, businesses and industry in the region for the future and during drought. The Lower Hunter Water Security Plan is being developed with customer feedback and was released for public exhibition in August 2021.

Photography

Image courtesy of Destination NSW.
Parramatta River, Western Sydney.

Figure 3. Map of NSW water strategy regions



The Department of Planning, Industry and Environment is working with other state agencies and local government to ensure the water strategies align with key NSW economic, infrastructure and land use strategies, plans and programs shown in Figure 4 including the:

- *NSW State Infrastructure Strategy 2018-2038*¹
- *Nine Regional Plans 2017*²
- *NSW Regional Development Framework*³
- *2019 NSW 2040 Economic Blueprint*⁴
- *Greater Sydney Region Plan 2018*⁵
- *Future Transport Strategy 2056*⁶
- *Marine Estate Management Strategy 2018-2028*⁷

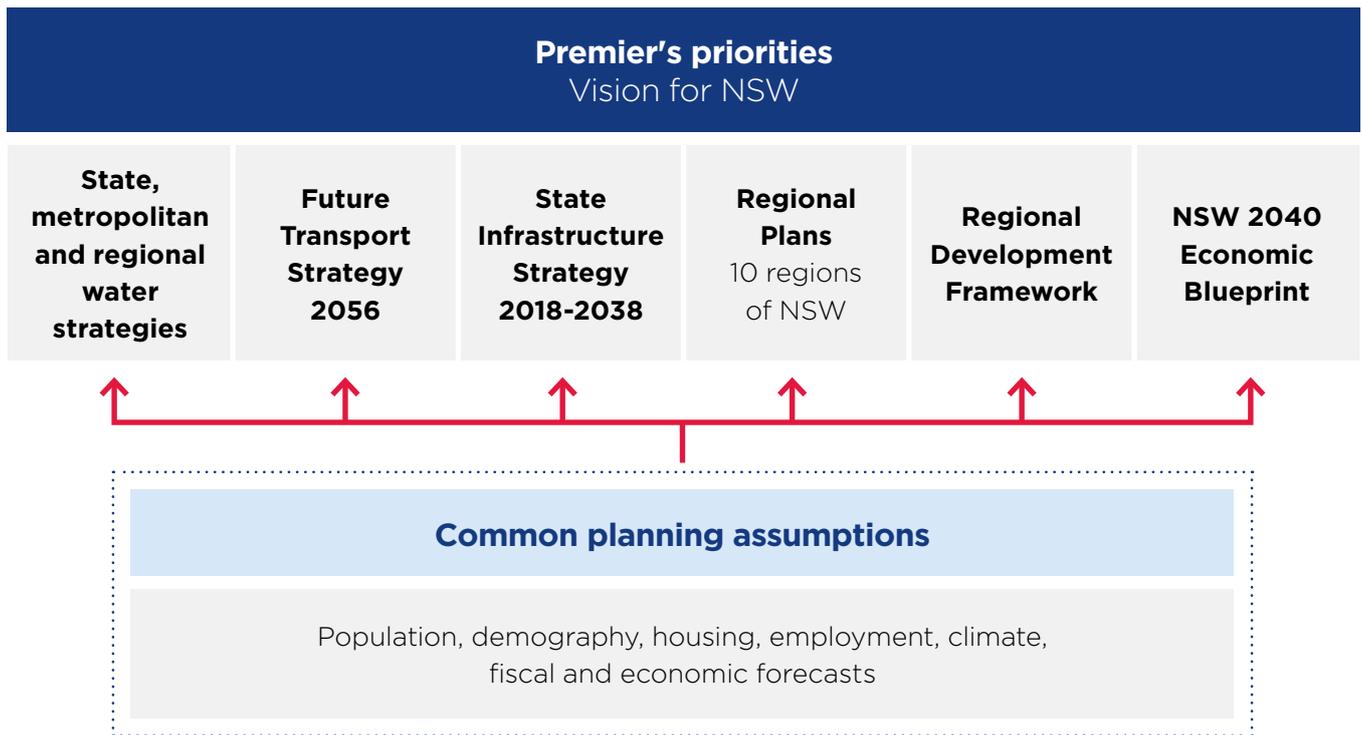
- *NSW Electricity Infrastructure Roadmap*
- *20-year Economic Vision for Regional NSW.*

All water strategies are also being informed by key reports including the Australian Government Productivity Commission’s draft report on National Water Reform,⁸ the ACCC’s Murray-Darling Basin water markets inquiry,⁹ and the NSW Productivity Commission’s Productivity White Paper.¹⁰

A set of common planning assumptions underpin all of these plans and strategies. This coordinated governance will make sure that water policy and investment decisions are robust, complementary and fully integrated with other plans.

1. www.nsw.gov.au/projects/nsw-infrastructure-strategy-2018-2038
2. www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans
3. www.nsw.gov.au/regional-nsw/regional-development-framework
4. www.treasury.nsw.gov.au/nsw-economy/nsw-2040-economic-blueprint
5. www.greater.sydney/district-plans
6. future.transport.nsw.gov.au/
7. www.marine.nsw.gov.au/marine-estate-programs/marine-estate-management-strategy
8. www.pc.gov.au/inquiries/current/water-reform-2020#report
9. www.accc.gov.au/focus-areas/inquiries-ongoing/murray-darling-basin-water-markets-inquiry
10. www.productivity.nsw.gov.au/white-paper

Figure 4. Key NSW strategic plans and common planning assumptions



Source: Infrastructure NSW, *State Infrastructure Strategy 2018-2038*, adapted by Department of Planning, Industry and Environment

Integrated water cycle management strategies

Local water utilities are responsible for undertaking long-term strategic town water services planning for their communities. This includes setting service and investment priorities with reference to state and regional water strategies. An integrated water cycle management strategy is a 30-year plan developed by local water utilities that identifies

an integrated water, sewerage and stormwater supply scenario that provides the best value for money on the basis of social, environmental and economic considerations. Figure 5 shows the relationship between all water strategies and plans, and how they work together to form the water policy and planning context for NSW.

The National Water Initiative

NSW is committed to implementation of the National Water Initiative, which is the national blueprint for water reform agreed by the Council of Australian Governments in 2004.

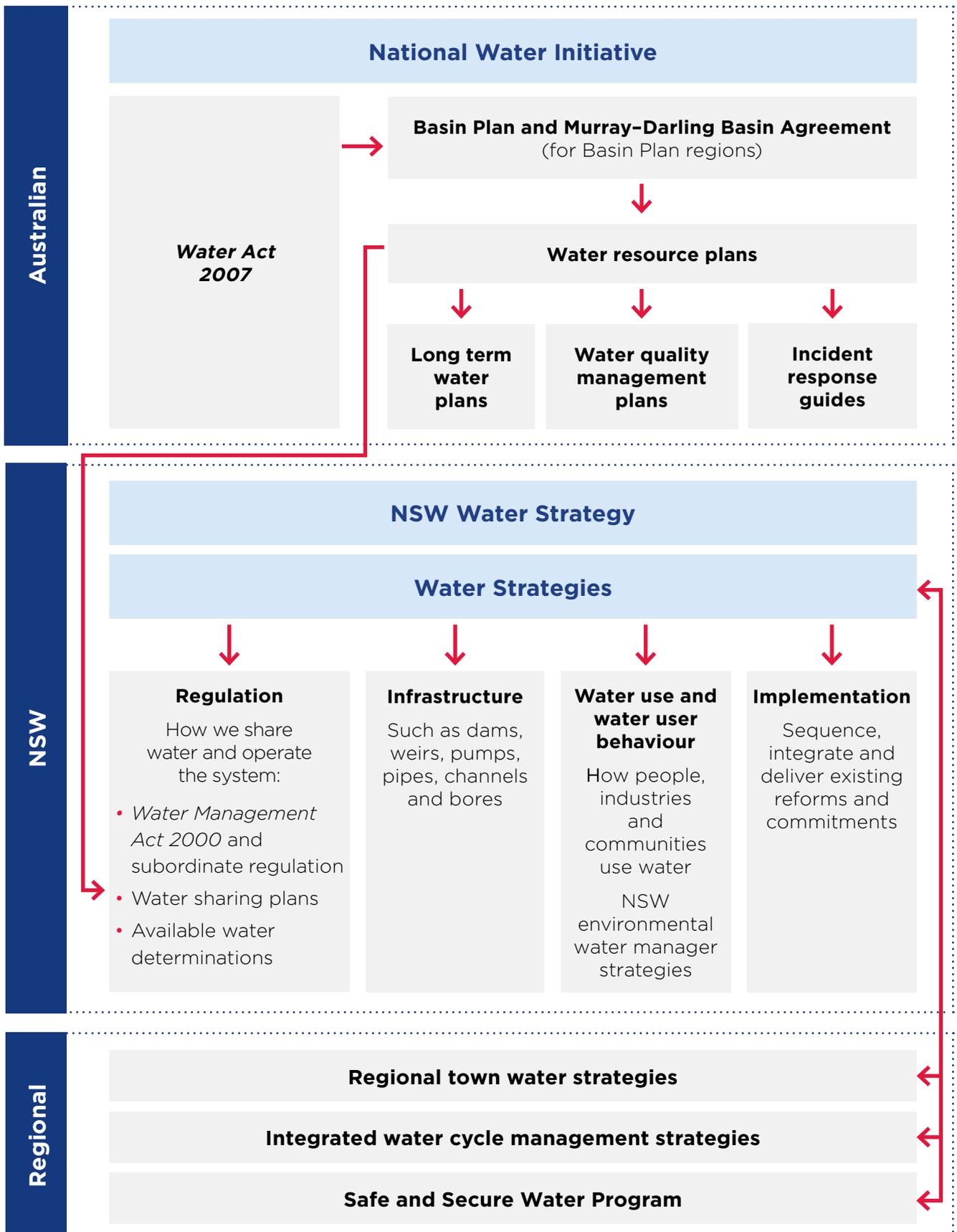
Under the National Water Initiative, governments commit to:

- prepare comprehensive water plans
- achieve sustainable water use in over-allocated or stressed water systems

- introduce registers of water rights and standards for water accounting
- expand trade in water rights
- improve pricing for water storage and delivery
- better manage urban water demands.

The National Water Initiative is informing the development of NSW's regional and metropolitan water strategies.

Figure 5. NSW water policy and planning context





Photography

Image courtesy of Destination NSW.
Tweed River, Chinderah.

A scenic view of a river with a bridge in the background and reeds in the foreground. The river is calm, reflecting the sky and the surrounding greenery. The bridge is a steel truss bridge, and the trees are lush and green. The foreground is filled with tall, green reeds.

Sharing and managing our water

Water is essential for the health and wellbeing of all NSW citizens, the preservation of the state's natural environment and the prosperity of our economy. We all have a common purpose to share and manage water responsibly.

Photography

Image courtesy of iStock.
Hunter River, Greater Hunter.

Water is essential to our environment, economy and communities

Valued at over half a trillion dollars in 2020, the NSW economy is forecast to grow to about \$2 trillion by 2040. The water industry directly supports a significant number of jobs, and water is also a key input into industries such as agriculture, energy, mining and manufacturing, and tourism. These industries play a vital role in the NSW economy: irrigated agriculture alone contributed \$4.4 billion in gross value in 2017/18,¹¹ as well as indirectly generating jobs and income in regional communities.

Water is essential to the health and wellbeing of NSW residents. A secure supply of safe drinking water is critical for the continued urban expansion and growth of NSW cities and towns, and the water sector supports sanitation through wastewater and stormwater services. Water enhances the liveability of communities by supporting green spaces within the urban landscape and recreational activities. Water also acts as a natural cooling asset, reducing the temperature of urban landscapes by 1-2 degrees¹² through assets such as urban wetlands and lakes.

Water is also deeply entwined with Aboriginal culture—providing food, kinship, connection, recreation, stories, songlines and healing. Healthy waterways are critical to the culture and wellbeing of Aboriginal communities across NSW.

Water is critical to a healthy and sustainable natural environment, and to the resilience of NSW's natural capital. Water supports a variety of ecosystems and habitats that maintain native flora and fauna, such as diverse fish and bird populations, including a number of the state's threatened species and threatened ecological communities. Wetlands, estuaries and other waterways across NSW are both internationally-significant environmental assets and important visitor attractions for regional communities

that help to sustain livelihoods and the health of individuals and businesses. Many of our waterways, and the plants and animals they support, are in a stressed state: we need to do more than protect these waterways—we need to enhance and actively sustain the condition of our rivers, creeks, wetlands and estuaries.

The recent drought has highlighted the vulnerability of metropolitan and regional water supplies across NSW. At the beginning of 2020, 100% of NSW was in drought. The Bureau of Meteorology reports the recent drought in the Murray-Darling Basin to be the most intense on record, noting that the drought has also taken place against a background of rising temperatures—with the last seven years in the Basin being among the 10 warmest on record (and 2019 being the warmest).¹³

Across the state, many communities continue to deal with the effects of these drier and hotter conditions on vital water supplies and water-dependent environmental assets.

Between July 2017 and February 2020, Greater Sydney's water storages experienced one of the worst drought sequences on record. Sydney's storages declined rapidly over two and a half years by over 50%, reducing dam levels to a low level of 40%. This rate of depletion had not been experienced in the historical record and was not anticipated in the 2017 Metropolitan Water Plan,¹⁴ which was prepared to secure water for a liveable, growing and resilient Greater Sydney.

11. Australian Bureau of Statistics, *Gross value of irrigated agricultural production—2017/18*

12. Kurn, D.M., Bretz, S.E., Huang, B., and Akbari, H. 1994, *The potential for reducing urban air temperatures and energy consumption through vegetative cooling*, United States, DOI:10.2172/10180633

13. Bureau of Meteorology 2020, *Climate Statement 70—Drought conditions in Australia and impact on water resources in the Murray-Darling Basin*, 13 August 2020, p.17.

14. www.planning.nsw.gov.au/About-Us/Sydney-Metropolitan-Water

If Sydney experiences water shortages like this in the future, it is likely to have an impact on the city's economic performance and NSW's credit rating,¹⁵ with consequent negative economic effects.

During the same period, most major regional dam storages were depleted, with some storages effectively empty and others dangerously low—representing a significant risk to water security. At the end of 2019, almost 50 town or city water supplies were at a high risk of failure, facing the risk of 'zero' water supply within six to 12 months. In some towns when rainfall came in early 2020, water was declared unsafe as water quality parameters exceeded *Australian Drinking Water Guidelines*.¹⁶

Drought can also have devastating effects on our natural systems. Drought, high temperatures and bushfires followed by heavy rainfall resulted in the deaths of millions of native fish over the summers of 2018/2019 and 2019/2020 in NSW. For example, in 2018/2019 there were three significant fish death events in the Darling River near Menindee where it is estimated that over one million native fish died.¹⁷

The recent drought highlighted many vulnerabilities in metropolitan and regional water services in NSW. These vulnerabilities indicate that we need much better long-term strategic planning and to fundamentally rethink and improve how we use and manage water.



Photography

Image courtesy of Destination NSW.
Rotary Park, Tenterfield.

15. www.moodys.com/research/Moodys-Climate-related-risks-pose-long-term-credit-challenge-for--PBC_1211485

16. www.nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines

17. www.mdba.gov.au/sites/default/files/pubs/Final-Report-Independent-Panel-fish-deaths-lower%20Darling_4.pdf

We need to do things differently

Water availability in NSW has always been highly variable—and this will continue. It is possible that extremes of wet and dry may become more pronounced and extreme events more frequent.

Our arrangements for sharing water are essential but contested. NSW has a well-established and secure system for planning, licensing, issuing entitlements and making allocations of water to different users—but these are put to the test during extreme drought.

We have learned that we can't rely on our experience from the recent past to inform long-term water management decisions. In the years ahead, we will face the fundamental challenge of supporting the diverse aspirations of the people of NSW—for a better environment, a strong economy and thriving communities—with water resources that are finite and have clear limits on how much can be used for different purposes and where availability may be even more variable and unpredictable than in the past.

Variability of inflows means that the system needs to be able to capture water when it is available to manage reliability of supply over time, especially through prolonged periods of low flow that were experienced in the most recent drought. The Government's priorities to progress the provision of new dams and other water infrastructure respond to this challenge.

Meeting this challenge requires a much better understanding of plausible future climate conditions and how these may affect river flows, groundwater resources and the supply of water for communities, towns and cities, industry and the environment.

In NSW the recent impacts from extreme drought, bushfires and the global COVID-19 pandemic are all pressure points stretching water management capability and preparedness. The prospect of more frequent and extreme drought conditions in the future, together with reduced cool season rainfall in south-eastern Australia, should not come as a shock. We must plan and prepare for a future where we may need to deal with more extreme and more frequent droughts and floods than we have experienced in the past. This means that we need to assess our reliance on traditional climate dependent water sources to supply our towns, cities and industry, while protecting the communities and natural environments sustained by our waterways.

The NSW Water Strategy acknowledges these challenges and sets a strategic and unified approach to water management issues to beyond 2040—and to a future that may be quite different to the past.



Photography

Image courtesy of Destination NSW.
Bowral, Southern Highlands.

Populations are growing and shifting

As NSW caters for a growing population, variable water reliability increases the risk to secure and sustainable water supplies. By 2041, the population of NSW is projected to grow by 2.8 million to about 10.6 million. Growth will be centred in Greater Sydney, which is expected to grow by about 45% and be home to over 7 million people. Strong growth of more than 400,000 people is also forecast for regional NSW over the same period, driven by people moving from

Greater Sydney. More people are also expected to move from rural and remote areas to larger regional centres. Predicted reductions in international migration, families having fewer children or delaying having children due to the COVID-19 pandemic and economic recession are likely to reduce but not stop this growth. It is likely to be more noticeable in the metropolitan areas than in regional NSW.

Figure 6. NSW: projected population growth by local government area 2016-2041

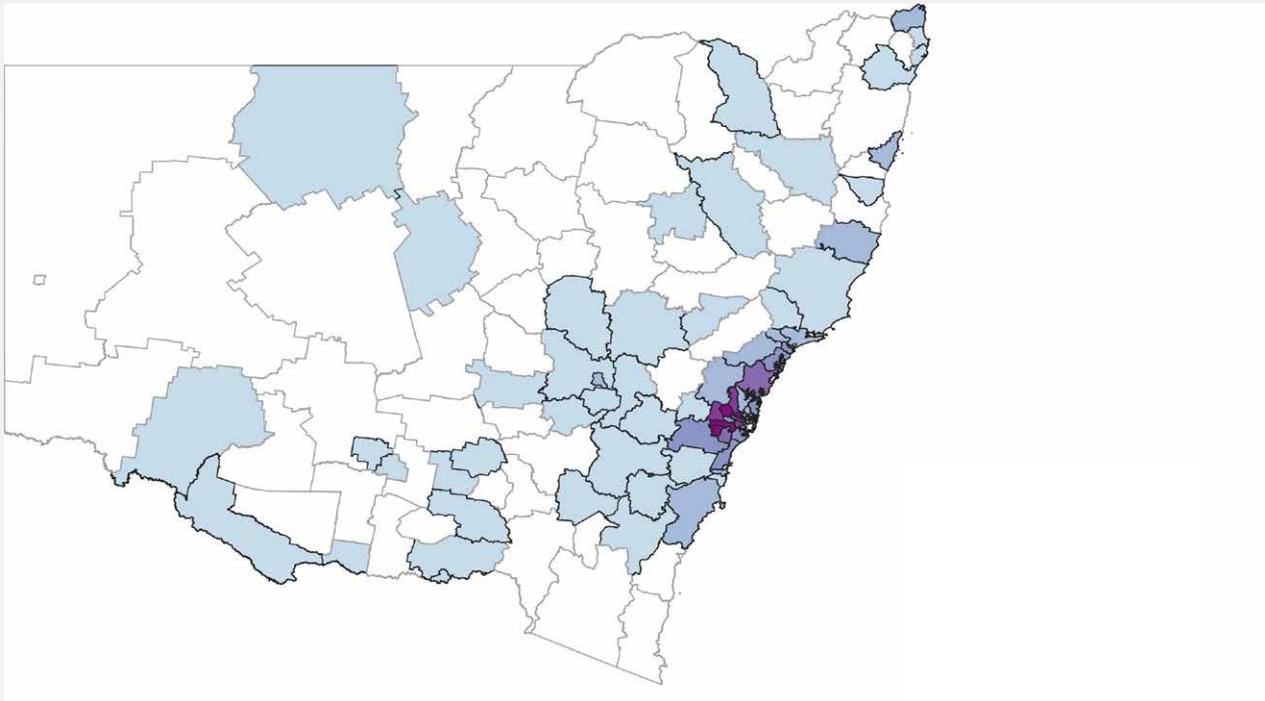
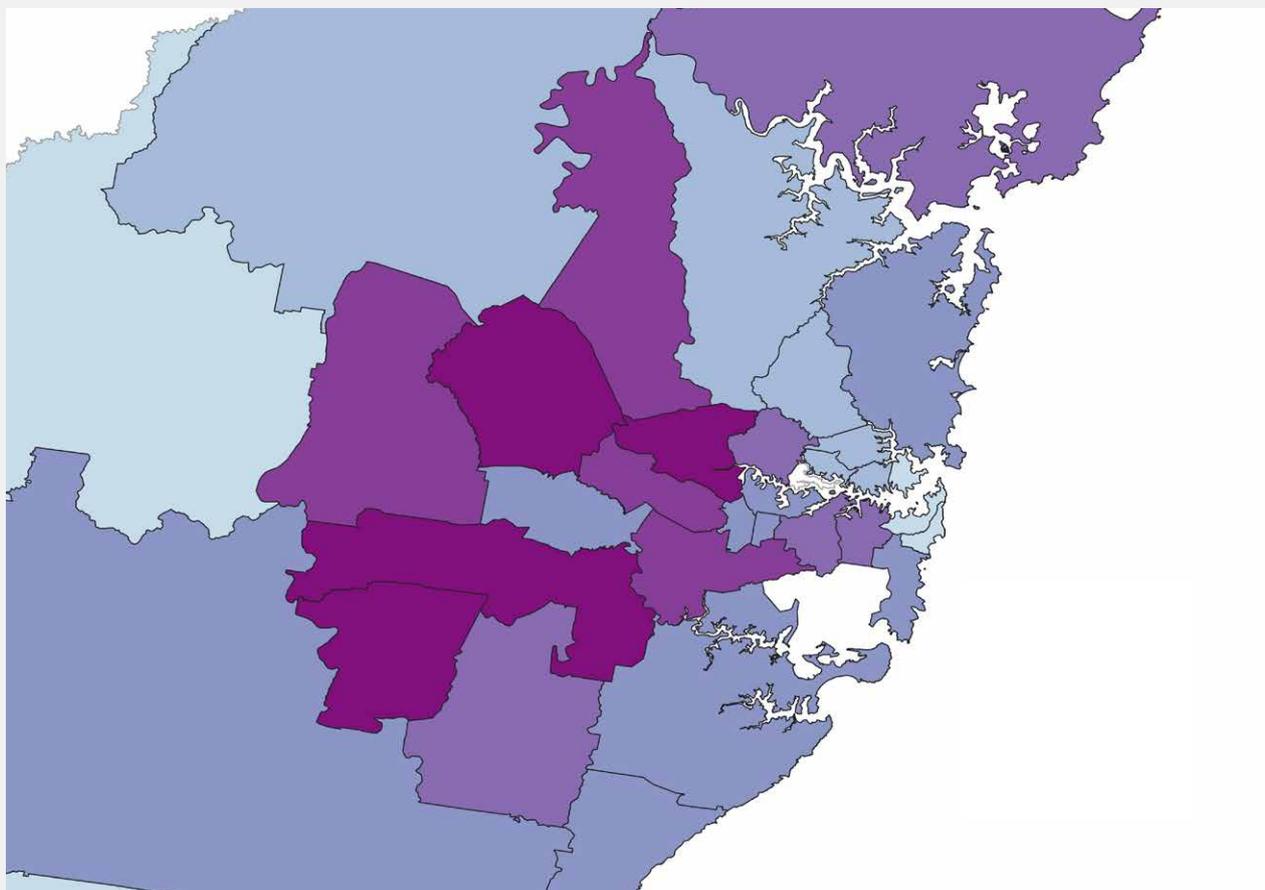


Figure 7. Greater Sydney: projected population growth by local government area 2016-2041



Below zero	0 - 10,000	10,000 - 30,000	30,000 - 60,000
60,000 - 120,000	120,000 - 180,000	180,000 and above	

The climate is variable and changing

The NSW Government has invested in new modelling methods and datasets to develop a better understanding of both historical climate variability and likely future climate conditions. We are using new scientific methods that augment the observed historical record (about 130 years of rainfall, temperature and evaporation data) with paleoclimate data (data reconstructed from before instrumental records began, using sources such as tree rings, cave deposits and coral growth) and climate change projections. This greatly improves our ability to identify plausible climate impacts and risks, and it represents a significant and important advance in water planning for NSW.

The message from this work so far is that our water supplies in NSW could be less secure than we thought. This is because we now understand that droughts longer than those of the last 130 years are likely at some point, and that we could also see higher temperatures and less rainfall. Projected changes in rainfall patterns, warmer conditions and increased evaporation will impact future water availability.

The frequency, intensity and duration of droughts are also predicted to increase, which may affect water quality and the ecology of our rivers.

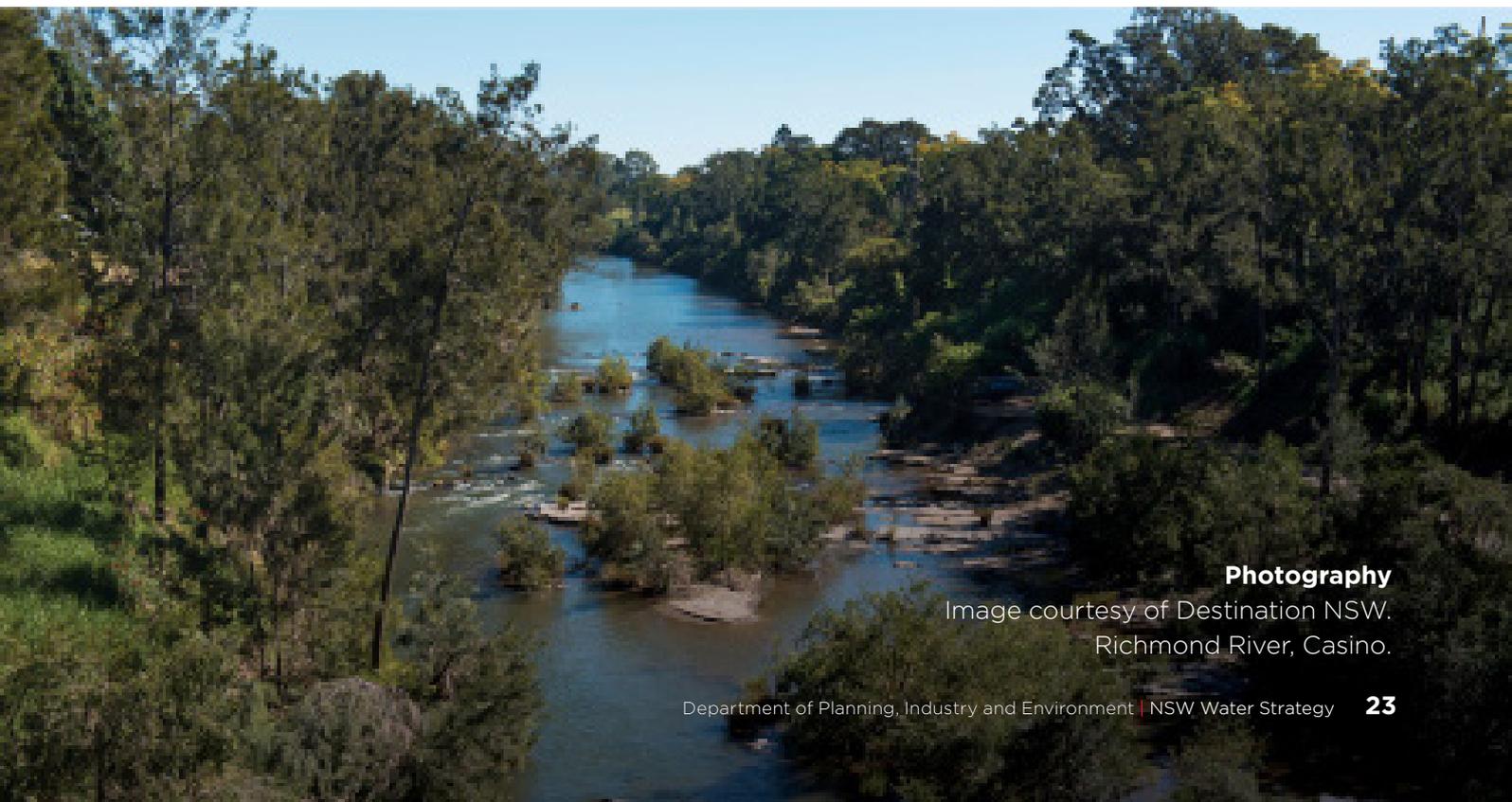
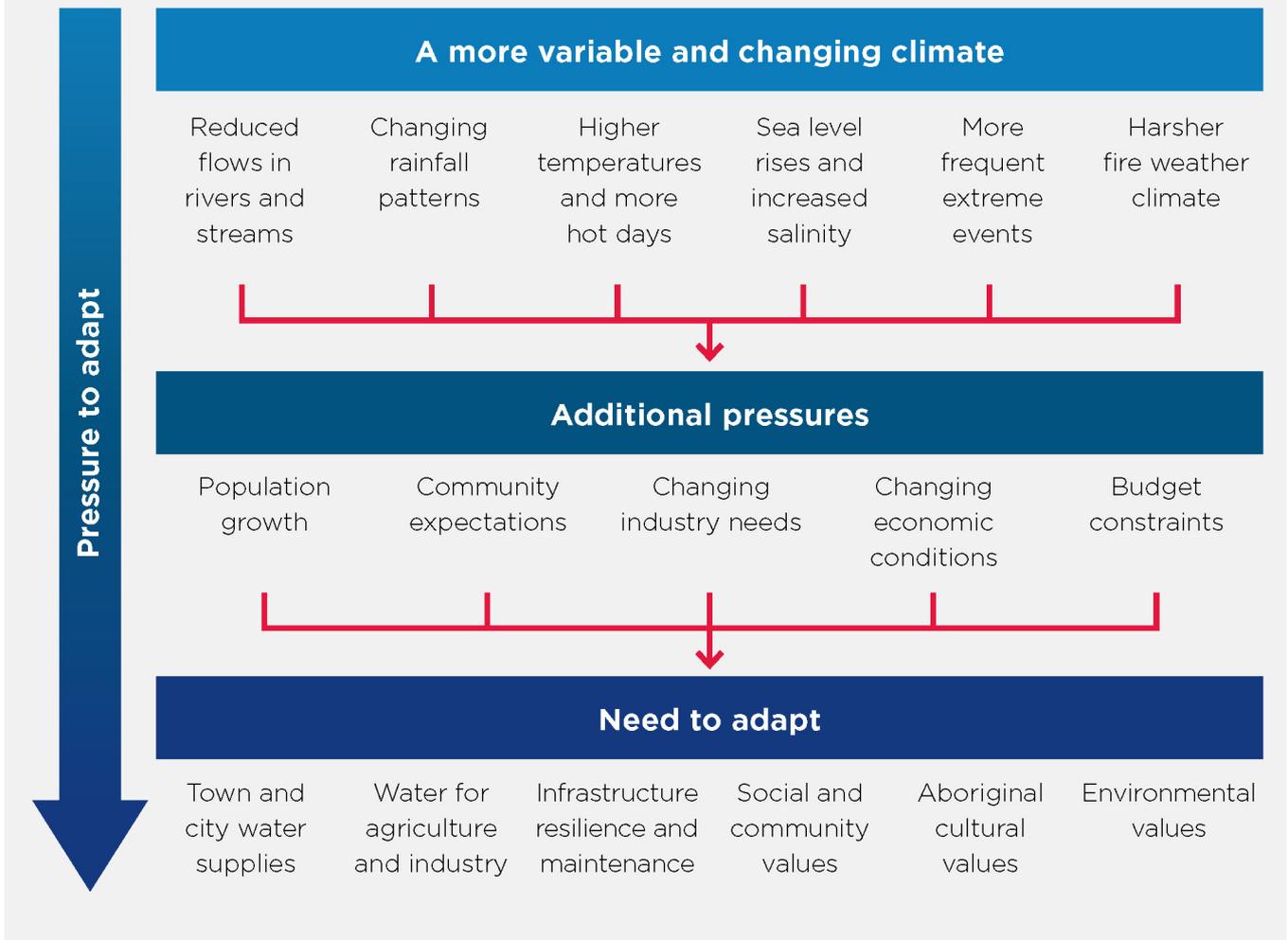
Global climate models are useful for providing broad predictions of likely variations and changes in rainfall, rather than forecasting specific regional conditions. For NSW, these models indicate that there is unlikely to be much change in rainfall in the north of the state; however, in the south of the state, winter and spring rains are likely to be less.

Along the south coast, changes in the patterns of east coast lows are likely, with an increase in the intensity of rainfall. The risks that stem from such events are not confined to the loss of life and property; the gross domestic product of Australia was reduced by an estimated \$30 billion due to the Queensland floods in 2010/11.¹⁸

Our new climate risk modelling means that we can now better understand the likely future climate characteristics of each region in NSW. We can better identify the potential risks to water security in different parts of the state and we can develop specific, targeted actions to mitigate these risks.

18. House of Representatives Standing Committee on Economics, June 2011

Figure 8. Pressures to adapt in the water sector



Photography
Image courtesy of Destination NSW.
Richmond River, Casino.

We need to do more with less to support economic growth

The *NSW 2040 Economic Blueprint*¹⁹ sets the direction for NSW's ongoing success in a changing world, highlighting major opportunities to grow industries, develop innovative and world class businesses and improve the state's economy.

The Blueprint focuses on maximising the economic and employment potential of fast growing, high tech and service industries, and on the state's five major urban centres of Newcastle, Wollongong and Greater Sydney's three cities (the Eastern Harbour City, the Central River City and the Western Parkland City). But it also targets productive and vibrant regions, including an agricultural industry that will supply the growing middle class in Asia—with NSW aspiring to be 'Asia's delicatessen' and a trusted source of high quality, high-value products.

The Blueprint recognises the importance of secure and sustainable water supplies to support existing industries such as agriculture, tourism, mining and energy and to encourage investment and growth in new industries. Economic growth will also be stimulated by government-led initiatives such as Special Activation Precincts that have been identified to become thriving business hubs in regional NSW.

The NSW Productivity Commission White Paper (2021) highlights many of the key challenges facing the water sector. It notes the risk that traditional rainfall-dependent water supply will become less reliable as demand pressures grow, and that the combination of population growth, changing climate and ageing infrastructure will test the water sector's ability to meet the evolving water needs of NSW. It called on government to respond to these challenges to ensure our water services continue to support productivity growth and that NSW continues to be an attractive place to live and do business.

Access to water is essential to achieving the aspirations set out in the Blueprint and to driving—and benefiting from—sustained future economic growth in NSW. But we will need to be smart in how we use water within the system's

limits. As we seek greater productivity from our available water resources within sustainable extraction limits, this thinking of 'doing more with less' will need to inform how we manage, plan for and use water.

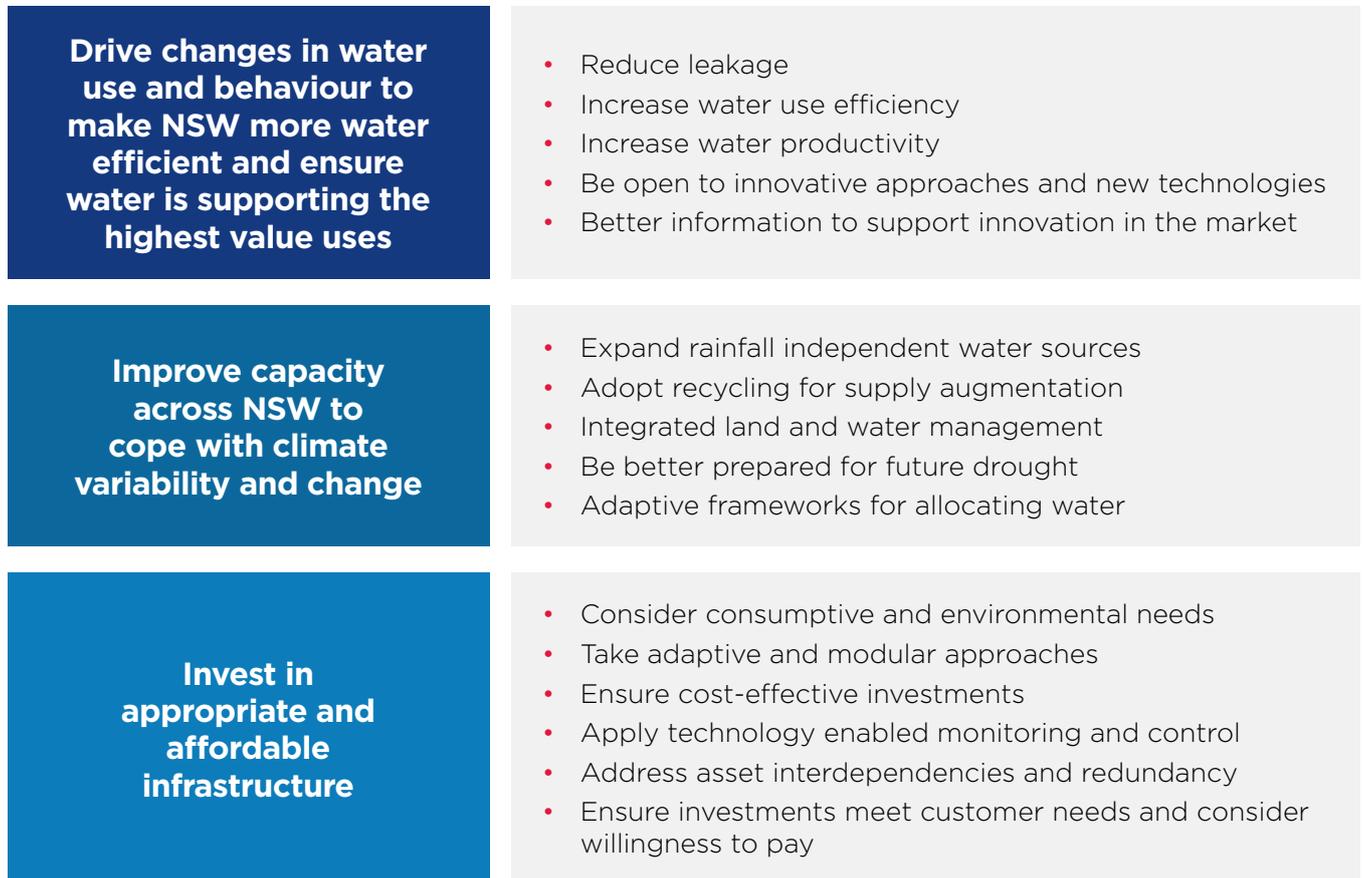
In particular, we will need to:

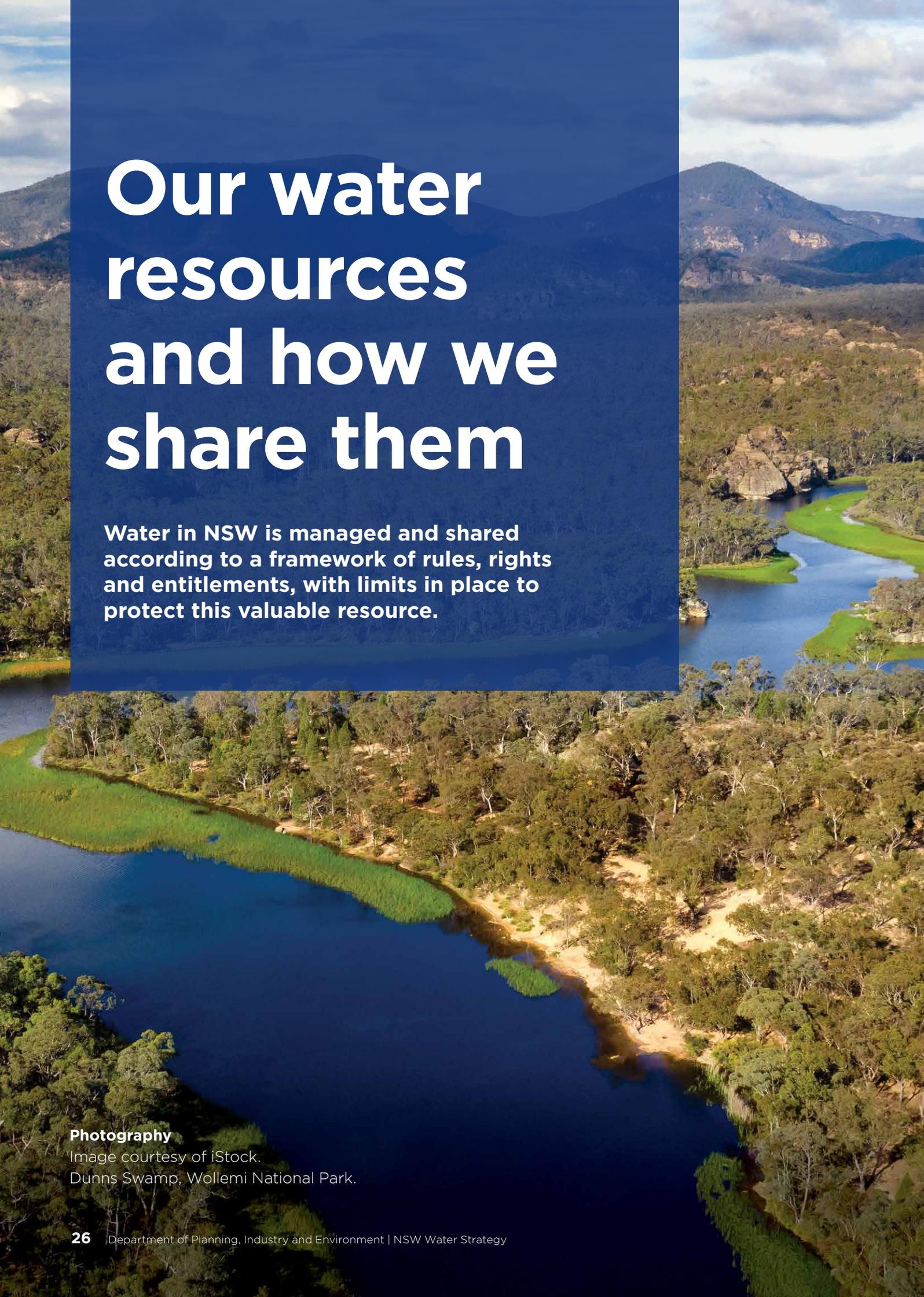
- **keep up with global commodity markets**—there is increasing competition for water within a capped system west of the dividing range. Many regional economies are highly reliant on the export of food, energy and resources. As demand for these exports increases and new markets emerge, regions will need to be resilient and adaptable to changed conditions to increase the productivity and efficiency of limited water resources
- **explore opportunities from technology and data analytics**—innovation and research are critical to improving the productivity of water. Advances in science and technology will create opportunities for innovation in water supply, treating and transporting water, water use efficiency and wastewater and stormwater re-use. There will also be significant advances in metering, modelling and monitoring that government can use as an evidence base for decision-making and the deployment of more sophisticated compliance strategies
- **seek shared benefits**—there are opportunities to achieve shared benefits from water delivery and maximising outcomes when water is used. Currently, water is ordered by users for a single purpose, such as irrigation orders, bulk water transfers and environmental flows. There is a need for more work to recognise the environmental benefits from water released for production and how better management of releases could provide an opportunity to generate shared outcomes. This will require planning and cooperation between government, water users and stakeholders, including Aboriginal communities. There are also options to generate shared benefits in other areas, such as energy recovery from wastewater management.

19. www.treasury.nsw.gov.au/nsw-economy/nsw-2040-economic-blueprint

The figure below shows the high-level approaches NSW needs to take to do more with less and make our water resources go further in a future with a more variable and changing climate.

Figure 9. Doing more with less: high-level approaches





Our water resources and how we share them

Water in NSW is managed and shared according to a framework of rules, rights and entitlements, with limits in place to protect this valuable resource.

Photography

Image courtesy of iStock.
Dunns Swamp, Wollemi National Park.

Water management is complex. It involves water, planning and environmental laws and policies, statutory rules and plans about sharing water, trading in water entitlements and water allocations, the operation of public and private infrastructure, and a range of decision-making, monitoring and enforcement agencies. It also extends across state boundaries.

Water management in NSW covers approximately 58,000 km of rivers and major streams:²⁰

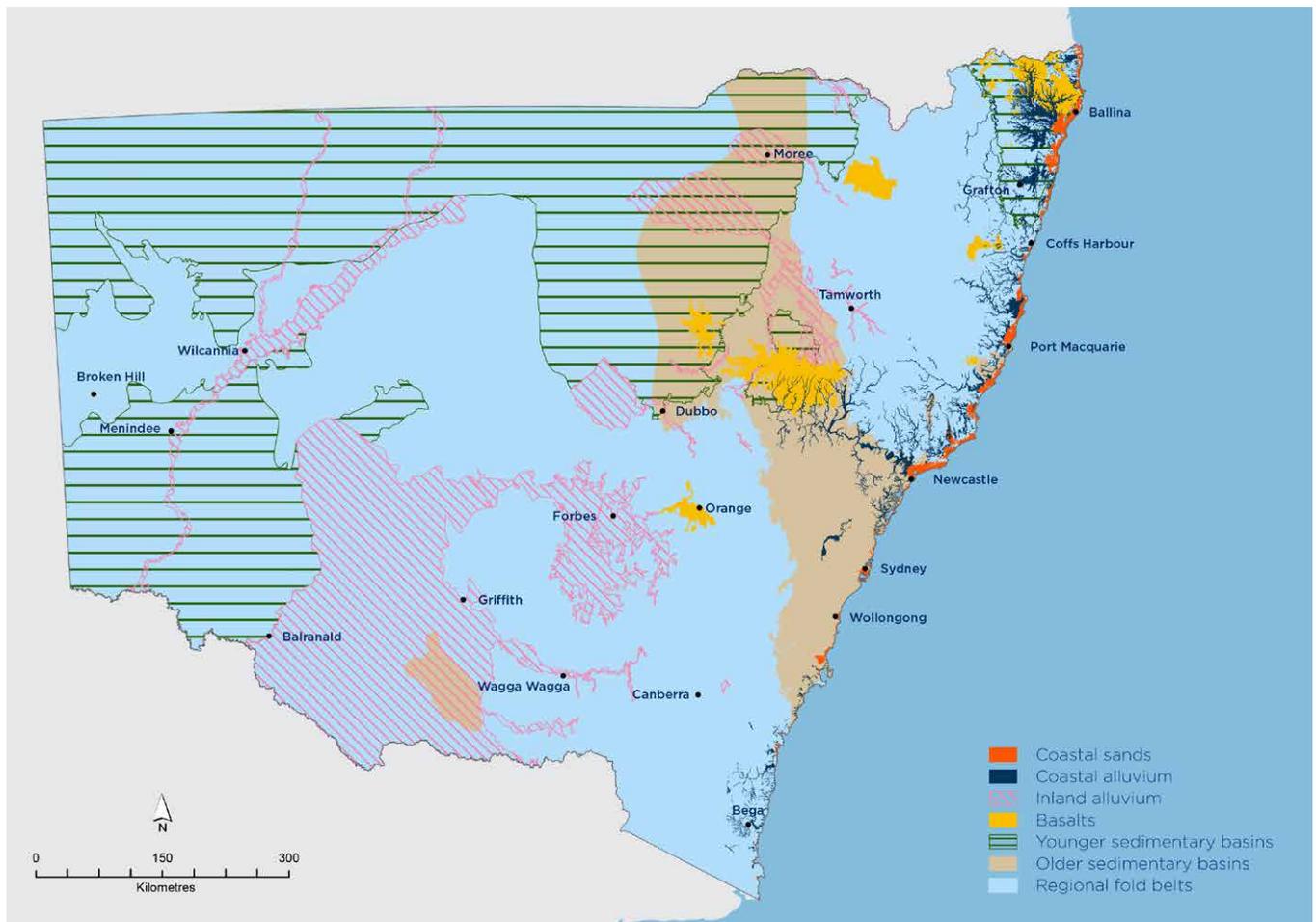
- West of the Great Dividing Range, long, slow moving rivers flow westward across flat landscapes, with some running through to the ocean at the mouth of the Murray River near Adelaide (generally long, low gradient inland rivers).

- East of the Great Dividing Range, the terrain is steeper and the climate is generally wetter with faster flowing rivers that run east to the ocean (short, high gradient coastal streams).

Some of these river systems are regulated (controlled by major publicly owned dams or weirs). In these systems, water licence holders can order water from the dam and then take water from the river according to their licences. In unregulated rivers and streams, water users are reliant on natural water flows and rainfall. In some systems, flood waters are harvested from the floodplain.

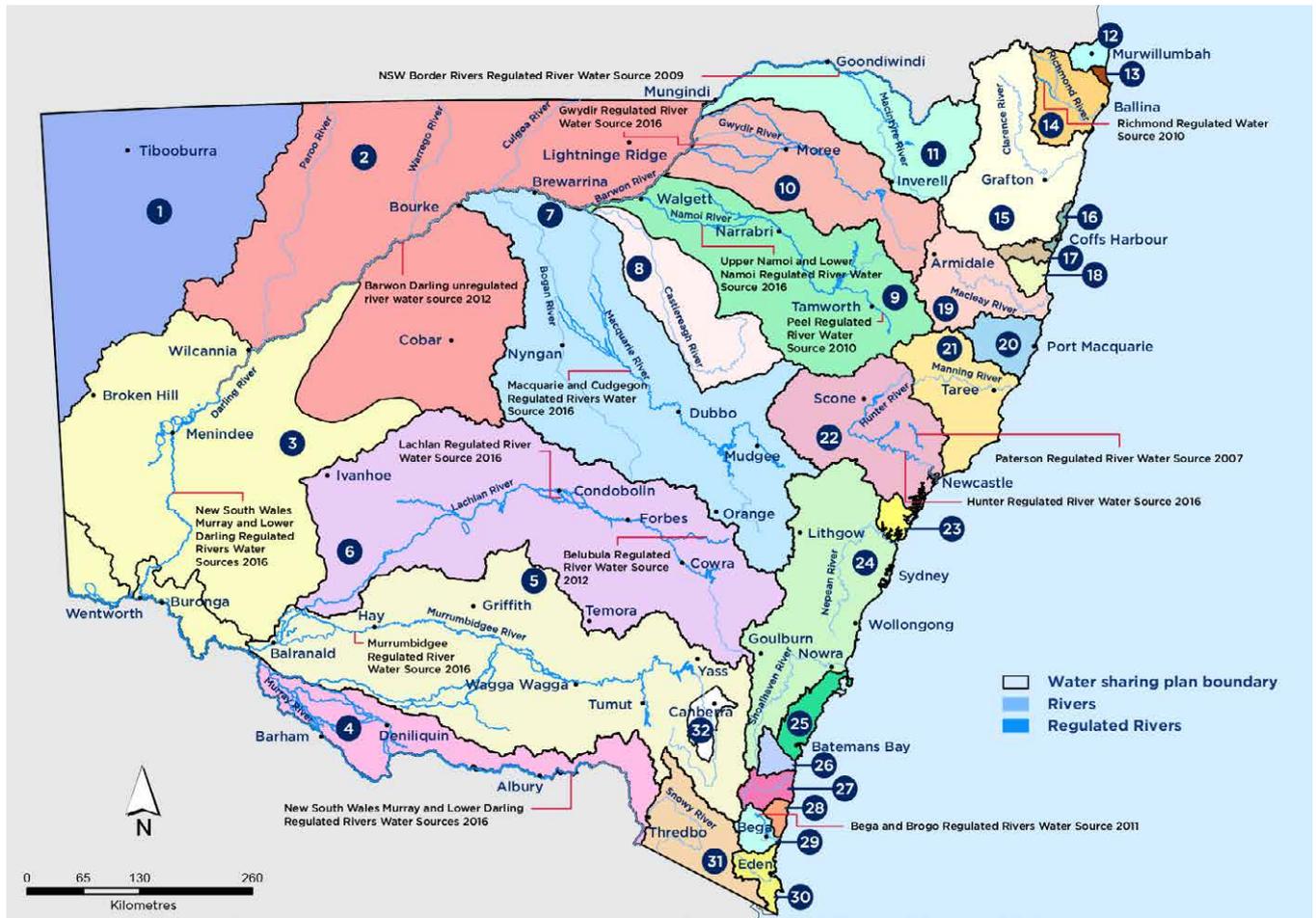
Groundwater is also a valuable resource for NSW, supplying 20-30% of all water needs. Figure 10 shows a simplified picture of groundwater resources in NSW and Figure 11 shows major regulated rivers and unregulated river water sources.

Figure 10. Overview of NSW groundwater resources



20. NSW Government 2018, *NSW State of the Environment*, www.soe.epa.nsw.gov.au/

Figure 11. NSW surface water sources



Legend:

1. North Western Unregulated and Fractured Rock Water Sources 2011
2. Intersecting Streams Unregulated River Water Sources 2011
3. Lower Murray-Darling Unregulated River Water Source 2011
4. Murray Unregulated River Water Sources 2011
5. Murrumbidgee Unregulated River Water Sources 2012
6. Lachlan Unregulated River Water Sources 2012
7. Macquarie Bogan Unregulated Water Sources 2012
8. Castlereagh Unregulated Water Sources 2011
9. Namoi and Peel Unregulated Water Sources 2012
10. Gwydir Unregulated Water Sources 2012
11. NSW Border Rivers Unregulated River Water Sources 2012
12. Tweed River Area Unregulated and Alluvial Water Sources 2010
13. Brunswick Unregulated and Alluvial Water Sources 2016
14. Richmond River Area Unregulated, Regulated and Alluvial Water Sources 2010
15. Clarence River Unregulated and Alluvial Water Sources 2016
16. Coast Harbour Area Unregulated and Alluvial Water Sources 2009
17. Bellinger River Area Unregulated and Alluvial Water Sources 2020
18. Nambucca Unregulated and Alluvial Water Sources 2016
19. Macleay Unregulated and Alluvial Water Sources 2016
20. Hastings Unregulated and Alluvial Water Sources 2019
21. Lower North Coast Unregulated Water and Alluvial Water Sources 2009
22. Hunter Unregulated Water and Alluvial Water Sources 2009
23. Central Coast Unregulated Water and Alluvial Water Sources 2009
24. Greater Metropolitan Unregulated River and Alluvial Water Sources 2011
25. Clyde River Unregulated and Alluvial Water Sources 2016
26. Deua River Unregulated and Alluvial Water Sources 2016
27. Tuross River Unregulated and Alluvial Water Sources 2016
28. Murrumbidgee Unregulated and Alluvial Water Sources 2016
29. Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011
30. Towamba River Unregulated and Alluvial Water Sources 2010
31. Snowy Genoa Unregulated and Alluvial Water Sources 2016
32. Australian Capital Territory no water sharing plan



Photography

Image courtesy of Destination NSW.
Shoalhaven River, Tallong.

How is water shared in NSW?

Water sharing plans are statutory plans made under the NSW *Water Management Act 2000*.²¹ The 10-year plans set the priorities and rules for sharing surface water and groundwater between environmental and extractive needs, and between different types of extractive use for towns, domestic and stock and Native Title use, and other industrial and agricultural uses. They create certainty for water users by:

- defining sustainable limits on surface and groundwater use to enable supply reliability, downstream sharing and environmental outcomes
- protecting water for the environment, basic landholder rights and cultural needs
- providing secure, legal and tradeable water access rights to boost investment confidence.

Water licences set out how much, where and when water can be taken by licence holders. Different licence types cover different water uses and have different levels of security. Water sharing plans also set the rules for water trading—the buying and selling of water licences and annual water allocations.²²

In most parts of NSW, the available water is fully committed. For many people, purchasing water entitlements or allocations in the market is the primary way to secure the water they need. Water trading drives more efficient water use, increases economic productivity and helps to optimise use of water for the environment.

In the Murray-Darling Basin, which covers 75% of NSW west of the Great Dividing Range, the Murray-Darling Basin Agreement shares the available water in the River Murray system between NSW, Victoria and South Australia. This Agreement, together with water resource plans accredited under the Commonwealth *Basin Plan 2012*²³ and the NSW water sharing plans, limits the amount of water available to be allocated for use from NSW.

During normal operations, the highest priority for water sharing is the environment, followed by basic landholder rights (domestic and stock, Native Title and harvestable rights). During extreme events, such as prolonged droughts, the priority changes. Critical human water needs and essential town water services (authorised by an access licence) become the highest priority, followed by the environment. In the Murray-Darling Basin, the *NSW Extreme Events Policy*²⁴ and regional incident response guides come into effect.

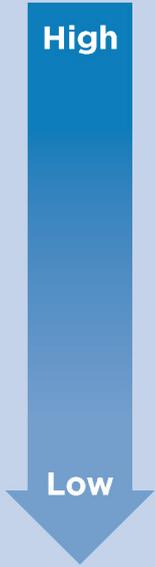
21. www.industry.nsw.gov.au/water/what-we-do/legislation-policies/acts-regulations

22. More information on water licences and trading is on the Department of Planning, Industry and Environment's website at www.industry.nsw.gov.au/water/licensing-trade/trade

23. www.mdba.gov.au/basin-plan-roll-out

24. www.industry.nsw.gov.au/water/what-we-do/legislation-policies/eep

Figure 12. Priorities for water sharing

Priority	Normal circumstances	Extreme events
Highest	<ul style="list-style-type: none"> Needs of the environment 	<ul style="list-style-type: none"> Critical human water needs
	<ul style="list-style-type: none"> Basic landholder rights 	<ul style="list-style-type: none"> Needs of the environment
	<ul style="list-style-type: none"> Local water utility access licences Major utility access licences Stock and domestic access licences 	<ul style="list-style-type: none"> Stock High security licences Commercial and industrial activities authorised by local water utility Water for electricity generation on a major utility licence Conveyance in supplying water for the purposes listed above
	<ul style="list-style-type: none"> Regulated river (high security) access licences 	<ul style="list-style-type: none"> General security licences
	<ul style="list-style-type: none"> All other forms of access licences Supplementary access licences 	<ul style="list-style-type: none"> Supplementary licences

This change in priorities is triggered when a water sharing plan (or part of a plan) is suspended. The aim is to operate within the plan rules for as long as possible because the plan provides certainty

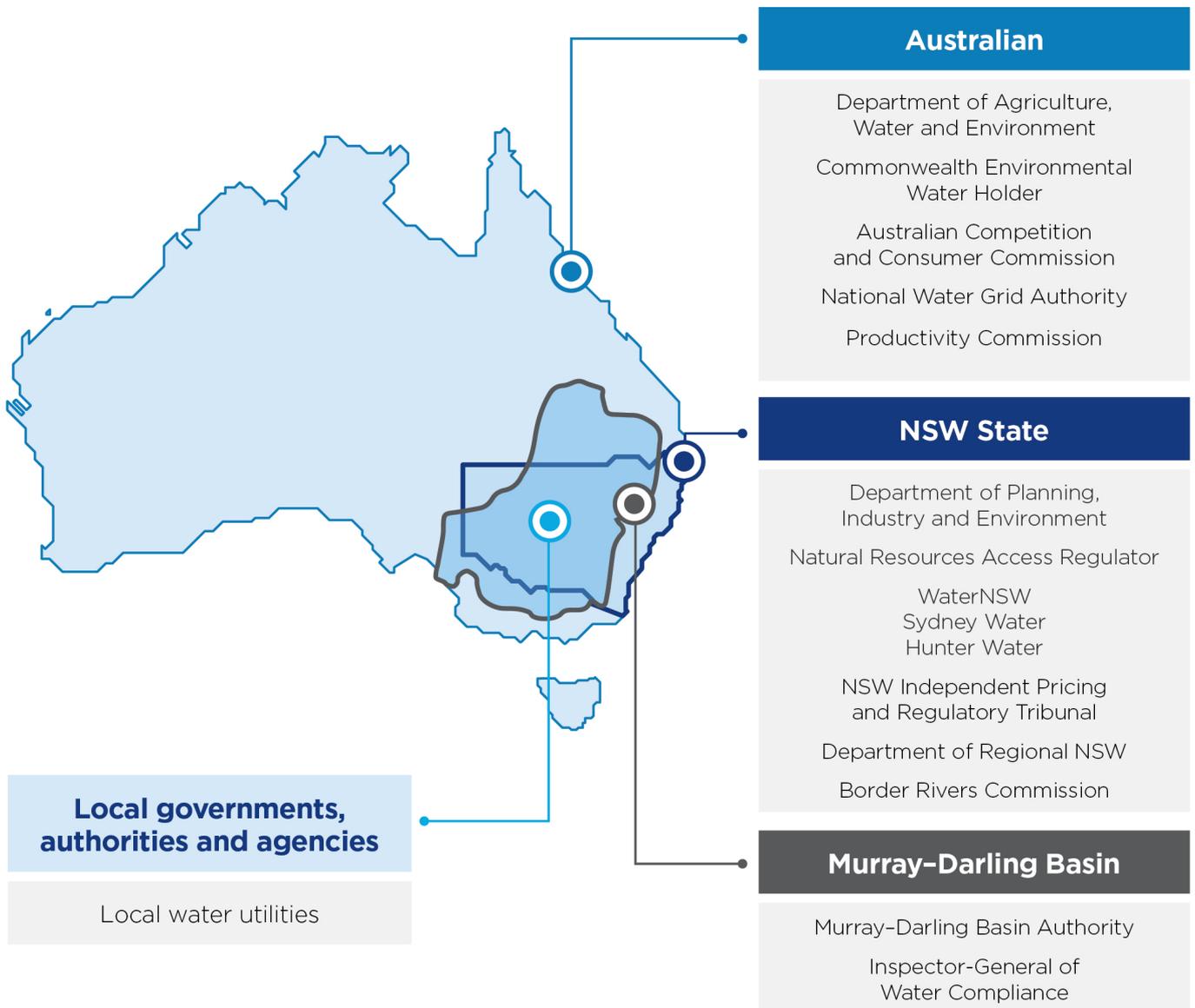
for all users of these water sources. In light of the experience from the recent drought, we now have an opportunity to consider whether these triggers need to be reviewed.

The NSW water sector

Responsibility for water management in NSW is shared between Commonwealth, State and local governments, authorities and agencies (Figure 13). A number of inter-jurisdictional bodies, independent statutory bodies and

corporations also play roles in managing water resources and providing advice to governments. Effective planning and delivery of water security solutions relies on cooperation and coordination between all of these organisations.

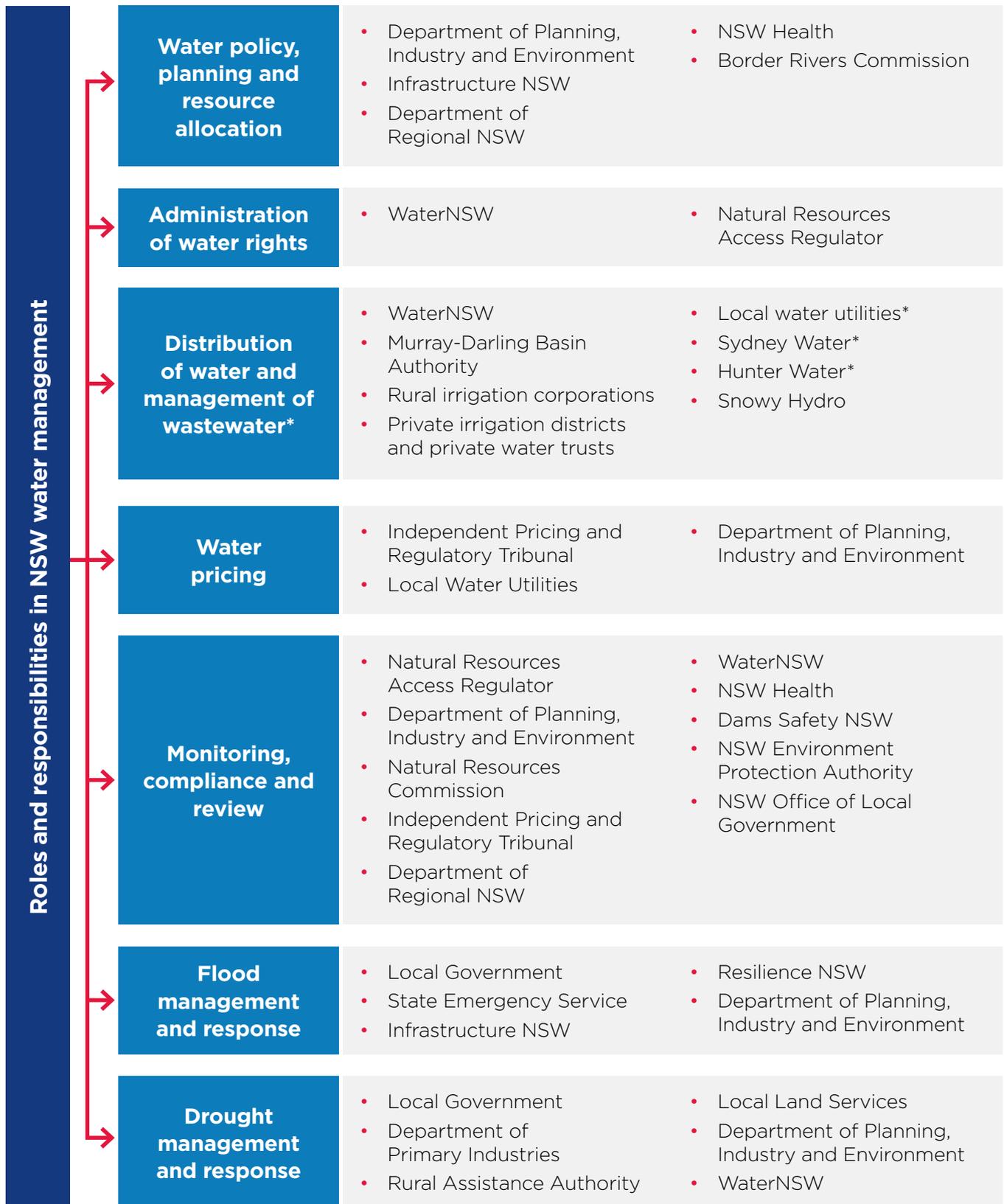
Figure 13. Key government organisations with responsibility for water management



Note: Department of Planning, Industry and Environment cluster includes key agencies including the Environment Protection Authority, the Office of Local Government and Dam Safety NSW.

Figure 14 shows the roles and responsibilities for managing water at a state level in regional NSW and metropolitan areas. Further details of the water management framework in NSW are available at the Water in NSW webpage.²⁵

Figure 14. Roles and responsibilities for water management in NSW



Source: www.industry.nsw.gov.au/water/what-we-do/how-water-is-managed

*Organisations with water distribution and wastewater management functions

25. Department of Planning, Industry and Environment, *Water in NSW*, www.industry.nsw.gov.au/water/what-we-do/how-water-is-managed

Reforms to the water sector

The NSW Government has recently made changes to improve strategic planning, delivery of infrastructure and operational performance across the water sector. The reforms improve coordination across the sector, enhance the strategic oversight of major investment decisions and assign explicit accountabilities for actions to address risks.

The Water Sector Leadership Group has been established, consisting of Department of Planning, Industry and Environment—Water, NSW Treasury, Sydney Water, Hunter Water and WaterNSW. This group is leading improved coordination across the government-owned and managed water sector to put water customers and communities at the centre of everything we do.

WaterNSW will strengthen its role as a dedicated regional customer-focused organisation that supports water users and councils in the regions. To reduce the risk to regional towns, \$4.9 million has been allocated to support a Town Water Risk Reduction Program. This voluntary program will give local water utilities and councils

more levers to support regional coordination, address skills gaps, access the expertise of the water sector and improve the regulatory framework, as well as provide new options to deliver and finance town water infrastructure.

The reforms will also ensure that responsibilities for planning for Sydney's future water supply are clear, with Sydney Water assigned the critical role of planning future supply augmentation for Greater Sydney to support the delivery of the Greater Sydney Water Strategy.

Water Infrastructure NSW has been established within the Department of Planning, Industry and Environment to improve the governance and oversight of water infrastructure planning and investment.

These reforms are expected to lead to significant improvements in organisational arrangements that support improved service delivery and water security for regional towns and communities, drive greater innovation in the water sector and provide leadership in exploring and delivering solutions to address water security risks and diversify water supplies.

Photography

Image courtesy of Destination NSW.
Nepean River, Penrith.

Recent water reforms

The NSW Government has implemented a range of significant reforms to improve water management in recent years. Some of these reforms have been in response to independent reviews and inquiries into water management issues. As a result of actions already taken, NSW has already made substantial progress against the recommendations of the Independent Commission Against Corruption's November 2020 report into the management of water in NSW.

Improving water and sewage services for Aboriginal communities

Together, the NSW Government and the NSW Aboriginal Land Council are investing more than \$200 million over a 25-year period to fund the maintenance, operation and repair of water supply and sewerage systems in 62 discrete eligible Aboriginal communities.

Improving water supply and sewerage services for regional communities

The \$1 billion Safe and Secure Water Program co-funds eligible projects to address key risks to regional water safety and security, and aims to provide safe, secure and sustainable water and wastewater services to regional NSW towns.

Implementing the Murray-Darling Basin Plan

The Basin Plan, made under the Commonwealth *Water Act 2007*, aims to rebalance water sharing between the environment and other water uses, and limits the amount of water that can be used by towns, communities, farmers, mining and industry to make sure there is enough left for a healthy environment. Water sharing between states is also governed by Basin level agreements.

NSW continues to work with other jurisdictions and communities on the implementation of the Basin Plan. The NSW Government has submitted 20 water resource plans to the Murray-Darling Basin Plan for accreditation—representing the vast majority of water resource planning across the jurisdictions in the Basin.

Improving compliance and transparency

A tough new regulator, the independent Natural Resources Access Regulator,²⁶ has been established to crack down on illegal water use and rebuild trust in the community around water use and access. The Natural Resources Access Regulator is using new technologies, including remote sensing and satellite monitoring, as part of its efforts to detect breaches in our water rules and deter water users from breaking the rules.

Introducing new metering laws

Robust new laws are now in place to accurately meter water taken from rivers, creeks and groundwater in NSW. Once these rules are fully implemented, around 95% of all licensed water take capacity will be accurately metered, helping to reduce the overuse of water, increase water available to downstream users and better manage water for the environment.

Fast-tracking the NSW approvals process

The *Water Supply (Critical Needs) Act 2019*²⁷ provides an alternative authorisation pathway for emergency water supply projects required for certain towns and localities declared to be in critical need of water during the recent drought, with a sunset date of November 2021. The Act also supports certain dam projects that are being delivered in partnership with the Australian Government to enhance future water security and supply.

26. www.dpie.nsw.gov.au/nrar

27. www.industry.nsw.gov.au/water/what-we-do/legislation-policies/acts-regulations

Improving the management of environmental water

The NSW Government is committed to improving how we manage environmental water in the Northern Murray-Darling Basin to maximise environmental outcomes, improve our water systems and make sure that communities across NSW continue to enjoy the many benefits associated with healthy, productive rivers, streams and wetlands. We have implemented 'active management' in the Barwon-Darling, Macquarie and Gwydir valleys to protect water that has been purchased for the environment from extraction when it flows through these systems. We also made several amendments to the water sharing plan for the Barwon-Darling system including a resumption of flow rule to protect the first flows following a continuous period of dry or low flow, and introducing limits to the amount an individual licence can pump out of the river each day.

Recognising Aboriginal people's water rights, interests and access to water

The NSW Government acknowledges the importance of healthy waterways to Aboriginal people and communities across NSW and is examining ways to better meet their spiritual, cultural, social and economic needs around water. We are exploring options to improve outcomes for Aboriginal people at state-wide, regional and local levels and to increase the representation of Aboriginal water rights, interests and access to water in water resource management. We are working with peak Aboriginal groups on what needs to change.

Reforming the management of floodplain harvesting

In some areas, particularly in the northern Murray-Darling Basin, as well as water being taken from rivers and groundwater sources, flood waters are harvested from the floodplain and stored in on-farm storages for use in irrigated agriculture. Floodplain harvesting makes up a significant proportion of the legal limits for surface water take in the northern Basin.

The NSW Government introduced a Floodplain Harvesting Policy in 2013 so that this form of water take can be effectively regulated within these legal limits. Implementation of the policy in the northern Basin seeks to control floodplain harvesting within legal limits through licensing. The reform will reduce floodplain diversions in some northern Basin valleys by up to 30%, resulting in significant environmental and downstream outcomes. Licensing will also provide much needed certainty for historically legitimate floodplain harvesting to continue, supporting businesses and communities throughout the northern Basin.

The 2019 Floodplain Harvesting Action Plan sets out the NSW Government's commitments to use the best available facts, data and scientific analysis, consult and set clear rules, ensure rules are followed and improve floodplain harvesting management over time. The NSW Government's Floodplain Harvesting Measurement Policy 2020²⁸ requires landholders receiving a flood plain harvesting access licence in the northern Murray-Darling Basin to install meters and telemetry to provide accurate and reliable water take information. For the first time anywhere in Australia, floodplain harvesting will be measured and high quality data will be generated to support a fair system of floodplain access.

28. www.industry.nsw.gov.au/water/plans-programs/healthy-floodplains-project/improvement-program-for-floodplain-harvesting-measurement-and-compliance

Implementing the Murray-Darling Basin Plan

The Murray-Darling Basin Plan requires a significant body of work to be undertaken by NSW. As a large percentage of the Basin is in NSW, our state has borne the lion's share of the plan's implementation. To date, NSW has recovered more than 1,000 GL of our 1,276 GL Basin Plan target, with most of the remaining recovery planned to be delivered through offset projects.

A clear pathway forward beyond 2024 is critical to provide certainty to our Basin communities and ensure that high quality projects deliver the economic, social, cultural and environmental outcomes sought by the Basin Plan.

For the Basin Plan to deliver on its intended outcomes, the following is needed:

- A renewed focus on adaptable and flexible implementation of the Plan with a focus on genuine and balanced outcomes.
- An amendment to the Basin Plan to extend the 2024 deadline for implementation of the Sustainable Diversion Limit adjustment mechanism and water recovery, as the current deadline is not achievable.
- A commitment to complementary measures, or a range of non-flow projects, that deliver significant Basin Plan environmental outcomes without taking productive water away from our towns and communities.
- Implementation of reforms to improve the governance of Basin water markets, market integrity and conduct, trade processing and market information, and market infrastructure.
- A single source information platform where water users and communities can go to find out critical information about water resources in the Murray-Darling Basin.

Photography

Image courtesy of iStock.
Gwydir River, Moree.

NSW Water Strategy: Towards 2050

Our vision:

Sustainable water resources for thriving people, places and ecosystems, both now and for future generations.

Photography

Image courtesy of Murray Vanderveer, Department of Planning, Industry and Environment.
Pinnacle Lookout, Orange.

What we need to achieve

To rise to the challenges facing NSW, the NSW Government is planning for the future and taking action to improve the security, reliability, quality and resilience of the state's water resources. We also need to continue to rebuild community trust and confidence in the management of water resources in NSW.

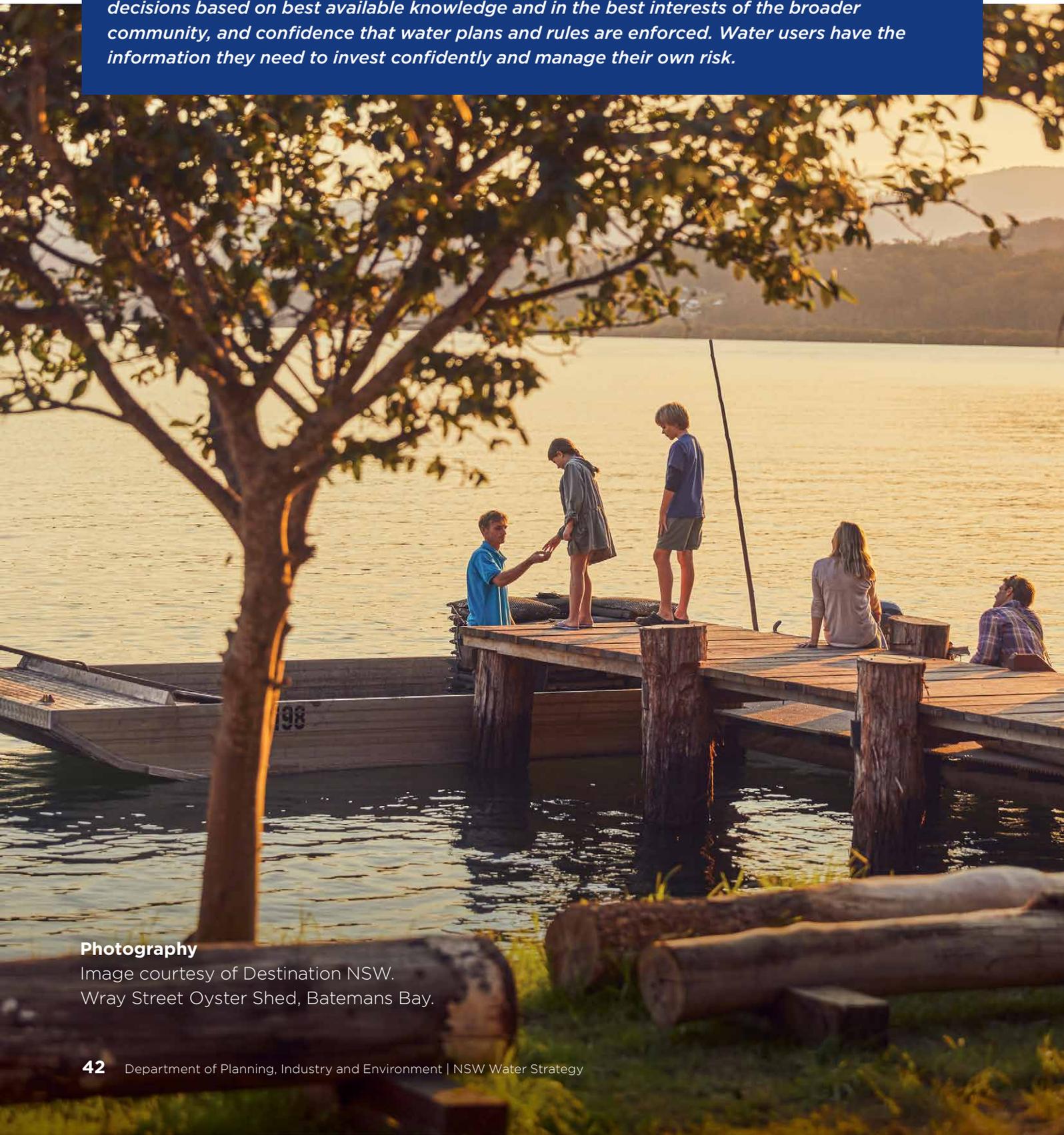
To achieve these aims, we have identified seven strategic priorities focused on meeting core objectives based on the NSW *Water Management Act 2000*. The Act provides a clear direction that NSW must provide for the sustainable and integrated management of the water sources of the state for the benefit of both present and future generations. We have also developed a set of principles to guide the long-term strategic planning for water resource management in NSW, as well as the day-to-day management of the system.

Actions taken through the NSW Water Strategy will need to contribute to one or more of these core objectives and align with the guiding principles.

Figure 15 outlines the objectives, principles and priorities for the NSW Water Strategy, as well as the actions the NSW Government will take in each priority area.

Build community confidence and capacity through engagement, transparency and accountability

Our aspiration: The NSW public has a high level of trust in the water sector to make good decisions based on best available knowledge and in the best interests of the broader community, and confidence that water plans and rules are enforced. Water users have the information they need to invest confidently and manage their own risk.



Photography

Image courtesy of Destination NSW.
Wray Street Oyster Shed, Batemans Bay.

Key challenges and opportunities

Recent reviews of water management within NSW and across the Murray-Darling Basin have identified diminished public trust in governments to deliver good long-term water management policy and support rural and regional communities.

These reviews identify the need for the water sector to be more transparent and accountable. This includes having clear evidence underpinning how and why decisions are made, and ensuring that this evidence is available to—and can be understood by—customers, stakeholders and the broader community.²⁹ Reviews have also highlighted the need for ‘a single source of truth’ about water management and for this information to be easily accessible to the public.

There are more than 35,000 water licence holders across NSW and hundreds of thousands of landholders with a basic landholder right to take water for domestic and stock purposes. The Government engages with these licence holders through regular newsletters, communications and alerts. In addition, there are engagement forums for customers and stakeholders, including Customer Advisory Groups, River Operations Stakeholder Consultation Committees and broader river planning stakeholder groups in each valley, as well as Environmental Water Advisory Groups in some valleys.

Water management is complex and involves many agencies and all three levels of government. This complexity, along with the scope of reform in water management in NSW, means that water users and stakeholders are being consulted on multiple, and at times overlapping, government initiatives. This has led to instances of confusion, frustration and ‘consultation fatigue’. It also leads to a perception in the community that water agencies are not ‘joined up’ or working together.

While NSW and Australian water managers are improving the transparency of water information, there is still more work to be done to support effective water markets and give the community confidence that the rules are fair and compliance is being monitored and enforced.

The NSW Government acknowledges the importance of better communication with, and the more effective involvement of, all stakeholders in water management decisions and water resource planning. This includes Aboriginal communities, environmental groups, industry, local government and the broader community. We recognise that these diverse water users need access to reliable and timely information to make informed decisions on business and investment risk, and to participate in the water market.

We continue to improve how we consult on water-related projects, reforms and strategies and we are committed to making clear and concise information about water sharing and management easy to find and understand.

29. Department of Planning, Industry and Environment, IPART Price Submission—Stakeholder Engagement, February 2020.

What communities want

In recent years, the Department of Planning, Industry and Environment has consulted extensively with communities across NSW on a range of water-related projects and reforms, including the development of water sharing plans and water resource plans, metering reforms, floodplain harvesting policy, environmental water management, the drought response and regional water strategies.

The department reviewed more than 1,300 consultation and engagement activities undertaken over the last four years to better understand community expectations for water management activities. Four themes were identified, centred around the need for better quality, easier to understand and more timely information, and a fair and consistent compliance and enforcement regime. The four themes and key priorities identified by stakeholders are:

- **Clear and transparent enforcement of the water management framework to ensure consistency and compliance.** Customers indicated strong support for a robust compliance and enforcement regime. More engagement and transparency, as well as adequate resourcing particularly in relation to the number of compliance officers, were identified as customer priorities in this area.

- **Monitoring customers can trust across programs and water sources.** This includes improvements to current technology, as well as reporting requirements. Feedback from customers was that this would allow for fair and consistent rule enforcement, based on accurate information. Customers also want accurate and reliable data to provide them with certainty and to inform decisions about how to manage their water entitlements.
- **Improved accountability for water management decisions through greater transparency and strong evidence.** Customers requested more technical reports and scientific analysis to provide evidence to support the department's decisions and proposals, as well as to inform customer feedback on these.
- **Improving the information available to customers** to provide certainty, better inform their decisions and their feedback to the department on specific issues and improve their understanding of the water management system.

We also know that water users expect public consultation on major policy changes to the water management framework in NSW. Customers expect that changes to rules which affect water access will be subject to meaningful consultation.

Photography

Image courtesy of David Barnes, Department of Primary Industries.
Bald Rock, Stanthorpe.

Improve collaboration and engagement with communities

The NSW Government will continue to improve its approach to collaborating and engaging with communities by placing communities at the centre of decisions about water service provision.

We will work to build a trusting partnership with water users and the broader community using the following principles so that engagement is:

- **purposeful** to deliver outcomes with a clear understanding of what all parties want to achieve
- **inclusive** to enable the participation of all relevant stakeholders
- **timely** to provide enough time for meaningful consultation and in an efficient manner

- **transparent** to enable meaningful participation and set clear expectations around how participants' input will inform outcomes, including publication of what we heard and what action will be taken
- **respectful** to acknowledge the needs, experience, perspective and expertise of participants.

A critical foundation of this partnership is for government departments and agencies to become much better at explaining complex water management technical and regulatory concepts in plain English so that the model for water management, and the obligations of individuals within the system, can be understood clearly and easily by everyone. Our job and our challenge is to put ourselves in the shoes of our stakeholders and provide the best possible engagement experience.

Action 1.1 Improve engagement, collaboration and understanding

The Government will improve how the water sector engages with communities about water management and make it much easier for water users and the broader community to engage with and understand water management and how decisions are made. We will:

- a. use plain English in water management communications and documents
- b. improve coordination between water sector agencies on engagement activities to reduce overlap, confusion and consultation fatigue
- c. test community interest in each region of NSW to be involved in oversight of the implementation of each of the 12 regional water strategies
- d. build knowledge, seek feedback and explore new ways to increase confidence among water users about water management decisions
- e. work with First Nations/Aboriginal People and peak organisations to design appropriate and inclusive approaches for engagement and consultation with Aboriginal People.

Make water data and information open, transparent and easy to find

Open, transparent and accessible information is critical to building community trust in water management decisions and regulation. While the availability and transparency of water data has improved, more can be done to address community concerns about a need for greater transparency around how water is used and shared, and how water rights are held and traded.

An important new initiative in NSW is the WaterInsights Portal that provides easy access to information about how water is managed and shared in NSW. It aims to help water customers to make more informed water resource planning decisions and to help communities and other stakeholders to understand what water is present in the system—in storage or in rivers or in aquifers. It explains the rules about how water is used, shared, traded and managed.³⁰

NSW has a number of public water registers that provide searchable information about water licences, approvals, water trading and environmental water. These registers can be improved to make them easier to navigate and provide more information and greater transparency about water and how it is being used, while protecting water users' privacy.

A number of public dashboards are also available on the Department's website to make rules and water information more transparent. These dashboards provide information on water trade, allocations and use.

Through its *Open Data Policy*, the NSW Government is committed to making data available for use by the community, researchers, business and industry. There are opportunities to be more proactive in making available the government-held datasets that underpin water management in NSW.

Action 1.2 Increase the amount and quality of publicly available information about water in NSW

The Government will continue to improve the quality and range of water-related information made publicly available and ensure it is easy to find, search and navigate. We will:

- a. provide easier access to information about how water is managed and how

decisions are made, particularly decisions around future water availability

- b. improve data management, accessibility and transparency and take an open by default approach to information and data
- c. improve NSW's public water registers to increase transparency (while protecting privacy).

30. waterinsights.waternsw.com.au/



Saltwater Creek

- ← Mowarry Point 5.9km
- ← Leatherjacket Bay 9.0km
- ← Boyds Tower 13.7km
- Bittangabee Bay 9.0km →
- Greencape Lighthouse 17.0km →

Photography

Image courtesy of Destination NSW.
Ben Boyd National Park, Green Cape.

Improve and expand water modelling capabilities

Water planning models help to inform most of the decisions in regional water management in NSW. These models use and produce extensive and detailed information on water availability and use across a range of climatic, development and regulatory conditions. This information could be used to great value in the wider community.

However, there is restricted access to this information (partly due to concerns about information that could be market sensitive) and limited broad understanding of how to correctly interpret this information. Providing greater access to water planning models and their outputs, along with explanatory materials, will help to unlock the value in these models and provide information that can help people and organisations outside government in their own understanding and decision-making around water management and use.

Departments, agencies, local water utilities and others rely on the information gained from different types of modelling to help them make decisions. Currently, different modelling platforms are used for different purposes, including:

- river system models for water planning
- river system modelling for operational decisions
- groundwater (hydrogeological) models

- floodplain modelling
- estuary modelling
- dam safety analysis (Probable Maximum Flood)
- water utility secure yield analysis models
- rainfall runoff models
- water quality models
- ecological models, including population models.

These models are developed on an as-needs basis, largely as standalone models to serve one or more specific purposes. There is scope to link together these separate models and expand their purpose to answer a wider range of questions. There is also scope to provide public access to this data and the potential for open model access in the future.

Making the most of these models requires gaining acceptance that they are the best they can be with the available data and resources and that they conform with best practice guidelines and are subject to peer review and continual improvement. We will also need to design and implement new IT systems and governance arrangements to manage access to, and use of, models and modelled information.

Action 1.3 Enhance modelling capabilities and make more data and models openly available

To improve and expand our modelling capabilities and make more data, models and model outputs openly available, the Government will:

- a. develop best practice guidelines/Codes of Practice to ensure that all models are widely applicable, and that modelling is of the highest quality
- b. maximise the benefits from existing fit-for-purpose models by investigating how we can link these different models and expand their application
- c. identify opportunities to increase transparency in model methods and to make publicly available models and data that have been peer reviewed and quality assured.



Photography

Image courtesy of Sally Anderson-Day, Department of Planning, Industry and Environment. Gwydir River, Bingara.

Demonstrate that rules are enforced

Communities across NSW need to have confidence that water plans and rules are being followed and enforced, and non-compliances addressed. Actions taken through the NSW Water Strategy will improve trust and confidence in the water sector and the water management framework.

Building an effective and trusted compliance regime

The Natural Resources Access Regulator (NRAR) commenced operations in NSW on 30 April 2018 and has responsibility for enforcing water

management legislation. The NRAR assists water users understand their obligations, actively monitors compliance with water plans and rules, and takes appropriate enforcement action where water use and access rules are breached.

Water users across NSW have demonstrated that they want the certainty and social licence that widespread compliance brings and have embraced the NRAR's work. However, confusion can persist with some water users. The regulatory regime is complex, and the NRAR has observed that water users are often unsure of their obligations, including the interpretation of water sharing plan rules or the conditions on water access licences.

Action 1.4 Reinforce the effectiveness of the Natural Resources Access Regulator

The Government will continue to build the capacity of the NRAR to fulfil its role as a fair but firm regulator of water management and give the community confidence that water plans are implemented and rules are enforced. We will:

- a. undertake more extensive and effective promotion of the regulatory approach and actions of the NRAR

- b. clarify water user obligations and communicate them clearly, so that water sharing plans across the state more effectively underpin a modern and enforceable licensing system
- c. increase the NRAR's use of and access to technology, such as remote sensors, satellite imagery and drones, enabling the NRAR to better direct its investigations and resources to address the instances of highest harm to water users and the environment.



Rebuilding trust in compliance

The NSW Government established the Natural Resources Access Regulator (NRAR) to crack down on illegal water use and rebuild trust in the community around water use and access.

Since its formation, the NRAR has launched 31 prosecutions in court and undertaken more than 1100 individual compliance actions including 464 formal warnings, 379 statutory directions and 373 infringement notices. In 2019/20 alone, the NRAR investigated 1,367 cases, conducted 1,614 proactive compliance actions and initiated 118 enforcement actions.

Proactive compliance campaigns are run routinely alongside investigations of suspicious activity reported by the public. These reports are prioritised so that those with the potential to cause the most harm to

waterways, water users or the environment are dealt with first. Currently, the NRAR's investigators and compliance officers travel throughout the state's 58 water sharing plan areas, inspecting properties and assessing compliance with water users' licences and the *Water Management Act 2000*.

The NRAR regularly publishes reports on its activities and maintains a public register that details enforcement actions taken under the *Water Management Act 2000* and prosecution outcomes. The NRAR is also developing a strategic engagement plan to make sure that water users understand their obligations and are aware of the consequences of non-compliance and the compliance approach of the regulator.

Photography

Image courtesy of Salty Dingo.
Compliance officers, Natural Resources Access Regulator.

Regulating floodplain harvesting

Floodplain harvesting is the last major component of water take proposed to be brought within the licensing framework provided by the NSW *Water Management Act 2000*.

To protect the environment and downstream water users from the impact of unconstrained floodplain harvesting, the NSW Government introduced the NSW Floodplain Harvesting Policy in 2013 so that this form of water take could be

regulated within legal limits. The regulation of floodplain harvesting will be given effect through amendments to relevant water sharing plans and the Water Management (General) Regulation 2018.

Implementation of the NSW Floodplain Harvesting Policy and the NSW Floodplain Harvesting Measurement Policy are essential to ensure that water taken in this way is accurately measured, fully accounted for, and regulated within legal limits.

Action 1.5 Take the final steps in floodplain harvesting reform

The Government will finalise floodplain harvesting reforms by issuing floodplain harvesting licences and amending draft water sharing and water resource plans to manage take within legal limits.



Photography

Image courtesy of Department of Planning, Industry and Environment. Floodplain harvesting.

Reviewing domestic and stock basic landholder rights

Domestic and stock rights are one component of basic landholder rights under the *Water Management Act 2000*. These rights allow landholders whose properties are next to a river or on top of an underground water source to take water for domestic and stock watering purposes without the need for a licence or approval (although an approval is required to construct a dam or water bore).

The use of these rights is largely unregulated. There is no limit on the volume of water that may be taken or guidelines about how the right can be used.³¹ However, a basic landholder right cannot be traded.

Several reviews have pointed to regulating domestic and stock basic landholder rights as a logical next step towards improving water management in NSW. The *Murray-Darling Basin Water Compliance Review*³² noted that these rights are often poorly understood and there is no requirement to report water take and no compliance program around the use of these rights. It recommended that all Basin governments 'audit water take by stock and domestic and other rights holders to identify areas of stress on water resources from the exercise of these rights, and put in place measures to monitor compliance'.³³

The *Independent Panel Assessment of the Management of the 2020 Northern Basin First Flush Event* also recommended that NSW needed a better understanding of volumetric requirements for domestic and stock basic landholder rights so these can be factored into planning and preparation for such events.³⁴

Recent droughts have raised further issues around the way water is extracted and used under domestic and stock basic landholder rights during extreme dry periods.

Action 1.6 Review the regulation of domestic and stock basic landholder rights

The Government will review and consult with the community about how domestic and stock basic landholder rights are regulated. We will:

- a. review the current situation to better understand how much water take is occurring under domestic and stock basic landholder rights and whether this is creating risks in particular areas or circumstances
- b. consult with the community on options for improving understanding of domestic and stock basic landholder rights, and whether rules are required to better manage that form of water take and enhance the regulator's (NRAR) ability to enforce compliance.

31. Other than the definitions of domestic consumption and stock watering provided for in s.52 of the Act

32. www.mdba.gov.au/publications/mdba-reports/murray-darling-basin-water-compliance-review

33. Murray-Darling Basin Authority 2017, *The Murray-Darling Basin Water Compliance Review*, www.mdba.gov.au/sites/default/files/pubs/MDB-Compliance-Review-Final-Report.pdf

34. *Independent Panel Assessment on the Management of the 2020 Northern Basin First Flush Event*, September 2020, www.industry.nsw.gov.au/water/allocations-availability/northern-basin-first-flush-assessment

Make sure that water take is measured

Measuring non-urban water take ensures we know whether water is being taken according to the rules. Fully accounting for this resource and ensuring everyone is playing by the rules will become even more important in a more variable and changing climate.

The NSW Government is taking a leadership role when it comes to improving the standard, coverage and transparency of measuring and monitoring non-urban water take. We will continue to demonstrate this leadership—giving water users and communities confidence in water management and sharing arrangements across NSW.

Action 1.7 Make sure the majority of non-urban water take in NSW is accurately measured

The Government will ensure that the vast majority of non-urban water take, including floodplain harvesting, in NSW is measured by accurate, auditable and tamper-proof meters. Key milestones for delivering this action are:

Non-urban water metering rules

- 1 December 2020—compliance date for pumps greater than 500 mm
- 1 December 2021—compliance date for all other works in northern inland region

- 1 December 2022—compliance date for all other works in southern inland region
- 1 December 2023—compliance date for all other works in coastal regions.

Floodplain harvesting measurement rules

- January to May 2022—compliance date for large storages (1,000 ML or greater)
- 1 July 2022—compliance date for all other storages.

Playing by the rules

Most water users do the right thing and they—and the broader community—expect those who don't to be held accountable.

Across NSW, new rules are being rolled out to significantly improve metering and measuring of non-urban water take. Development of these rules was a key commitment of the NSW Government's 2017 Water Reform Action Plan and the Murray-Darling Basin Compliance Compact.

The new non-urban metering rules became law in December 2018 and will take effect in a staged roll-out between 2020 and 2023. The rules will ensure that more than 95% of licensed non-urban water take capacity is measured accurately. NSW is also establishing a robust regime for measuring and monitoring the water take from floodplain harvesting.

The new rules are based on 'internet of things' telemetry technology, allowing information about water use to be transmitted in near real time to government agencies and water users. In the short term, this technology will drive efficiencies in the way government undertakes its regulatory, billing, river management and water planning functions.

It will also pave the way to expanded functions over time, such as:

- increased automation of compliance and enforcement functions
- integration with other systems to implement water management rules, such as active management of environmental flows and water modelling
- supporting more publicly accessible information about water take
- integration with automated on farm infrastructure, such as a 'remote' on and off switches for pumps, soil moisture probes and weather stations.

Over time—as the costs of metering and telemetry technology decrease, and the benefits to government, water users and the general community increase—it is reasonable to expect that NSW will achieve near universal uptake of telemetry-enabled metering equipment.

Importantly, the new rules are driving an increase in the size, maturity and technological sophistication of the water metering industry, creating jobs and export opportunities and driving competition and innovation that will deliver further benefits to NSW and Australia.



Photography

Image courtesy of Salty Dingo.
Compliance officers, Natural Resources Access Regulator.

Recognise First Nations/Aboriginal People's rights and values and increase access to and ownership of water for cultural and economic purposes

The NSW Government recognises First Nations/Aboriginal People's rights to water and our aim is to secure a future where water for First Nations/Aboriginal People is embedded within the water planning and management regime in NSW, delivering cultural, spiritual, social, environmental and economic benefit to communities.

Photography

Image courtesy of Destination NSW.
Macquarie River, Dubbo.

Key challenges and opportunities

Aboriginal values and uses of water provide a cultural connection to Country and First Nations/Aboriginal People are acknowledged as the first managers and carers of this natural resource. First Nations/Aboriginal People have rights and a moral obligation to care for water under their law and customs. These obligations connect across communities and language groups, extending to downstream communities, throughout catchments and over connected surface water and groundwater systems.

The 2007 Echuca Declaration defines cultural flows as 'water entitlements that are legally and beneficially owned by the Nations of a sufficient and adequate quantity and quality to improve the spiritual, cultural, natural, environmental, social and economic conditions of those Nations'.³⁵

The Government recognises there are systemic issues that need to be addressed at a state-wide level to better enable the exercise of First Nations/Aboriginal People's rights and access to water, both within the Murray Darling Basin and in coastal regions of NSW:

- **Cultural flow access**—while there are some provisions for accessing water for cultural purposes in NSW, these do not currently meet the needs and obligations of First Nations/Aboriginal People to care for Country or achieve the cultural water flows and water management aspirations set out in the 2007 Echuca Declaration. Also, policy settings limit the use of cultural water entitlements so that no direct or indirect economic benefit can be gained. Only seven cultural water entitlements have ever been issued, with only two remaining in use today.

- **Self-determination and decision making**—historically, there have been limited opportunities made available for First Nations/Aboriginal People to be involved in water policy development processes and limited co-management opportunities. While the water sector's engagement with First Nations/Aboriginal People and communities is improving, as demonstrated in recent water planning initiatives in the Murray Darling Basin, it is not yet a mature, knowledge-sharing partnership.
- **First Nations/Aboriginal People's knowledge about the water management system**—the water sector has not effectively worked with First Nations/Aboriginal People to develop and share suitable information about water institutions, technical information and regulations to support understanding of the complex water management framework.
- **Water and culture**—there is not sufficient awareness or acknowledgement of First Nations/Aboriginal People's water rights, values, interests and concerns in water management frameworks and little effective integration of First Nations/Aboriginal People's knowledge and science into water management decisions and practices.

35. www.mdba.gov.au/sites/default/files/pubs/sa-mldrin-echuca-declaration-2009.PDF

Several key pieces of work provide the foundation for the way forward including First Nations-led work developed under the National Cultural Flows Research Project.³⁶ The Government will work with First Nations/Aboriginal People and organisations and apply the processes developed in the *Pathway to Cultural Flows in Australia*, *Cultural Flows—A guide for First Nations and* and *Cultural Flows—A guide for Water Managers*.

There are also existing Government strategies that provide the principles and commitments for effective engagement and shared decision making including: Closing the Gap commitments; the NSW Government's OCHRE Plan; and the Department of Planning and Environment's Our Place on Country Aboriginal Outcomes Strategy 2020–23. The National Agreement on Closing the Gap is built around four priority reforms:³⁷ building and strengthening structures to empower Aboriginal and Torres Strait Islander people to share decision-making with governments; building formal Aboriginal and Torres Strait Islander community-controlled sectors to deliver services to support Closing the Gap; systemic and structural transformation of mainstream government organisations to improve accountability and better respond to the needs of Aboriginal and Torres Strait Islander people; and enabling shared access to location specific data and information to support Aboriginal and Torres Strait Islander communities and organisations achieve the first three Priority Reforms.

The National Agreement also includes a commitment to develop an inland waters target that will measure progress towards securing Aboriginal and Torres Strait Islander interests in water bodies inland from the coastal zone under state and territory water rights regimes. This will include data development to identify a nationally consistent measure for inland waters encompassing, for example, water licenses, water rights and water allocation plans.

The need to improve the way NSW manages water resources to achieve better outcomes with First Nations/Aboriginal People has also been highlighted in several recent independent reviews including the Natural Resource Commission's Review of the Barwon Darling Water Sharing Plan (2019), the Independent Panel assessment of the 2018/19 fish deaths in the Lower Darling (Vertessy Report, 2019) and the Independent Panel Assessment on the Management of the 2020 Northern Basin First Flush Event.

In addition, the Australian Government Productivity Commission's draft report on National Water Reform included recommendations for a new objective and element of the National Water Initiative dedicated to First Nations/Aboriginal People's access to water and involvement in water management.

Specific actions to improve outcomes for First Nations/Aboriginal People through the NSW Water Strategy are outlined in this section. However, actions across all priorities in this Strategy seek to deliver social, cultural and economic outcomes for Aboriginal people, and achievement of these outcomes will rely on meaningful partnership and engagement.

36. culturalflows.com.au

37. www.closingthegap.gov.au/priority-reforms

High-level themes for improved Aboriginal water outcomes in the Murray-Darling Basin

Complementing the work led by First Nations and representative peak groups over many years, recent government engagement with Aboriginal stakeholders provides further guidance for embarking on reforms to improve the way we manage and share water. In preparing the NSW water resource plans, the Department of Planning, Industry and Environment undertook a culturally appropriate, Nation-by-Nation approach to hearing from First Nations/Aboriginal People on water-dependent cultural values and uses in the Murray-Darling Basin, including over 52 workshops and 250 Traditional owner interviews across the Basin.

Common actions called for during that consultation include:

1. Establish and enhance cultural flows by:
 - recognising and providing for the **cultural** dimensions of water for Aboriginal people
 - providing **economic** opportunities derived from water and access to water entitlements
- seeking **shared benefits** by using water allocated for environmental and consumptive purposes to deliver cultural benefits where synergies exist.
2. Acknowledge that water is critical to the **health and wellbeing** of communities
3. Enable **access to Country** to maintain healthy waterways and engage in cultural practices
4. Embed culturally appropriate First Nations/Aboriginal **participation, partnerships and knowledge transfer** into water management and government decision-making.

These themes have been a starting point for discussions with First Nations/Aboriginal People about the regional water strategies. Through the regional water strategies, the department is now also working with Aboriginal people in coastal regions to understand issues and aspirations for coastal communities.

Photography

Image courtesy of Destination NSW,
Lake Burrendong, Mumbil

Work as partners to empower First Nations/Aboriginal People in water management

The Government is committed to improving water management outcomes for First Nations/Aboriginal People in partnership with First Nations peak organisations, Aboriginal water interest groups and First Nations communities.

We recognise that First Nations/Aboriginal water interests are represented by different groups and organisations and we will make every effort to consult with Aboriginal people with respect and in culturally appropriate ways, to meet the needs and protocols of Aboriginal representative bodies.

Our partnership and engagement approach will be underpinned by the Closing the Gap National Agreement, which outlines that the way government works with First Nations/Aboriginal People needs to change, and that First Nations/Aboriginal People should have a genuine say in the design and delivery of policies, programs and services that affect them.

Further, all water related initiatives and processes in an area should involve Native Title holders and claimants.

Action 2.1 Strengthen the role of First Nations/Aboriginal People in water planning and management

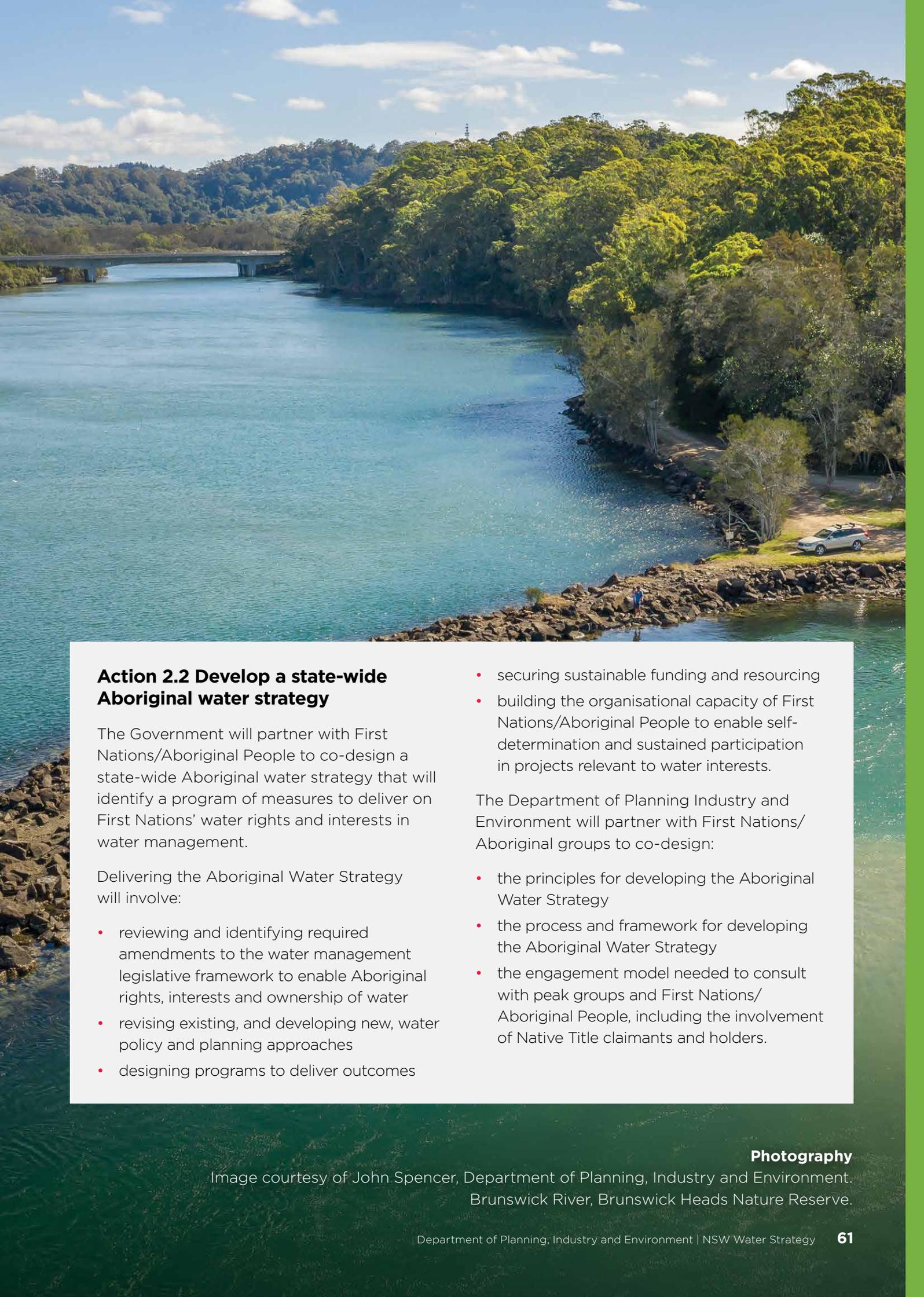
The Government will strengthen the role of First Nations/Aboriginal People in water planning, management, governance and decision-making by:

- working with First Nations peak organisations, Aboriginal water interest groups and First Nations communities to determine how we will work together on critical state-wide water strategies, policies, programs and issues
- adopting more appropriate and inclusive approaches to engagement and consultation with Aboriginal people, including in accordance with each First Nation's cultural protocols
- ensuring existing water governance and decision-making processes provide for

First Nations representation, including through identified First Nations roles on relevant boards and committees and supporting roles for Aboriginal community-controlled organisations in water governance

- partnering with First Nations in water planning and management consistent with the principle of self-determination, and building the capacity of First Nations to develop water governance and decision-making processes that empower Traditional Owners
- ensuring water related plans, policies and programs deliver social, spiritual, cultural, economic and environmental outcomes for First Nations/Aboriginal People.

We will also improve accountability and transparency in water governance and management, consistent with actions under Priority 1.



Action 2.2 Develop a state-wide Aboriginal water strategy

The Government will partner with First Nations/Aboriginal People to co-design a state-wide Aboriginal water strategy that will identify a program of measures to deliver on First Nations' water rights and interests in water management.

Delivering the Aboriginal Water Strategy will involve:

- reviewing and identifying required amendments to the water management legislative framework to enable Aboriginal rights, interests and ownership of water
- revising existing, and developing new, water policy and planning approaches
- designing programs to deliver outcomes

- securing sustainable funding and resourcing
- building the organisational capacity of First Nations/Aboriginal People to enable self-determination and sustained participation in projects relevant to water interests.

The Department of Planning Industry and Environment will partner with First Nations/Aboriginal groups to co-design:

- the principles for developing the Aboriginal Water Strategy
- the process and framework for developing the Aboriginal Water Strategy
- the engagement model needed to consult with peak groups and First Nations/Aboriginal People, including the involvement of Native Title claimants and holders.

Photography

Image courtesy of John Spencer, Department of Planning, Industry and Environment.
Brunswick River, Brunswick Heads Nature Reserve.

Recognise Aboriginal water rights, interests and the need to access water

Water is deeply entwined with Aboriginal culture. Water provides food, kinship, connection, recreation, stories, songlines and healing.

Healthy waterways are critical to the culture and wellbeing of Aboriginal communities across NSW. We need to improve water management in NSW to give greater recognition to First Nations/ Aboriginal water rights and interests and improve access to water, waterways and water-dependent cultural sites.

Action 2.3 Provide Aboriginal ownership of and access to water for cultural and economic purposes

The Government will enhance First Nations/ Aboriginal People's access to water for cultural and economic purposes by:

- recognising and protecting Native Title rights to water in water sharing plans
- working with First Nations to better understand cultural values and flow requirements to inform water planning and sharing decisions
- increasing water available for cultural and spiritual purposes
- increasing water entitlements in First Nations/Aboriginal ownership
- where there are synergies, using water allocated for environmental and consumptive purposes to deliver Aboriginal outcomes and benefits
- improving and enabling access to Country to maintain healthy waterways and engage in cultural practices.

Photography

Image courtesy of Daryl Albertson, Department of Planning, Industry and Environment. Ramsar site, Gwydir River.

Share water knowledge

The Government recognises the richness of traditional First Nations/Aboriginal knowledge and experience in caring for our land and water, and has come to appreciate this more during the Nation by Nation engagement undertaken in the Murray Darling Basin as part of the development of the State's first water resource plans under the Basin Plan.

We will continue to enhance this inclusive approach which will enrich planning and approaches for sustainable water management into the future.

We will also assist Aboriginal people to engage in what is a complex system of water rules and regulations to influence, and be actively engaged in, water management into the future.

Action 2.4 Work with First Nations/ Aboriginal People to improve shared water knowledge

The Government will work closely with First Nations/Aboriginal People to improve shared water knowledge and enable Aboriginal-led programs to implement projects informed by Aboriginal knowledge and science. We will also take action to make sure that Aboriginal people have a better understanding of water management frameworks and regulation in NSW. We will do this by:

- establishing culturally-safe mechanisms for two-way sharing of water knowledge, where appropriate, supported by appropriate mechanisms for data sovereignty that ensure the protection of First Nations/Aboriginal People's intellectual property rights and interests

- delivering programs to improve cultural competency in the water sector
- delivering programs to improve knowledge of water management policies, rules and frameworks in Aboriginal communities.

We will also partner with First Nations/ Aboriginal People to develop programs and initiatives that will:

- increase the participation and employment of Aboriginal people 'on the ground' in maintaining the health of land, rivers and wetlands
- provide opportunities at regional and local levels for Aboriginal people to contribute traditional ecological knowledge to the management of land and water resources.



Photography

Image courtesy of Destination NSW.
Wingecarribee River, Berrima.

Protect Aboriginal culture and heritage

Numerous First Nations/Aboriginal cultural sites across NSW are near or are in water (such as fish-traps). The Government recognises the cultural significance of these sites and their importance to Aboriginal people and NSW.

Action 2.5 Work with First Nations/ Aboriginal People to maintain and preserve water-related cultural sites and landscapes

The Government will work closely with Aboriginal communities to ensure that:

- regional and metropolitan water strategies appropriately consider First Nations/Aboriginal People's cultural heritage in assessing infrastructure, policy and planning options in each region
- meaningful engagement occurs with First Nations/Aboriginal People upstream and downstream of new infrastructure proposals
- cultural heritage implications of new water policies are considered.

We will also partner with First Nations/ Aboriginal People to explore programs and initiatives that will support Aboriginal communities to identify and map water-dependent cultural sites and record cultural water practices, where culturally appropriate.

Photography

Image courtesy of iStock.
Murray-Darling confluence, NSW.

Improve river, floodplain and aquifer ecosystem health, and system connectivity

Our aspiration: The health of water resources and their catchments across NSW is protected and improved to support environmental, social, cultural and economic needs and values—now and into the future.



Photography

Image courtesy of Department of Environment, Energy and Science.
Macquarie south marshes, Macquarie lagoon.

Key challenges and opportunities

The health, wellbeing and prosperity of NSW communities and industries depend on healthy rivers, wetlands, floodplains, aquifers, estuaries and water catchments. The health of these surface and groundwater resources depends on good management of the resource, as well as land use and management in the surrounding catchment.

Across NSW, many surface water resources are already under stress. There are challenges in delivering water to the end of our long river systems and the dry decades since 2000 have had harmful impacts on river habitats and ecosystems in some valleys. Estuaries, wetlands, marshes and other waterways are dealing with issues such as reduced water replenishment and higher salinity levels. A more variable and changing climate—along with population growth and industry development—will exacerbate these pressures and change how much and when water will flow to water-dependent ecosystems.

Groundwater resources are also under stress in some places, especially in areas of concentrated use. In some areas, our knowledge about this resource, including the ecosystems it supports, is limited. Regional towns and industries are relying more heavily on groundwater to meet shortfalls in surface water supplies. At a state level, there is a need to ensure that groundwater use is sustainable in changing climate conditions, that access to groundwater is integrated with surface water access and that groundwater access and quality are protected from adverse land use impacts.

Connectivity is also an important characteristic of water system health in NSW. We need to better understand and manage water in the environment for connectivity between water on the land (as soil moisture, overland flow and infiltration), water in waterways and groundwater—recognising it is all one integrated system, not three separate ones.

The health of our surface water and groundwater systems is also directly affected by the land use and land management practices in surrounding catchments. The riparian and aquatic habitat of NSW has suffered a serious decline in quality and quantity since European settlement, with impacts associated with urban, industrial and agricultural development placing significant pressure on the natural environment.

These impacts have also affected native fish populations throughout the state's waterways. Native fish in all catchments have been affected. In most catchments, native fish populations are in poor health and have suffered serious reductions in distribution and abundance. In the Murray-Darling Basin, native fish populations are estimated to be 10% of their pre-European settlement levels and nearly two thirds of native fish species are listed as threatened under state or Commonwealth legislation.

Despite efforts to alleviate existing pressures, there continue to be significant challenges in delivering water for the environment and improving the health of waterways and their catchments. While regional and metropolitan water strategies will tackle some of these issues at a regional and local scale, integrated decision making and actions are needed at the state level.

A renewed focus on land use and ecosystem health

The Government will take landscape-scale and catchment-wide action to help address the impacts of urban, industrial and agricultural land uses on the health of our rivers and water-dependent ecosystems.

Protecting and enhancing ecological systems

Long Term Water Plans are part of the NSW Government's commitment to implementing the Murray-Darling Basin Plan. The plans draw together local, traditional and scientific knowledge to improve the way water is managed to maximise river and wetland health outcomes within and between catchments over the longer term.

The plans set objectives, targets and watering requirements for key plants, waterbirds, fish and system functions. Nine plans have been completed for NSW Murray-Darling Basin catchments, setting objectives and targets for five-, 10- and 20-year timeframes. Development of the plans provided an opportunity to take a more strategic, coordinated and catchment-wide approach to water management—improving outcomes for the length of the rivers and contributing to Basin-scale benefits over an extended timeframe.

The objectives and targets for birds, fish, vegetation and river functions within the plans are supported by specific Environmental Water Requirements. These requirements describe the volume, timing, duration and frequency of flows needed to achieve the identified objectives and targets.

Action 3.1 Consider NSW Long Term Water Plans to protect and enhance ecological systems

The Government will work to:

- a. consider the objectives and targets outlined in the NSW Long Term Water Plans to guide water planning, and to develop equivalent products for coastal regions of NSW, including protecting
- b. and enhancing our nationally listed wetlands and internationally recognised sites/species
- b. improve understanding of the impact of climate change on environmental water management
- c. engage with stakeholders, including First Nations/Aboriginal People in the implementation and review of NSW Long Term Water Plans.

Photography

Image courtesy of Destination NSW.
Lake Burrendong, Mumbil.

Taking landscape-scale action

The Government will deliver integrated land management programs and landscape scale rehabilitation activities in priority catchments.

This will involve partnerships and programs facilitated by government agencies such as Local Land Services working with industry partners, communities and non-government organisations, to support sustainable land use practices that improve river health and build the skills and harness the knowledge of local people, including the deep knowledge and experience of First Nations/Aboriginal People.

Actions will complement and be driven by catchment and natural resource management objectives within existing programs and plans, including Long Term Water Plans, Local Land Services Local Strategic Plans, Regional Strategic Weed Management Plans and Regional Landcare Partnership programs. This will help to ensure the successful implementation of recovery plans and priority action statements for Threatened Species and Endangered Ecological Communities.

In coastal catchments, actions will also be driven by Coastal Zone Management Plans and by the *Marine Estate Management Strategy*, which responds to threats to the water quality, habitats and biodiversity of the state's coastal waters and estuaries.

Actions will also link with existing programs such as:

- the Biodiversity Conservation Trust, which supports private land conservation
- the Regional Landcare Program, which connects efforts to deliver environmental and agricultural outcomes on private land
- those delivered by Local Land Services that provide advisory and extension services and incentives to change management practices on private land
- the NSW Travelling Stock Reserve Strategy, which manages Crown Land for multiple land uses including biodiversity conservation.

Action 3.2 Take landscape scale action to improve river and catchment health

The regional water strategies will identify specific priorities and target programs towards improving land use and land management practices in catchments where these are major contributors to a decline in river and catchment health.

We will also examine barriers to land management practices which improve river health.

Improve native fish health and populations

In addition to impacts on river health and habitat condition, native fish populations face a number of specific threats that are common to most of the state's river systems and catchments, including:

- **Barriers to fish passage:** All native fish need to migrate to spawn, seek food and refuge, and to recolonise habitats following drought. However, the ability of native fish to migrate in NSW has been significantly constrained through the construction of dams and weirs that have contributed to the 90% decline in native fish populations since European settlement. Without specific, targeted intervention to remediate fish passage, native fish populations will continue to decline.
- **Cold water pollution:** Cold water released into rivers from large water storages during warmer months is a key factor behind the reduction in the range and abundance of native freshwater fish species in NSW. This water is significantly colder in comparison to natural flows as it is released from deep within the dam.

In summer, water temperature can be up to 13°C lower than natural river flows immediately downstream of some structures and can persist for hundreds of kilometres in some waterways. Cold water pollution changes the range and distribution of native fish, reduces opportunities for effective reproduction, reduces body growth and condition and reduces recruitment success.

- **Fish extraction by water pumps:** Every year, large numbers of native fish are extracted by pumps and diverted into irrigation channels, never to return to mainstream river systems. These losses are unnecessary. Screens can stop fish and debris entering pumps and diversions and, at the same time, improve water delivery and extraction efficiency by reducing blockages caused by debris.

Addressing these threats will contribute to major improvements for native fish health and riverine productivity across NSW, as well as enhancing social and economic outcomes from existing water management efforts.

Action 3.3 Take action to address threats to native fish

The NSW Government will deliver three state-wide, catchment scale initiatives to address key threats to native fish populations. We will:

- a. implement the NSW Fish Passage Strategy
- b. address cold water pollution through interventions such as temperature monitoring, new operating protocols and cold water pollution mitigation technology at priority dams where cold water impacts are severe
- c. invest in fish-friendly water extraction technology at priority sites, guided by the regional water strategies.



Reconnecting NSW: the NSW Fish Passage Strategy

The NSW Fish Passage Strategy has been developed by the NSW Ministerial Task Force on Fish Passage to deliver a coordinated, strategic approach to fish passage remediation. The strategy is a 20-year plan to restore unimpeded fish passage to 165 high priority weirs, which will significantly improve native fish access to nearly 9,000 km of mainstream rivers and key off-channel habitats below all major storage dams in the state.

Fish passage remediation is an investment in infrastructure that delivers benefits for asset owners, the community and the environment. A key attribute of fish passage remediation work is that it does not require additional water to deliver these benefits.

Photography

Image courtesy of Department of Primary Industries.
Macquarie River.

Continue to improve knowledge and information about water resources and catchments

Best practice water management relies upon high quality information. To make the right decisions and choices about sharing and managing water, we need to know the ecological condition of our water resources and understand the risks to these resources from water extraction and inputs. The Department of Planning, Industry and Environment has developed spatial products to assist with tracking the overall health of NSW rivers.

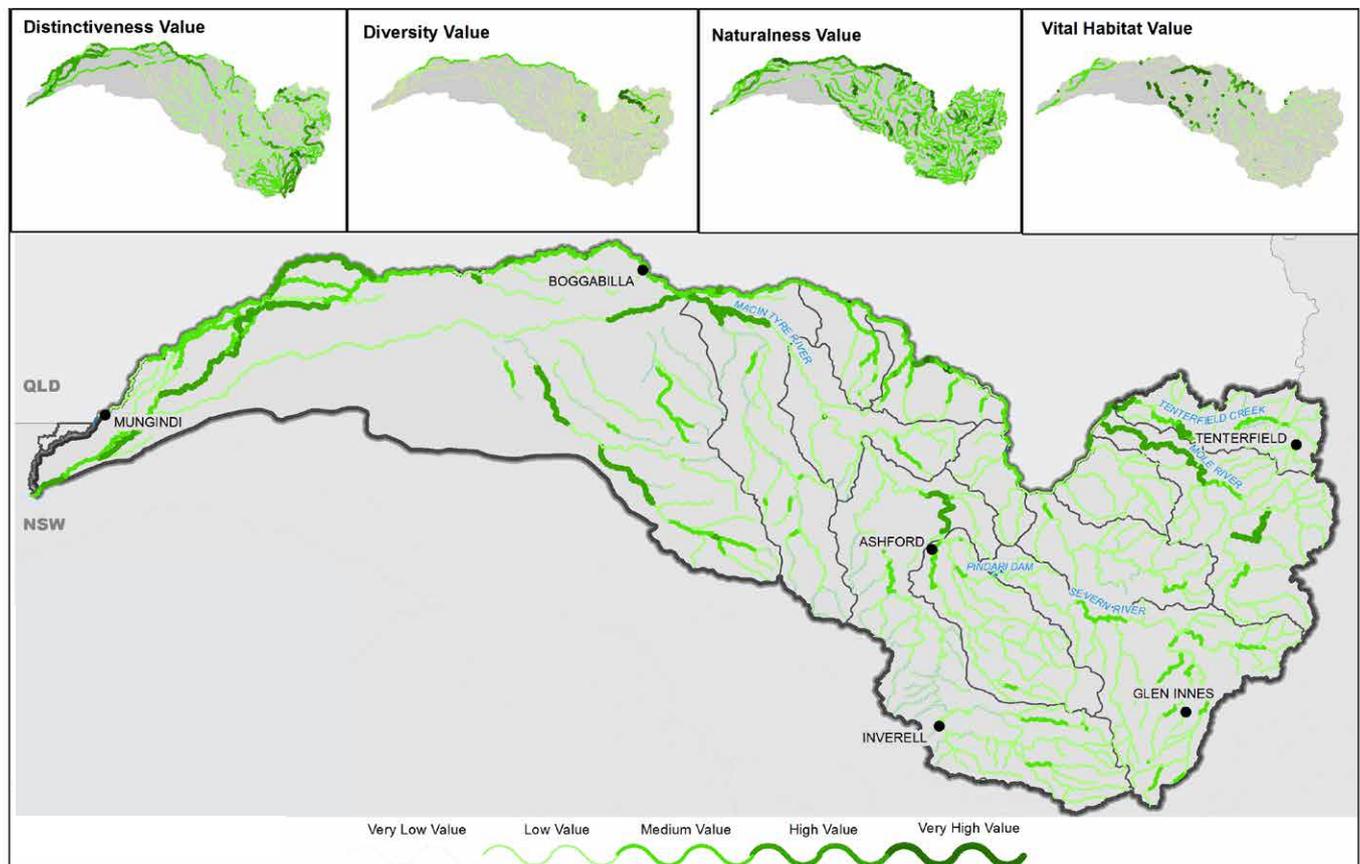
The NSW High Ecological Value Aquatic Ecosystems (HEVAE) framework is used to map and classify the instream ecological value of river reaches in NSW freshwater rivers. The HEVAE framework informs the development of water sharing plans, along with specific ecological

condition and intervention monitoring, including fish community status and threatened species distributions.

Figure 16 shows an example of HEVAE mapping at the scale of a water sharing plan for the Border Rivers area. These analyses have been done for all Murray-Darling Basin valleys and are underway in coastal regions to inform the remaking of coastal water sharing plans. Full NSW coverage is expected in 2021.

HEVAE has also been used to inform the Natural Resource Access Regulator’s compliance priorities in the Murray-Darling Basin and State Significant Development and WaterNSW licencing and works assessments. HEVAE and associated ecological data, including threatened species distribution and fish community condition, has also been provided to Local Land Services to set priorities for the Northern Basin Riverbanks Program.

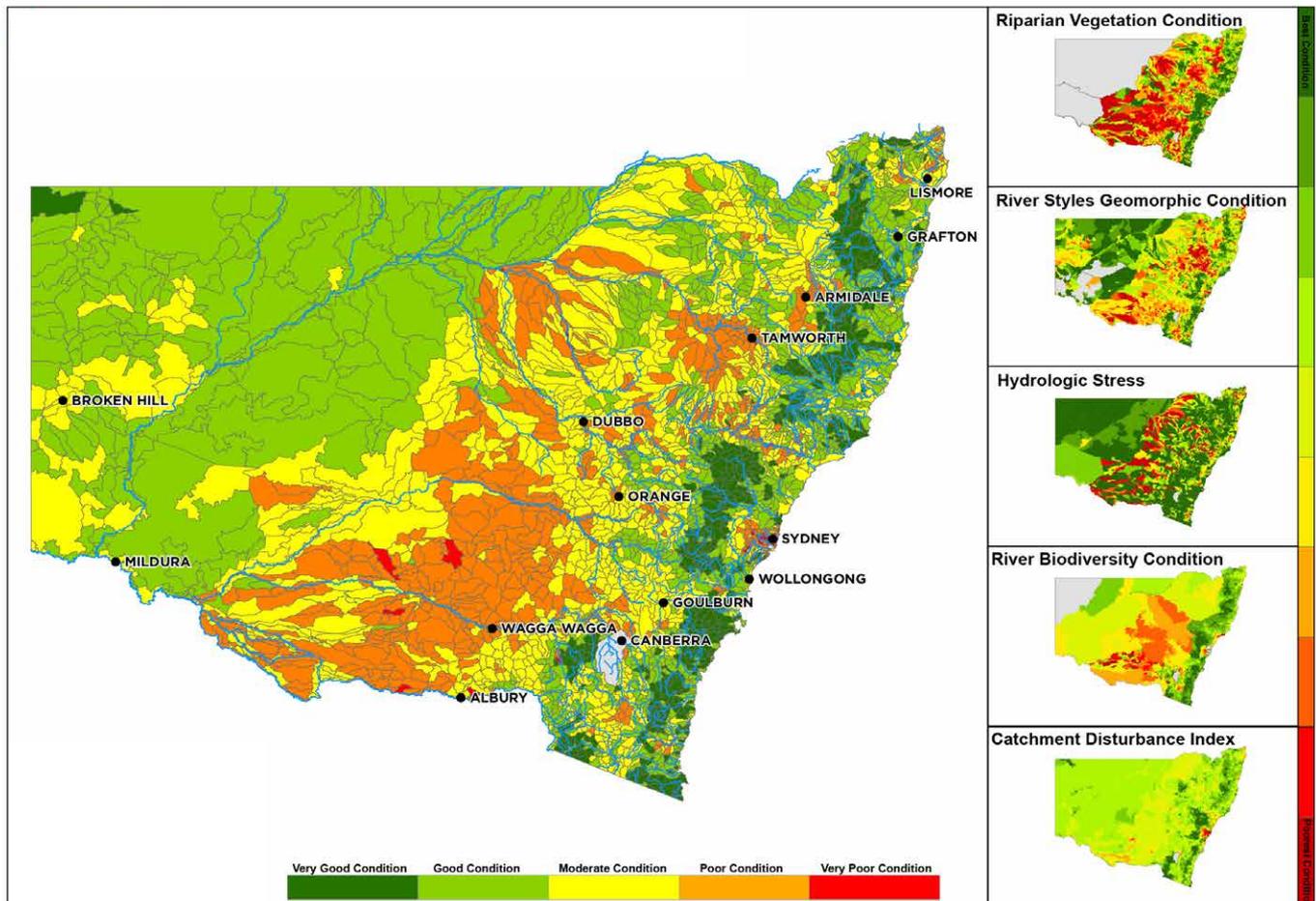
Figure 16. HEVAE mapping in the Border Rivers area



Source: Map produced by NSW Industry—Lands and Water, August 2016

NSW also produces a River Condition Index that assesses and compares river health across the state. Figure 17 shows the most recent index (2012).

Figure 17. NSW River Condition Index



Source: Map produced by NSW Industry—Lands and Water, 16 March 2012

Action 3.4 Invest in long-term and effective monitoring, evaluation, reporting and research

The Government will:

- a. implement monitoring, evaluation, and reporting frameworks to track the effectiveness of plans and policies and inform future management actions
- b. update the River Condition Index across NSW in 2021 after detailed assessments are completed in coastal water sources to provide a baseline for addressing progress of the NSW Water Strategy and the regional and metropolitan water strategies.



Photography

Image courtesy of Bron Powell, Department of Primary Industries—Fisheries, Boobera Lagoon.

An increased focus on water quality

The Department of Planning, Industry and Environment has developed water quality management plans for each water resource plan area in the NSW Murray-Darling Basin. These outline the risks, measures to address risks and water quality targets for each area. The plans are supported by water quality and salinity technical reports that describe the current conditions in each plan area. Elements of these plans and reports can be extended to coastal systems.

Monthly water quality sampling of NSW rivers is carried out by WaterNSW and water quality monitoring has improved across the state. However, monitoring of water quality events (for example, fish deaths and blackwater events) is currently managed on an ad hoc basis and could be improved. Better coordination of water quality data collection, management and assessment would allow better evaluation of catchment and water management plans and actions. Developing standard, state-wide arrangements for the monitoring of extreme events would enhance response actions and reduce risks.

The department is also exploring opportunities to improve the coordination and management of diffuse source water pollution. This form of pollution is often caused by runoff from urban and rural activities and significantly influences the water quality of NSW's rivers, waterways and the marine environment. By clarifying roles and responsibilities across government and focusing efforts on high priority causes of diffuse source water pollution, the Government aims to establish a unified management approach and deliver improved water quality across NSW.

Action 3.5 Adopt a more intense, state-wide focus on improving water quality

The Government will:

- a. continue to monitor and review the NSW Water Quality Objectives across NSW to ensure they reflect contemporary community and environmental values and uses³⁸
- b. define clear roles, accountabilities and frameworks for monitoring, assessing and addressing water quality risks across the state
- c. ensure the community can access information about water quality.

38. www.environment.nsw.gov.au/topics/water/water-quality/protecting-and-managing-water-quality

Improve groundwater knowledge and management

Groundwater is a valuable resource for NSW, supplying 20-30% of all water needs. Groundwater sustains many regional towns, major economic activities in regional areas (including agriculture and mining) and supports internationally protected ecosystems. The quantity, quality, accessibility and demand for groundwater vary depending on the location of the resource and its underlying rock type.

Groundwater is vital in inland regions where surface water is less available. Around 140 inland towns rely wholly on groundwater for town water supply and more than 100 other towns are partially dependent on groundwater, particularly during drought. Concentrated groundwater extraction around some inland major irrigation centres is putting pressure on this vital resource.

Coastal groundwater resources are under pressure from contamination from land use practices (such as industrial effluent) near larger population centres, expanding urban settlements and seawater intrusion.

Groundwater is likely to become an increasingly important water source in parts of regional NSW in the future. We need to carefully manage our groundwater resources to ensure they remain available to meet critical water needs and continue to deliver economic, social and environmental benefits for regional communities.

NSW has a world-class groundwater management framework that has undergone significant reform, including actions to protect the sustainability of groundwater sources—giving us a solid foundation for the future. However, significant opportunities exist to use groundwater more efficiently, innovatively and sustainably; improve our understanding of groundwater processes, ensuring groundwater of suitable quality is available for critical needs; and better manage risks to the resource.

Action 3.6 An enhanced, state-wide focus on sustainable groundwater management

The Government will develop and implement a NSW Groundwater Strategy and Action Plan to improve groundwater management across NSW. This strategy will address the challenges and opportunities around sustainable groundwater management and aim to secure and protect groundwater for thriving environments, communities and industries.

Understand and improve system connectivity

Connectivity of rivers is important for the environment, communities and industry. When water flows along the length of a river into downstream reaches and connected water courses, it provides water to support towns, landholders, Aboriginal people, industries and the environment within and between valleys.

Connectivity between valleys means that enough water is left in the rivers to flow downstream to other communities, towns, environmental assets and water users. Enabling connectivity between valleys is critical to sharing water fairly across NSW. Connectivity is also an important characteristic of water system health in NSW.

While there are provisions for recognising the connection between regions, water is generally managed on a valley-by-valley basis.

A number of recent reviews and assessments have recommended a greater emphasis on connectivity across the northern Murray-Darling Basin³⁹ and the NSW Government is working towards improving connectivity in the Basin.

Northern Basin connectivity was a component of the 2017 Water Reform Action Plan, the NSW Government's response to the Vertessy Report and the Natural Resources Commission's review of the Barwon-Darling Water Sharing Plan. Water sharing plans also contain rules that contribute to connectivity (either within a valley or between valleys). In the context of a more variable future climate, we may need to do more to improve connectivity across NSW.

Improving connectivity will inevitably involve trade-offs between and within regions in different parts of the state, including potentially restricting water being taken in some regions so other regions can have access to that water. It also requires exploring and resolving a number of complex issues, including:

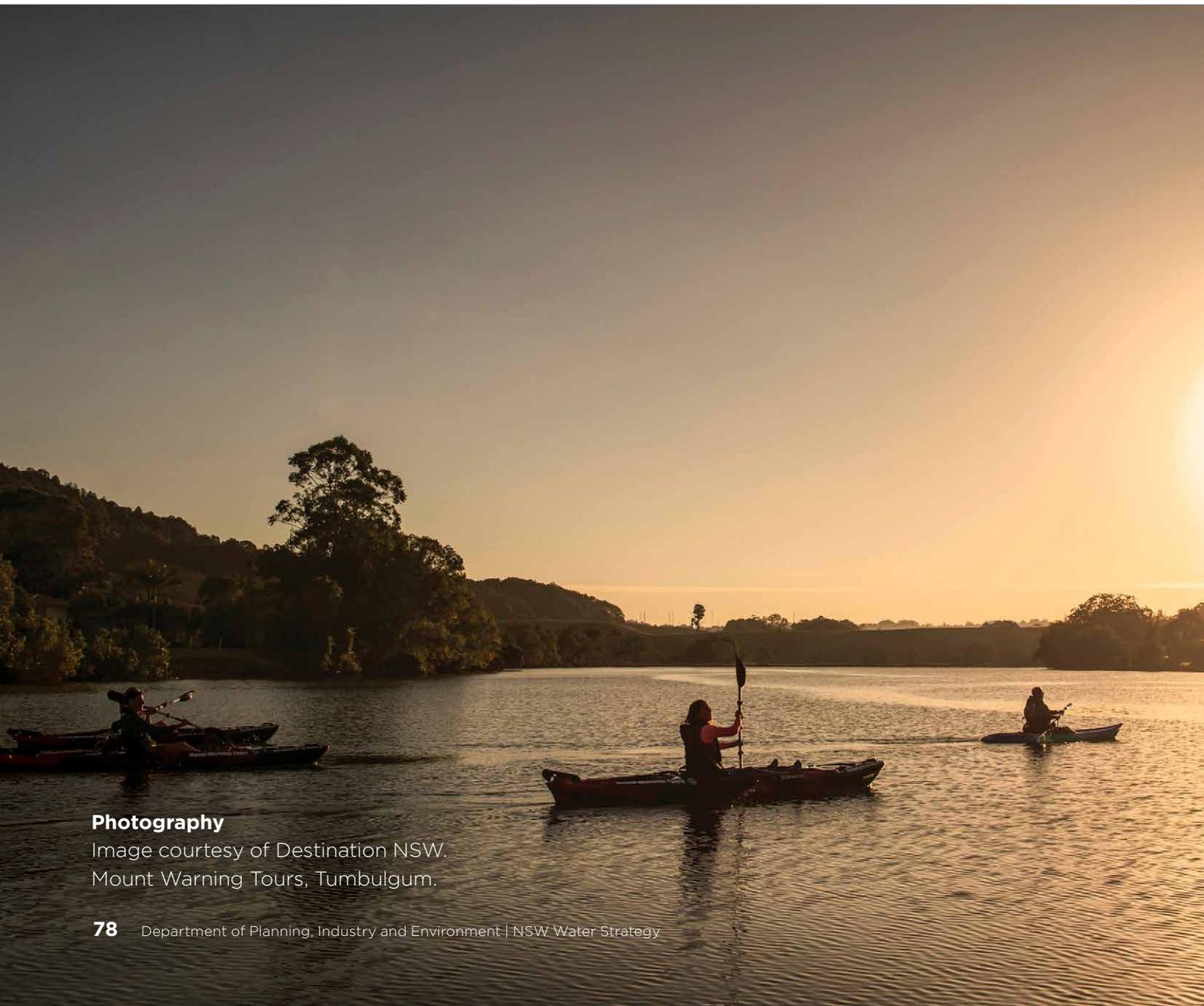
- defining what connectivity means and having a clear statement on objectives around connectivity
- determining principles that should be used to progress certain connectivity options, including trade-offs that the government and the community are willing to accept on water availability for industry, towns, cultural uses and the environment
- investigating options to deliver an agreed definition of connectivity, including options that would improve water security for critical human needs and the environment during low and cease-to-flow events
- a robust monitoring and evaluation program
- improved understanding of the benefits and impacts on different water users and the environment.

39. *The Independent Panel Assessment of the Management of the 2020 Northern Basin First Flush Event; The Independent Assessment of the 2018-19 fish deaths in the Lower Darling (Vertessy Report) and Review of the Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012.*

Action 3.7 Work with communities to better understand and improve system connectivity

The Government will take a community-driven and transparent approach to explore ways to improve the flows between hydrologically connected rivers and valleys across inland NSW. We will:

- a. develop principles and a clear statement about how NSW will increase connectivity across regions of the Murray-Darling Basin
- b. explore options to improve connectivity between catchments
- c. develop decision-making support tools and frameworks to better inform water sharing decisions across connected water resources, particularly in the Murray-Darling Basin
- d. implement the actions in the NSW Government's response to the Independent Panel Assessment of the Management of the 2020 Northern Basin First Flush Event.



Photography

Image courtesy of Destination NSW.
Mount Warning Tours, Tumbulgum.

Case study: Northern Connectivity Event 2018

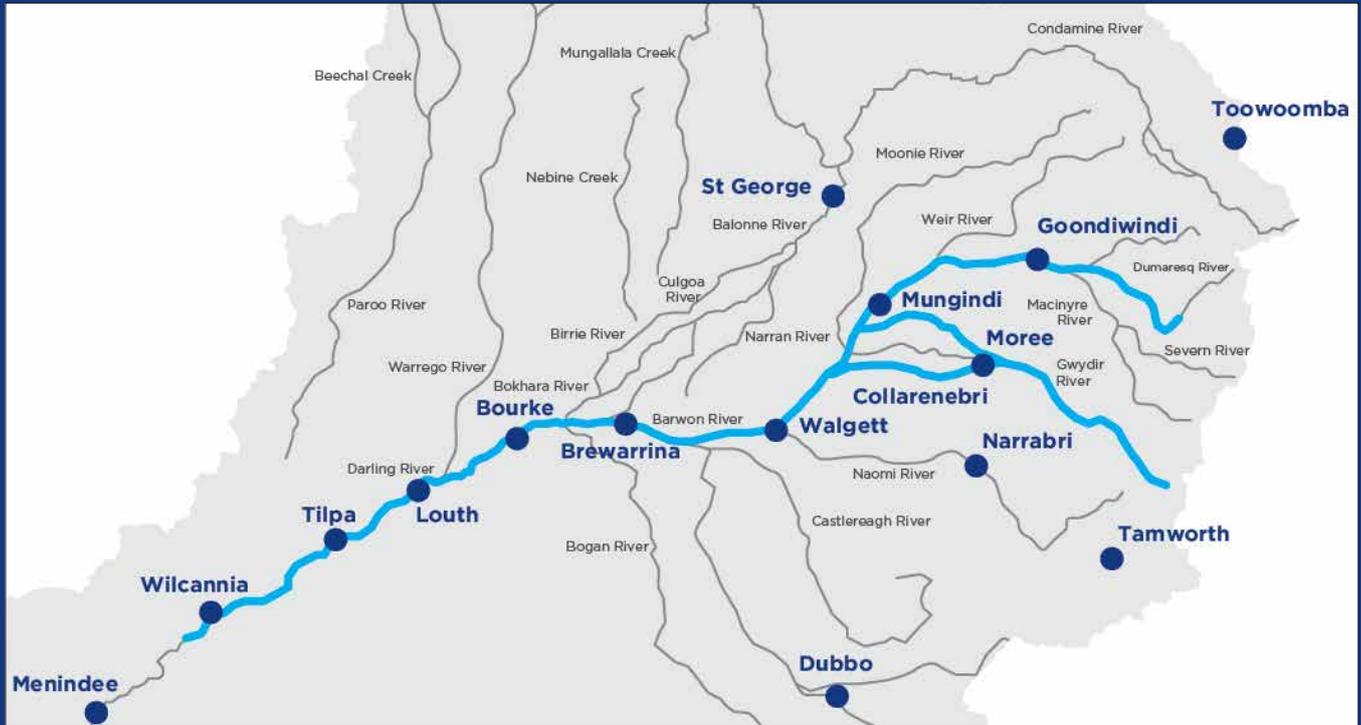
We trialled protection of held environmental water—Northern Connectivity Event

The Commonwealth Environmental Water Office partnered with a number of NSW agencies to release and manage 32.2 GL of environmental water to build on natural inflows and provide for connectivity across multiple river systems to protect and support native fish.

Temporary restrictions on water take were put in place to ensure the environmental water flowing instream was protected to benefit the environment and communities along the river. Spanning April to June 2018, the event involved flows over 2,000 km of river channels. It also involved extensive and targeted consultation with local landholders, irrigators, shire councils, traditional owners and various interest groups.

A review of the event found that no illegal water take occurred during the Northern Connectivity Event. This was thanks to the NRAR's on-the-ground compliance operations. Flows through the Barwon-Darling river system exceeded expectations and targets, passing through Wilcannia and reaching Menindee on 1 July 2018. The trial use of satellite imagery by the Murray-Darling Basin Authority also proved to be a useful additional tool in monitoring the event.

In addition to providing significant environmental benefits, the event will inform future policy, planning and operational decision-making.



Increase resilience to changes in water availability (variability and climate change)

Our aspiration: Water resource management is supported by the most up-to-date understanding of climate, including climate change and associated risks to water resources. This understanding is reflected in strategic planning and supports water management decisions.



Photography

Image courtesy of Destination NSW.
Darling River and Murray River, Wentworth.

Key challenges and opportunities

Australia has a highly variable climate, and rainfall is especially variable. This makes it vital that we understand as much as we can about our climate so we can work out how we manage our water supplies. The frequency and duration of wet and dry events determines how much water we have available.

NSW is already experiencing trends of higher average temperatures and reduced cool season rainfall. There are indications from climate models that drought conditions may become more frequent and severe, and last longer.

Higher demand from a growing population, alongside reductions in supply, will increase water scarcity, putting further pressure on all users, including the environment.⁴⁰

It is vital that we collectively improve our understanding of these risks to better manage water supply and ensure that our operational, planning and future development decisions take future likely water reliability and security into account.

Net Zero Plan—taking action on climate change

The NSW Government is committed to achieving net zero emissions by 2050 and to making NSW more resilient to a changing climate.

The **Net Zero Plan Stage 1: 2020–2030** is the foundation for NSW's action on climate change. The Plan aims to grow the economy, create jobs and enhance the prosperity and quality of life of the people of NSW while allowing the state to deliver a 35% cut in emissions by 2030 compared to 2005 levels.

The NSW and Australian governments are jointly investing more than \$2 billion over 10 years to help the state fast-track climate action through energy and emissions reduction initiatives delivered under the Plan. This includes actions targeting energy efficiency, electric vehicles, hydrogen, primary industries, coal innovation, organic waste and carbon financing.

The implementation of the Net Zero Plan, together with the NSW Electricity Strategy,

will result in more than \$11.6 billion of new investment for NSW, including \$7 billion in regional NSW, and support the creation of almost 2400 new jobs.

The **Climate Change Fund** is supporting programs and projects to improve NSW's resilience to natural hazards and climate risks. This includes investment in world-leading climate research, support for councils, communities and agencies to better prepare for and respond to heatwaves, storms, floods, droughts and bushfires, the Five Million Trees initiative and coastal risk management programs.

The Government is also delivering local scale climate change adaptation programs to help communities understand the impacts of climate change in their areas and prepare for and adapt to these impacts, including taking action to protect ecosystems and vital natural assets and resources.⁴¹

40. Productivity Commission, *National Water Reform Issues Paper*, May 2020, p.2.

41. Further information on these and other climate change actions is available at climatechange.environment.nsw.gov.au/About-climate-change-in-NSW/NSW-Government-action-on-climate-change

Use best available data, methods and modelling to inform decisions across the water sector

Until now, our water management decisions have been made on just 130 years of observed climate records. The NSW Government is investing in new, state-of-the-art climate data and modelling that brings together information from a variety of sources to improve our understanding of past climate conditions and plausible climate futures.

This new modelling, which is being adopted as part of the development of the regional and metropolitan water strategies, will provide a more accurate picture of the frequency, duration and magnitude of extreme climate events such as extended droughts and floods, and indicate plausible, more extreme scenarios that may emerge over the next 40 years due to climate change.

NSW's climate is affected by almost all the major weather and climate drivers on the Australian continent at some stage through each year. East coast lows (ECLs) and the major oceanic climate drivers—El Niño-Southern Oscillation (ENSO), the Interdecadal Pacific Oscillation (IPO), the Southern Annular Mode (SAM) and the Indian Ocean Dipole (IOD)—all interact over NSW, producing a highly variable climate from year to year and between seasons.

Figure 18 shows the various climate drivers influencing rainfall in Australia and Figure 19 shows the relative influence of these climate drivers in different parts of NSW. The complex effects of these climate drivers result in the extended periods of wet and dry that NSW experiences.

Figure 18. Australia's climate and weather drivers

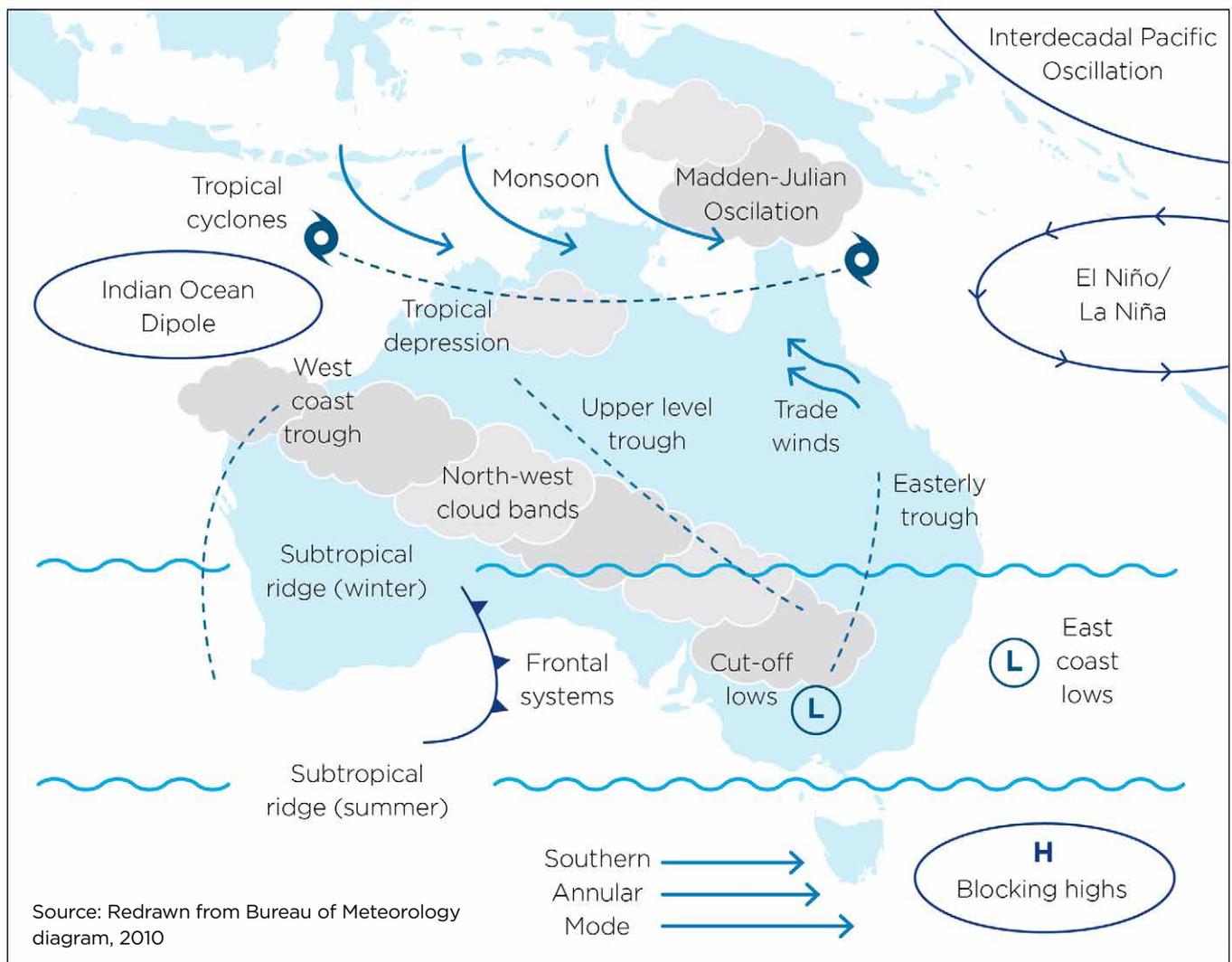
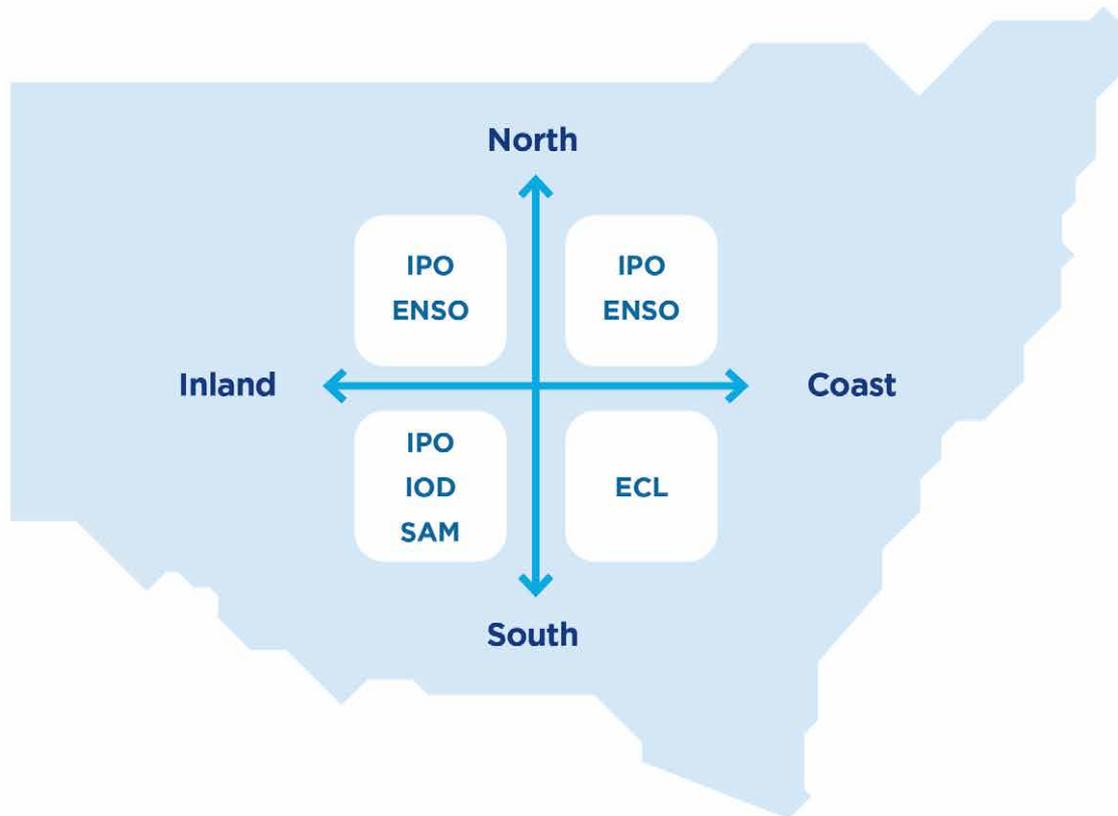


Figure 19. Influence of climate drivers across NSW



Source: Office of the Chief Scientist & Engineer, April 2020, *Independent review of the climate risk method for the NSW Regional Water Strategies Program*

Our 130 years of recorded information provides a good indication of average conditions, and shows a small number of extreme droughts and floods. We are now using paleoclimate records to better understand the likelihood of these extreme events. By analysing sources such as tree rings, cave stalactites and stalagmites, river sediments, soil patterns, and ice cores, we can identify the past duration and frequency of these events, for periods up to 500 years. We have combined this with our recorded information and our understanding of the key climate drivers, using statistical techniques, to generate 10,000 years of plausible past climate sequences. This information provides a better source of information to identify and assess the potential risks and outcomes of water management decisions under our current climate.

We have then combined this new 10,000 years of ‘current’ climate information with the climate change information provided by the NSW and ACT Government’s NARClIM project (see box on next page) to investigate the impacts of future human induced climate change on our rainfall and evaporation across the state. The method was developed by Department of Planning, Industry and Environment—Water with advice from the Universities of Newcastle and Adelaide. This new data and modelling approach has been independently reviewed by the Office of the NSW Chief Scientist and Engineer and a panel of independent experts and found to be best practice and a major advance on existing approaches.

We are considering worst-case scenarios

The NSW and ACT Regional Climate Modelling (NARClIM) Project is a research partnership between the NSW and ACT governments and the Climate Change Research Centre at the University of NSW.

NARClIM climate change datasets include a range of different future climate scenarios. We have used the most conservative result from NARClIM in our modelling for the regional water strategies—the scenario that

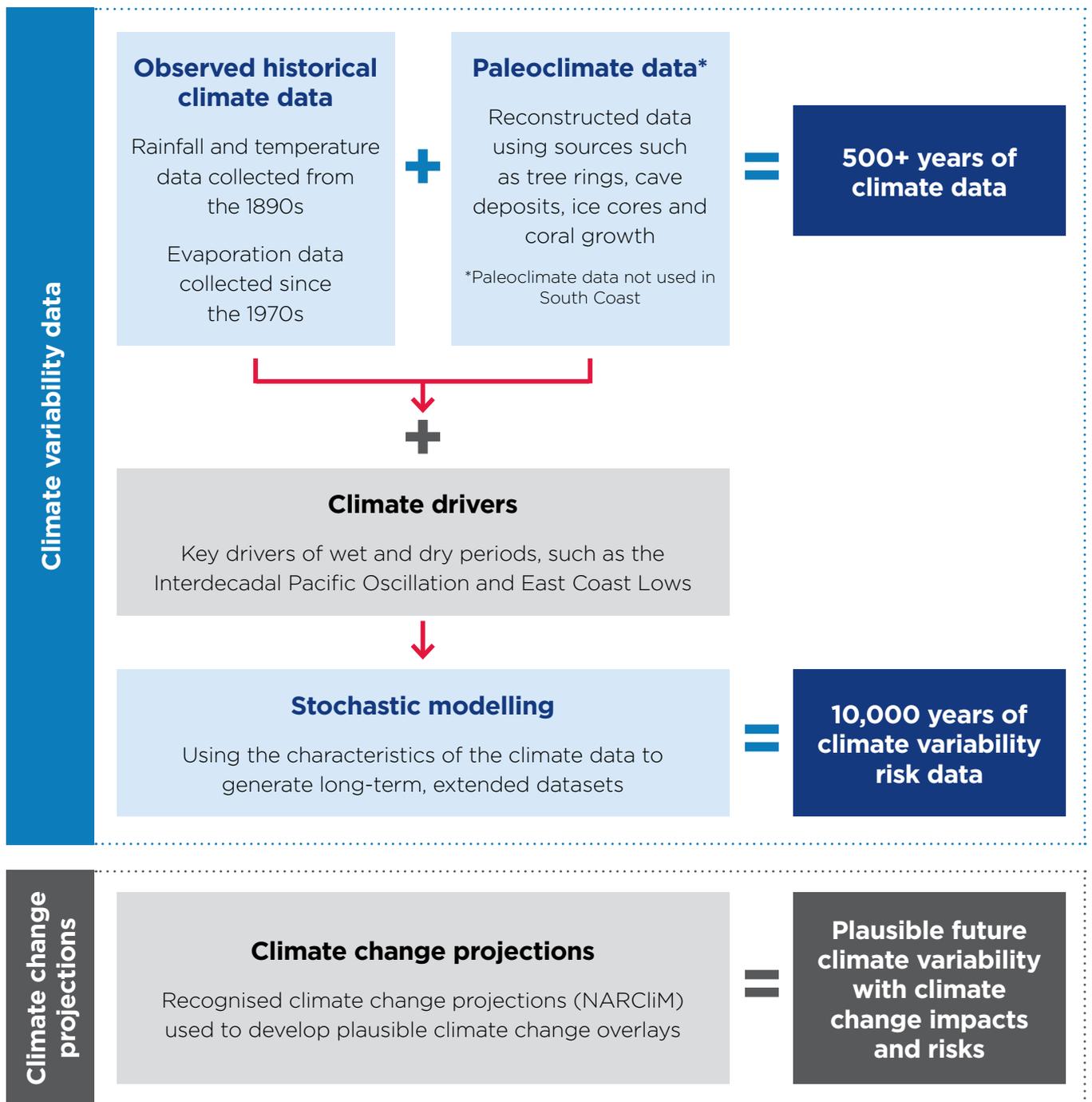
represents the greatest reduction in average monthly rainfall. While the results of the other scenarios in the current version of NARClIM are arguably equally appropriate and probable, we intend to ‘stress test’ the water system and understand the worst-case climate scenario for strategic water planning. This will test the resilience of options proposed in the regional and metropolitan water strategies, particularly options that aim to secure water for critical human needs.



Photography

Image courtesy of Destination NSW.
Tuross River, Tuross Head.

Figure 20. Illustration of new climate data and modelling approach



This new climate data is now being used in river system models to compare the outcomes of water-related policy, planning and/or infrastructure options. This enables us to test how effective different options—such as a pipe, dam or change in a rule or policy—might be in extreme scenarios, compared to other options.

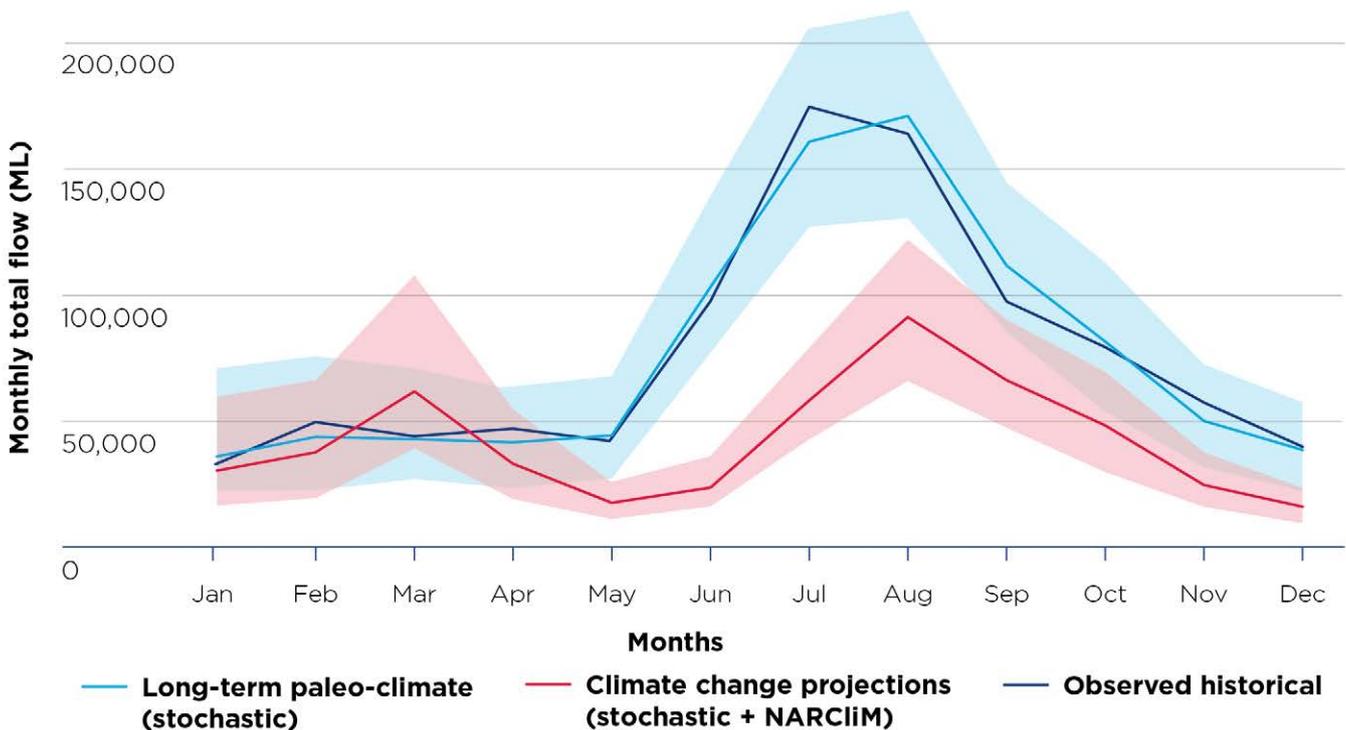
The overall message from the new modelling is that our water supplies in NSW could be less secure than we thought. This is because we have now factored in that droughts longer than those of the last 130 years are likely at some point and that we could see higher temperatures, higher rates of evaporation and less rainfall—leading

potentially to reduced river flows and more frequent low flow periods, decreased inflows into dams and water storages, and lower water storage levels.

This data has been used to investigate potential climate impacts in a number of locations across NSW and will be presented for each region as part of the regional and metropolitan water strategies. Figures 21 and 22 show examples of how this new modelling is being used to explore potential impacts in the Macquarie and Far North Coast regions.

Figure 21. Burrendong dam inflows under different climate scenarios

Inflows into Burrendong Dam in critical winter months (June–September) could be lower under long-term climate projections than those seen in both the observed and long-term historic records.

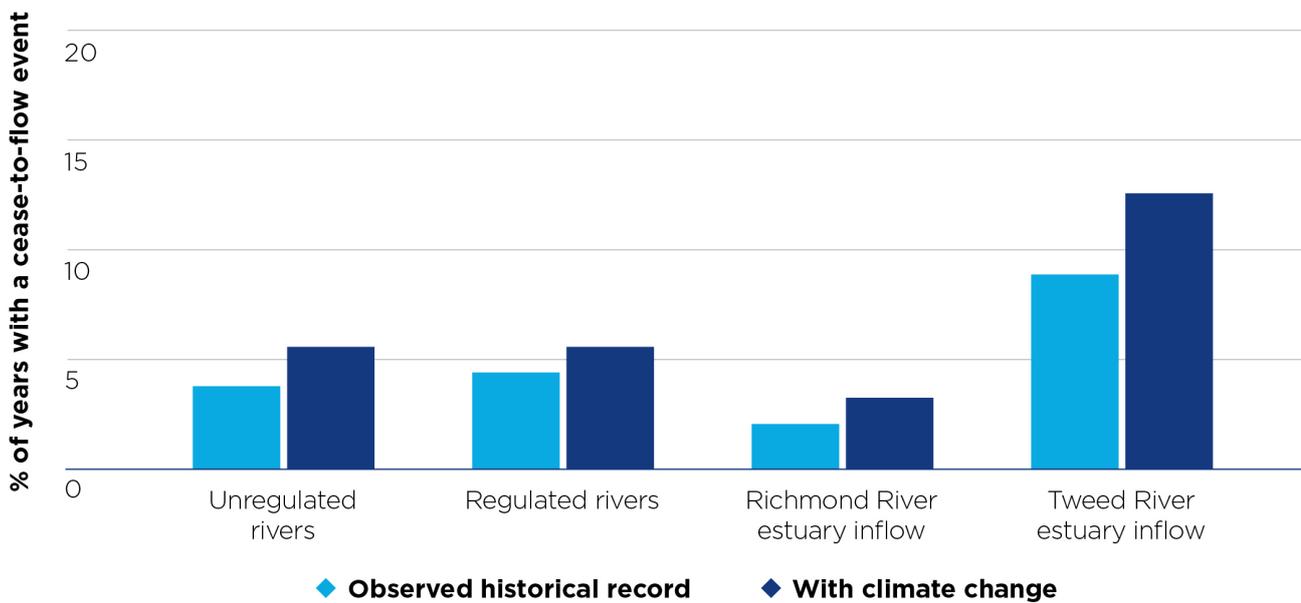


Source: Department of Planning, Industry and Environment—Water 2020, hydrological modelling

Note: The shaded area represents a 95th percentile confidence interval which means a high degree of confidence that values will fall within the shaded range based on the climate projection scenario.

Figure 22. Impacts of climate risks on the flow regime—cease-to-flow events in the Far North Coast region

There could be an increase in the number of years in which a cease-to-flow event occurs—across all regulated, unregulated and estuary inflow systems in the Far North Coast region.



Source: Department of Planning, Industry and Environment—Water 2020, hydrological modelling

Action 4.1 New actions to improve and apply our understanding of climate variability and change

The Government will continue to improve our understanding of climate, including variability and climate change, and ensure that it is applied and accessible to inform decisions across the water sector. We will:

- a. include new climate data and risk modelling methods in the NSW Common Planning Assumptions
- b. provide access to climate risk information for water users, councils and local water utilities, and the community to support towns and users adapt to likely reduced water reliability
- c. incorporate the new climate data into NSW water models, initially for regional and metropolitan water strategies and modelling of new infrastructure projects
- d. partner with key stakeholders and industry to develop communities of practice for climate risk modelling, and to promote improved risk management and adaptation
- e. advocate for use of a single climate risk methodology across the Murray-Darling Basin.

Update water allocation frameworks in response to changing water availability

Our improved data and modelling provides an opportunity to review the frameworks around water allocations—given our fuller understanding of the level of risk faced by different water users under current arrangements, as well as under more extreme but possible future climate conditions.

Licence holders in NSW regulated rivers are allocated water at the start of each water year and throughout the year if it rains and there are inflows to dams. The volume they are allocated is a proportion of their entitlement.

Water managers consider several factors when decisions are made about how much water to allocate to different categories of licences. These include dam storage levels and how much of this available water is already committed to the environment or is being held as carried over water in the accounts of licence holders (unused from previous years) or will be needed for the future requirements of high-priority needs such as towns, domestic and stock supplies. Water managers also consider how much water is needed for high security licences and interstate water delivery, as well as the volumes needed to deliver water down the river to meet these commitments.

When assessing the available water, an assumption is made about how much water will flow into the dam during a water year. This means that water managers have to take a level of risk at the beginning of the water year (which starts each year on 1 July) that these inflows will occur during the year to supply the allocations. Essentially, water allocations are a risk-based balance between providing water for productive use versus increasing reserves in storage to quarantine more water to improve water security in future years.

After the Millennium Drought, NSW opted not to take a more conservative approach to its water allocations to improve water security for critical

needs in the event of a future severe drought. Rather, in the event of the next drought, it was preferred to use other emergency drought mitigation measures to support communities. These include carting water for some domestic uses and restricting access to carryover water in general security licence accounts to meet higher priority needs.

In the wake of the recent drought, there are again calls to reduce water allocations to mitigate the impact of future droughts—that is, to be more conservative in how much water is allocated over a particular period to keep more water in reserve. However, this could potentially have a cost to productivity across non-drought years.

Current environmental water settings may also need to be reviewed to determine their suitability to protect and maintain environmental functions under changing climate conditions.

Water allocations are not the only tool for improving water supply reliability and security. Improved water reliability and security for towns and industries will be influenced by the combination of water availability, how the available water is allocated, river operations, infrastructure, demand management and water efficiency options.

Our new understanding of plausible future climate scenarios means it is appropriate to review water allocation approaches in each valley, in consultation with communities, to strike an acceptable balance between standards of water supply security for critical human and non-human needs during severe water shortages and optimal access to water when available for productive use.

Using the new, extended climate data records, we can look at water security needs across regions to identify potential climatic (drought) extremes and consider opportunities to improve water security for drought years, while aiming to limit the reduction to water allocations in other years. In some valleys, this may trigger a need to change water sharing plan rules and water allocations in response to new extremes in water availability.

Action 4.2 Review water allocation and water sharing in response to new climate information

The Government will review water allocation frameworks and water sharing plan provisions in response to new extremes in water availability. This will include:

- a. exploring 'critical human needs' and mechanisms to safeguard water for human needs during extreme events,

including development of a position on alternative water supplies where water security for towns cannot be guaranteed in extreme events

- b. exploring risk management approaches for more adaptive water allocation and accounting frameworks
- c. improving transparency and clarity for all water users about decision making for water allocations.



Photography

Image courtesy of iStock.
Irrigation farming.

Improve drought planning and preparedness

At the beginning of 2020, 100% of NSW was in drought.

While the Millennium Drought (2002-2009) was a new drought-of-record for the southern Murray-Darling Basin (the Lachlan valley and south), the recent drought (2017-19) became the new drought-of-record in northern Basin valleys—in some places far worse than previously experienced. In the Macquarie valley for example, inflows were one-third of the previous record low inflow based on over 100 years of data.

It also represented the lowest inflows on record in Greater Sydney by a significant margin and depletion rates were 1.5 times what they were during the Millennium Drought.

In October 2018, the Department of Planning, Industry and Environment released the NSW Extreme Events Policy, which establishes the principles for managing extreme events in the NSW Murray-Darling Basin. The policy is supported by Incident Response Guides for each major water source. The policy and guides establish a staged approach and provide a range of measures for water managers to deploy as conditions deteriorate. During the current drought, the stages became a key way to signal worsening water availability conditions to water users and the measures that could be applied to protect critical town water supplies. The stages apply to surface water shortages, groundwater shortages and water quality events.

Water sharing arrangements between Basin jurisdictions are set out in the Murray-Darling Basin Agreement, which provides limited adaptability or flexibility to respond to climatic extremes. Regardless of inflows into the system and available water in the system, NSW is required to contribute half of the entitlement flow to South Australia and then allocate remaining water to NSW water users. A review of the Murray-Darling Basin Agreement should be undertaken to identify mechanisms for greater flexibility and cooperation between jurisdictions experiencing different levels of drought.

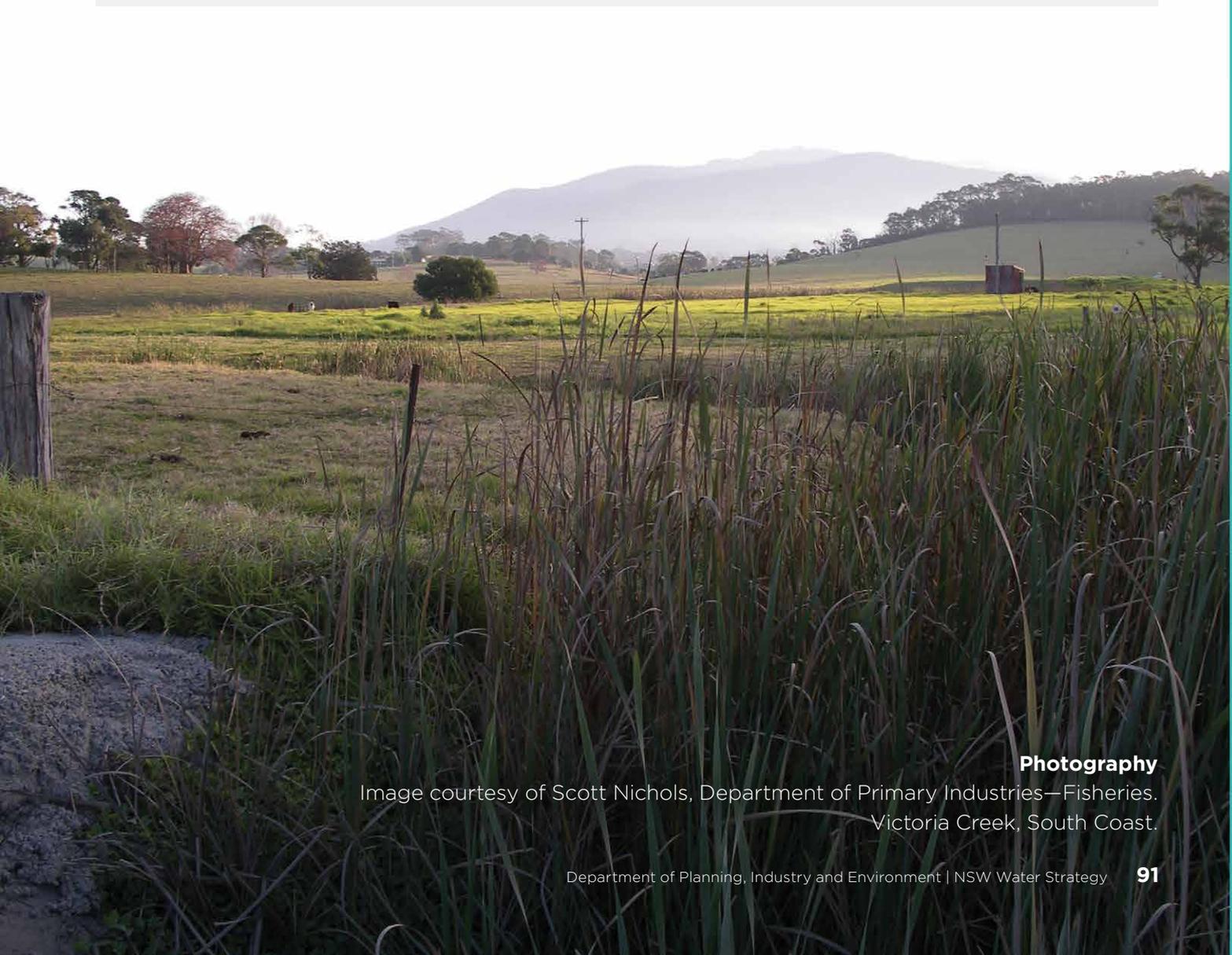
Definitions of town water restrictions can vary considerably across NSW. For example, level 2 water restrictions in Bathurst can indicate a very different level of restrictions to level 2 restrictions in another town. As the drought extended across NSW, the differences between these approaches created some confusion and uncertainty, with neighbouring towns in the same valleys adopting differing levels of restrictions in their water use.

It may not be appropriate or possible to mandate the same definitions, gradings and permitted activities under different restrictions for every city and town in NSW. However, common principles may help achieve greater clarity and consistency.

Action 4.3 Improve drought planning, preparation and resilience

The Government will work with communities across NSW to improve their preparedness for and resilience to drought. We will:

- a. develop and maintain the NSW Future Ready Regions Strategy, which will outline the Government's priority actions over the next few years to prepare for and respond to future droughts. The plan will outline key lessons from the recent drought periods in NSW and confirm the impacts drought can have on local communities, small businesses and industry
- b. ensure that the regional and metropolitan water strategies identify options to diversify water sources and water operations to be more resilient for drought and emergency response
- c. consider options for improving the management of shared water resources during times of drought and work with other Basin governments to promote improvements
- d. document our lessons learnt from managing water during the recent drought and ensure these lessons inform future decision making
- e. investigate options for a more consistent approach to water restrictions across NSW, including the development of common principles.



Photography

Image courtesy of Scott Nichols, Department of Primary Industries—Fisheries.
Victoria Creek, South Coast.

Better integrate water policy with other planning frameworks

Future water reliability and security in a changing climate will be central to land use and urban development planning decisions and industry development initiatives in regional NSW. There is an opportunity to consider water availability and impacts much earlier and more strategically through the planning system.

How land is used determines water management needs, whether water is servicing urban development or being provided for household use, agricultural production, mining, food processing and manufacturing, amenity, healthy ecosystems, cultural use or recreational use. It makes little sense to locate water intensive uses in areas with little access to water or where supplies are highly vulnerable—unless also giving broader consideration of infrastructure and supply needs.

In NSW, multiple government agencies work together under a range of legislation to ensure the impacts of major developments on water resources are properly understood and regulated. There is a need to better link approvals for land use with approvals for access to finite and

variable water resources, and to ensure that compliance is monitored and enforced. Giving consideration in the early planning phases to extraction caps, constraints, reliability of supply and market conditions reduces investment risk. It may also assist in establishing more streamlined planning approvals processes.

In addition to water availability for future development, land use planning must also link more effectively with broader issues of water quality and ecosystem health, and better recognise opportunities to integrate water supply, stormwater management and wastewater management.

For example, the Parramatta River Master Plan is guiding draft planning reforms to create a living river which include short-term recommendations to update local land use planning controls to align with objectives of the Master Plan which will reduce stormwater runoff and increase landscaped areas, improve waterways and riparian corridors, include stormwater management and water sensitive urban design provisions and review foreshore development to support waterway health.

Action 4.4 Better integrate land use planning and water management

The Government will better integrate strategic land use planning with water management frameworks and outcomes. We will take steps to:

- a. establish processes to support communication and early engagement to better inform land use, agriculture and industry investment decisions based on a clear understanding of water availability and constraints, and water allocation risk over the immediate and longer term
- b. develop new planning policies, if required, to integrate land use and water cycle management decisions
- c. identify opportunities for the planning system to support water resource health and resilience in a changing climate; for example, through strategic recognition of critical groundwater resources in coastal areas and mitigate impacts from urban development
- d. improve access to information about water availability to support development
- e. examine opportunities for information on high value water-dependent ecosystems and cultural values to be considered in land use planning decisions.

Case Study: Wianamatta South Creek Delivery Strategy

Wianamatta South Creek is a major tributary of the Hawkesbury-Nepean River in the western Sydney Basin that runs 80 km from Narellan to Windsor. A large part (80%) of the 63,000 ha catchment falls within the Western Parkland City urbanised area, covering 6,000 km² and eight local government areas. The catchment is experiencing both rapid and incremental scales of change from rural to predominantly urban land use, including development of the Western Sydney Aerotropolis precinct.

Wianamatta South Creek and its catchment has a critical role to play in realising the vision for the Western Parkland City to create cool, green and attractive urban communities by retaining water in the landscape, integrating water cycle planning in the design of new neighbourhoods and supporting the health and management of waterways.

This vision has been captured in several strategic land use planning frameworks, including the Greater Sydney Region Plan and Western City District Plan, with links to the proposed Design and Place State Environmental Planning Policy. Premier's priorities for open space and greening are also key requirements, with about two million trees to be planted in the area.

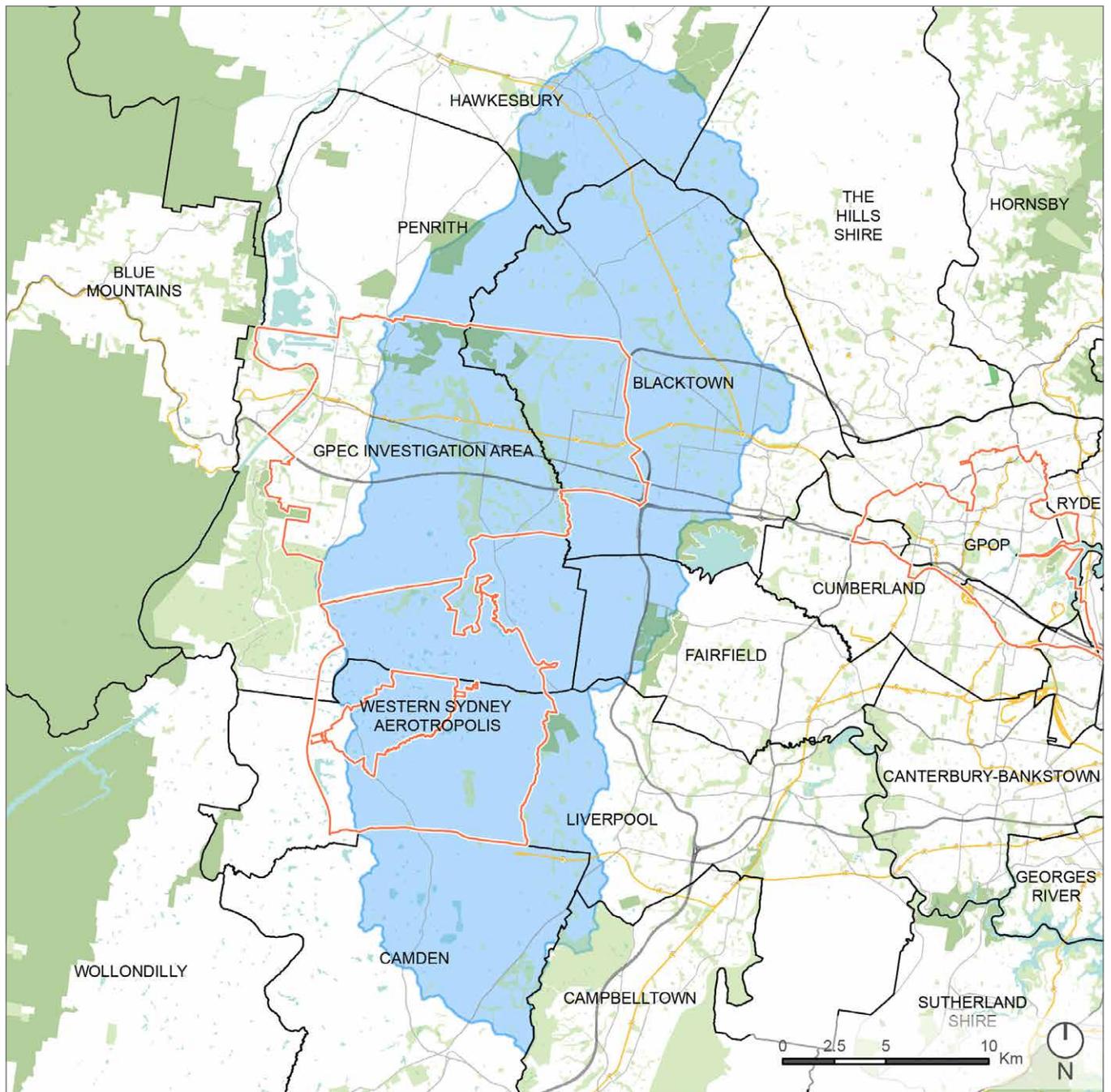
New integrated land use and water cycle management approaches and major policy reforms are required to achieve the economic, amenity and environmental objectives of the Western Parkland City. Reflecting this, the South Creek Catchment Sector Review identified changes to land use controls and major water-related infrastructure investment decisions:

- Stage 1 of the South Creek Sector Review identified significant economic value in taking an integrated approach to land use, water cycle management and investment in advanced recycling water infrastructure in developing the Western Parkland City. This value was estimated at around \$6.6 billion (NPV), compared to a business-as-usual approach
- Stage 2 of the South Creek Sector Review included a strategic economic analysis of stormwater and waterways governance, which found that a catchment-wide approach to planning and delivery of stormwater infrastructure and waterways management could deliver a significant economic benefit (which is being investigated further).

To achieve these changes, a Delivery Strategy is being developed to provide an adaptive and tactical 40-year framework and the tools needed for integrated land use and water cycle management for the Wianamatta South Creek catchment. The strategy focuses initially on actions aligned with planning for the Western Sydney Aerotropolis.

The Delivery Strategy will cover green and blue infrastructure, land use outcomes, catchment health and flooding, connected spaces and the interfaces and relationships with future development, utilities and transport. It will also address current and future land controls and ownership, and is being developed collaboratively with Aboriginal communities, landholders, local government, Sydney Water and other stakeholders. A key first step is Sydney Water's planning for the Upper South Creek Advanced water recycling scheme.

Figure 23. Wianamatta South Creek—Western Parklands City





Photography

Image courtesy of Greater Sydney Commission.
South Creek Catchment.

Support economic growth and resilient industries within a capped system

Our aspiration: NSW water management arrangements and the performance of the water sector support the NSW economy, enable industries to maximise the value of production from the available water resource and give new businesses the confidence to invest with certainty while supporting key industries, including agriculture and the resources sector, to adjust to a warmer future with more variable rainfall.



Photography

Image courtesy of Destination NSW.
Harvesting pecan trees, Moree.

Key challenges and opportunities

Water is the lifeblood of our cities and regional communities and the industries that support them. The NSW economy is forecast to grow to about \$2 trillion by 2040 with about two thirds of this economic growth coming from Greater Sydney. Confidence about the security of Greater Sydney's water supply is essential to supporting and sustaining this economic growth.

Water-dependent industries such as agriculture, food processing and mining are also major contributors to the NSW economy, and the NSW Government is prioritising economic and employment growth in regional areas. Water is also critical to support tourism in some regions—both for sustaining landscapes and waterways and for supporting the additional demand that tourism places on town water supplies.

Supporting economic growth and industry development in a system where water entitlements are capped, and water availability year on year is variable, presents clear challenges. There are opportunities to use the available water more efficiently and to support the uses of water that bring the highest return to regional and metropolitan communities. This includes the ongoing investigation of, and investment in, storages and pipelines to increase water security for regional communities and licence holders.

Water is essential for agriculture

The gross value of agricultural production in NSW in 2017/18 was \$13.2 billion with approximately 27,000 agricultural business participating in the sector. The production of meat, sheep and other livestock accounted for \$5.9 billion. Irrigated agriculture contributed \$4.4 billion to the gross value of agricultural production with cotton accounting for 35%, fruit and nuts 12% and nurseries and cut flowers 10%.

Australia's agricultural sector is positioned to take advantage of increasing global demand for high quality produce. Proximity to Asian markets is an important factor as Australia's agricultural sector looks to grow from \$60 billion of farm gate returns in 2019 to \$100 billion by 2030.⁴²

42. National Farmers Federation 2030 Roadmap

The role of water in driving the tourism economy in regional NSW

Water holds significant opportunities for tourism and recreation in NSW, particularly in recreational fishing, marine-based tourism and swimming. NSW offers a highly unique fishing experience, with a range of freshwater Australian sportfish such as Murray Cod, Golden Perch and Australian Bass. Many of our native species cannot be found in wild populations anywhere else in the world. In 2017/18, an estimated \$2.2 billion was spent on recreational fishing trips. This expenditure generates about \$3.4 billion of economic activity in NSW each year.

Marine based tourism, such as canoe and kayak trails on the Clarence River, Murrumbidgee River, Macquarie River, Tumut River and Hawkesbury Nepean River System offer opportunities for tourists to enjoy various destinations and adventure experiences. Naturally heated thermal baths in towns such as Lightning Ridge, Burren Junction and Walgett, fed by bore water from the Great Artesian Basin, offer a distinctive experience in north west NSW.

The mining sector's role in regional economies

The mining industry has been, and will continue to be, a key industry in many regional areas and the broader NSW economy. In 2019/20, the export value of NSW's mineral and processed metal product (including aluminium) was around \$23.9 billion, which is 47% of the state's merchandise export revenue. The industry contributed around \$1.7 billion in royalties and, as at the end of June 2020, directly employed around 30,200 people and 121,000 people indirectly through mine and non-mine related services.⁴³

Water is essential to mining operations. It is used in processing plants, transporting material and dust mitigation on site. Mines have invested significantly in water efficiency and recycling measures. Mining operations now typically recycle about 50% of water consumed onsite and the level of reuse and recycling of water is growing.

During the most recent drought, several NSW mines faced the real possibility of suspending mining operations due to lack of water but ultimately were able to continue operating. This was due mainly to accessing water stored in old underground workings and implementation of water reuse systems.

The mining industry is often able to use alternative lower quality sources of water, such as highly saline water or town wastewater as in Newcrest's Cadia Operation. Where required, mines have water treatment plants to ensure water being discharged is of high quality. This has led to significant advancement in water treatment technologies in Australia.

43. Mining, Exploration and Geoscience 2020, Coal Services 2020, ABS 2020

Case study: Regional NSW Special Activation Precincts

The Department of Regional NSW is embracing efficient water use in the design of its Special Activation Precincts (SAPs). There are currently five designated SAPs in regional NSW:

- Wagga Wagga—World-class business precinct in the Riverina
- Parkes—NSW’s first inland port—the new epicentre of the nation’s freight network
- Moree—Taking Australia’s agriculture to the world
- Snowy Mountains—Australia’s alpine and adventure playground
- Williamstown—The future of aerospace and defence industries.

SAPs are large, integrated planning and infrastructure projects and have been selected with the potential to activate significant regional economic development and jobs creation. All precincts are master planned with a 40-year vision and apply a mandate of water

sustainability, with specific designs tailored to the needs of each precinct. SAP water efficiency design features include:

- retention of stormwater for reuse
- recycled water networks
- development controls covering quality of water runoff.

The technical studies that inform each Master Plan consider the potential increased demand for water resources as a result of development within the SAP. This analysis has regard to industries that are expected to expand or establish in the SAP. The master planning process also considers any policy, operational and infrastructure settings that may need to be changed to cater for any future changes in water supply and demand.

Greater certainty for regional businesses to invest and create jobs

As more businesses seek to expand their operations in regional NSW and new industries emerge, the NSW Government is taking steps to ensure that water access and security is not an impediment to investment and economic growth.

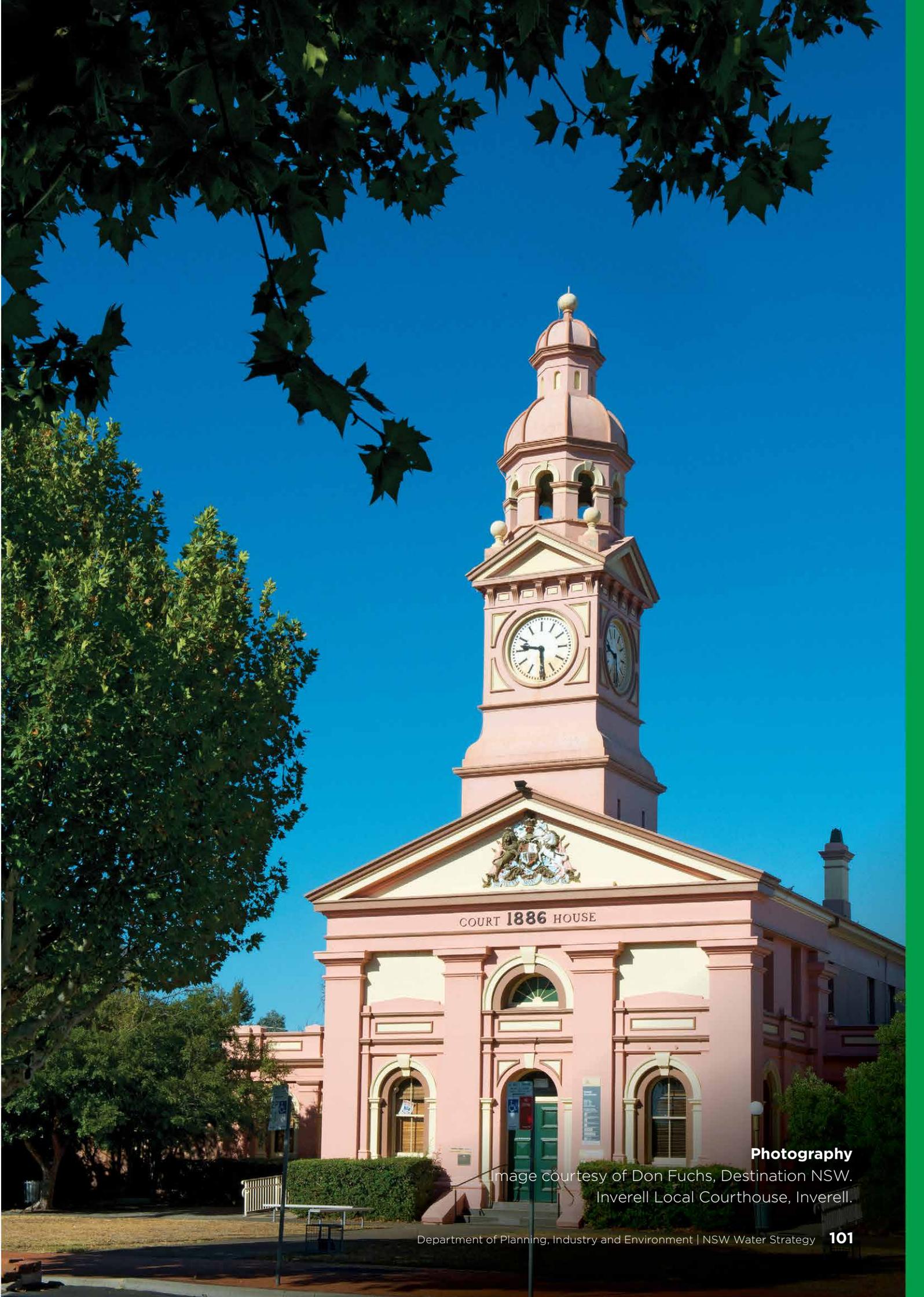
Water is an essential input for many regional economies and access to long-term, affordable water supplies is required to give many businesses the certainty they need to invest or expand. This may impact thousands of jobs in agriculture, food processing and manufacturing, resources and other industries. These sectors understand that water is a valuable and finite resource dependent on rainfall. Across much of NSW, the water markets provide a mechanism for high value industries to secure access at the level of

availability and risk that they are willing to bear. Smarter and more efficient ways of reusing and creating rainfall independent water supplies, and managing water consumption, also provide some industries with cost effective options, mitigating the risk to business operations on a year to year and long-term basis.

Action 5.1 Provide greater certainty to regional businesses that rely on secure access to water

The Government will increase business and investor confidence in regional NSW by:

- a. developing Special Activation Precincts and Regional Job Precincts
- b. developing and implementing the regional water strategies to identify the optimal mix of management and infrastructure investment to support jobs and economic growth in regional NSW.



Photography

Image courtesy of Don Fuchs, Destination NSW.
Inverell Local Courthouse, Inverell.

Support industry to enhance water efficiency through R&D and technology

Because the amount of water that can be extracted is capped (long term average annual extraction limits and sustainable diversion limits), NSW needs to harness technology and innovation to 'do more with less' and increase water efficiency and productivity. Innovation and research are critical to achieving these outcomes.

Research and development (R&D) will help water users to make informed decisions about how they can best adapt to future climate change and variability. Department of Primary Industries has investigated the potential impacts that increasing climate variability and climate extremes will have on primary industries. They have also developed programs to support continued productivity, including crop breeding for increased drought and heat tolerance, improved water use efficiency,

enhanced drought monitoring, long-term water supply planning, drought resilience programs and biosecurity risk management programs. The department will continue to deliver these vital R&D programs.

Mines continue to invest significantly in water efficiency and recycling measures and typically recycle about 50% of water used on site. The mining industry also finds opportunities to use alternative lower quality sources of water, encouraging and adopting advancements in water treatment technologies.

R&D, greater innovation, and technology take-up are all important contributors to businesses developing best-practice adaptation strategies to prepare for and manage changes in water variability, including drought. Research is also essential to inform ways in which the NSW water sector can support existing and developing agribusinesses to lift their productivity.

Action 5.2 Invest in R&D and new technologies to lift water productivity in NSW industries

The Government will look for opportunities to invest in R&D and new technologies to lift productivity and improve the economic return on water in NSW by:

- a. better capturing and quantifying the contribution of water to economic outcomes at the state and regional level, including the economic value of natural systems, in order to better understand and measure water productivity
- b. improving water use efficiency and productivity in agriculture, food processing and manufacturing, resources and other industries
- c. supporting the cost effective development of rainfall independent sources of water supply for key industry sectors, such as desalination and recycling
- d. supporting the development and improvement of irrigation systems to maximise the productive use of water
- e. improving understanding of how agricultural land use changes the availability of water (for example, the change to permanent pastures and zero till cropping increases the capture of rainfall, which—in turn—reduces runoff)
- f. continuing to roll-out the Farms for the Future pilots to provide enabling infrastructure that supports agribusiness productivity and improved water use management and efficiency, including on-farm connectivity and other ag tech solutions
- g. improving the capacity of NSW primary industries to better plan for and respond to climate change by reviewing existing impact and adaptation research and current activities for each industry, and developing a climate vulnerability modelling approach to capture climate exposure risk and sensitivity in key sectors.

Ensure the water market is working effectively

Water markets have continued to expand since the separation of land and water rights under the National Water Initiative, which created a free market for water rights. Water markets are now four times the size they were before these rights were separated.

There are significant price fluctuations based on supply and demand for water. In general, the trade market in the Murray-Darling Basin has a value in excess of \$1.5 billion per year.

Although this means, in theory, that water is moving to its highest value use, there are serious and increasing concerns that the market is not working efficiently and is significantly distorted due to lack of transparency and problems with its design.

The NSW Government supports an open, fair, efficient and sustainable water market characterised by integrity, transparency and accountability. We are committed to ensuring our water markets facilitate economic and social benefits to people, businesses, communities and industries, while also protecting our river systems and the environment.

Action 5.3 Improve the operation and transparency of water trade in NSW

The Government will take the following actions to improve the operation of the NSW water market. We will:

- a. improve the transparency of trading activities and access to information about these activities

- b. review the need for a regulatory framework covering water brokers and intermediaries to improve confidence in how the market is regulated.

The Australian Competition and Consumer Commission has conducted an inquiry into water markets in the Murray-Darling Basin. This represents a significant opportunity to review existing frameworks and undertake reform.

The NSW Government is considering further reforms to the water market following the Commission's final report, delivered in March 2021. We will ensure that any future reforms to the water market:

- protect our rivers and other water-dependent environmental assets
- maintain the core foundations of water management
- recognise the value of water to the state's regional economies
- support the Government's water market objectives
- do not erode previous hard-won reforms

- include genuine engagement with stakeholders
- address important issues for NSW, such as the increasing pressure on physical systems constraints like the Barmah Choke
- provide sufficient economic, social and environmental benefits to water users, industry, communities or the environment to justify change
- appropriately consider the interconnected nature of the water market and the potential for wide-ranging impacts.

The *Independent Assessment of Social and Economic Conditions in the Murray-Darling Basin* found that previous water market reforms have had uneven impacts, and that 'sustained trading of water into a region increases economic activity in that region and leads to reductions in economic activity in regions from which the water is traded'.⁴⁴ Any future reforms to the water market must also consider potential socio-economic impacts for communities.

44. Panel for Independent Assessment of Social and Economic Conditions in the Murray-Darling Basin 2020, Final Report

Investigate and invest in infrastructure to improve resilience

The NSW Government is developing 12 regional water strategies and two metropolitan water strategies to improve the resilience of our water resources for cities, towns and communities, the environment, Aboriginal communities and industry. The strategies will integrate and shape future planning and policies to deliver improved water outcomes, and will propose a mix of infrastructure, policy and operations options focused on maximising water security benefits that are distributed for the best economic and community outcomes.

Diversification of water sources to improve town water security is an emerging theme to address the current vulnerability of towns to drought, systems failure and poor water quality events. Portfolios of complementary infrastructure and non-infrastructure measures will be subject to economic, environmental and cultural evaluation to maximise the benefits and ensure the best outcomes of any infrastructure investments.

Water also has an important role to play in NSW's energy future. The NSW Electricity Infrastructure Roadmap outlines the opportunities for pumped hydro in NSW as an important form of energy storage to complement renewables like wind and solar energy, while also stimulating regional NSW economies through construction and operation, supporting jobs and attracting new industries.

Action 5.4 Identify infrastructure and operational options for each region of NSW

The Government will improve infrastructure investment decisions and outcomes through strategic long-term planning. We will:

- a. identify infrastructure and operational management options for each region in NSW to improve reliability for all water

users and the environment through the development of 12 regional water strategies and two metropolitan water strategies for Greater Sydney and the Lower Hunter

- b. monitor and report on the implementation of all 14 water strategies.

Water availability in the Murrumbidgee and Murray valleys

The NSW Government acknowledges community concern over the collective impacts of climate and policy changes to the reliability of water supply, which has been reflected in the MDBA report *Trends in Water Use (2020)*. This report highlighted an average reduction in water availability of 375 GL per annum across the NSW Murrumbidgee (100GL) and Murray (40GL) and the Victorian Murray and Goulburn (235GL) valleys. The report highlighted four possible reasons for this gap between the agreed limit and the water available for use. These include:

- changes in climatic conditions reducing inflows into the Southern Connected Basin
- more conservative water user behavior
- decision making around allocations
- inaccuracies in modelling practices.

More work is required to better understand the apparent underuse volumes, in particular in the Murrumbidgee. The Commonwealth Government has established a working group to further investigate and address this issue. It includes representatives from NSW and Commonwealth governments, irrigation stakeholders, Ricegrowers and NSW Irrigators Council.

The NSW Government is committed to making the allocation process more transparent and is working to provide clear information for each regulated valley in NSW.

Action 5.5 Investigate causes of underuse and develop options to bring use back up to cap

The Government will further investigate issues of water availability and consult with the community through the regional water strategies for the Murrumbidgee and Murray valleys.

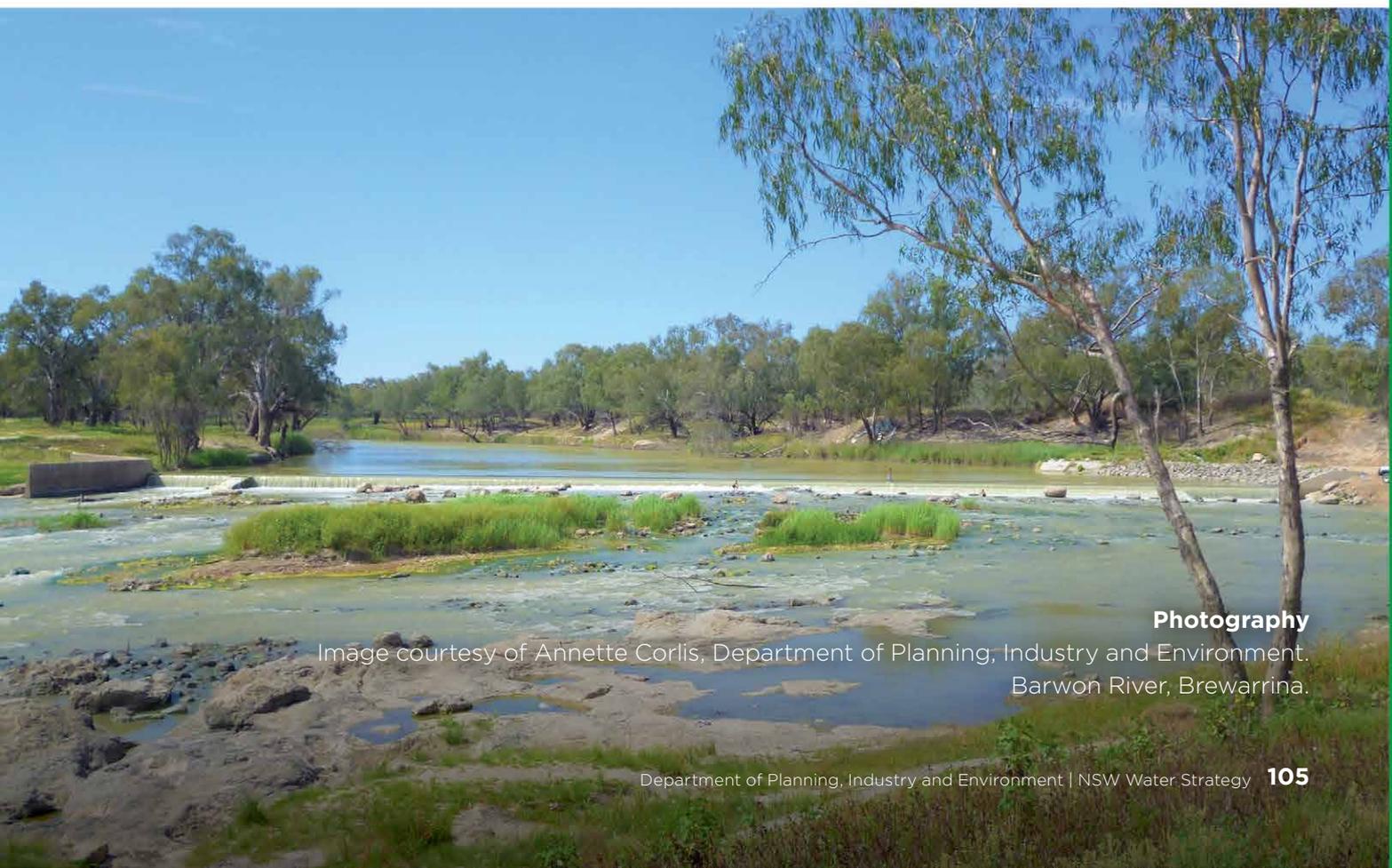
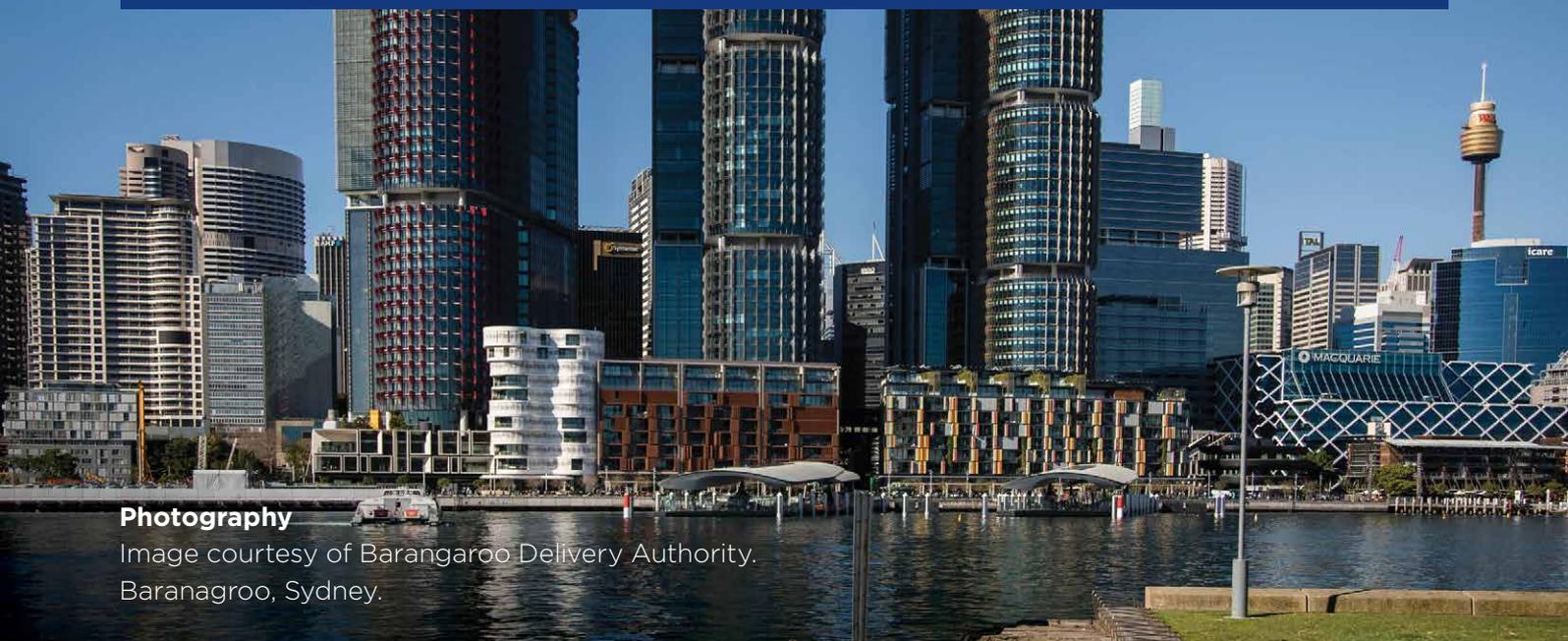


Image courtesy of Annette Corlis, Department of Planning, Industry and Environment.
Barwon River, Brewarrina.

Photography

Support resilient, prosperous and liveable cities and towns

Our aspiration: NSW towns and cities are resilient to changes in water availability, extreme drought and flood events, with water management underpinning secure employment, a healthy natural environment and liveable places that support community health and wellbeing.



Photography

Image courtesy of Barangaroo Delivery Authority.
Barangaroo, Sydney.



Photography

Image courtesy of Destination NSW.
Mudgee.

Key challenges and opportunities

Water is a finite resource that is essential to life. Water management in our cities and towns affects people's health and wellbeing, and the amenity of communities. Many businesses also depend on water being available, reliable and safe for their operations. However, climate variability and change pose risks to sustainable water supplies as NSW caters for a growing population.

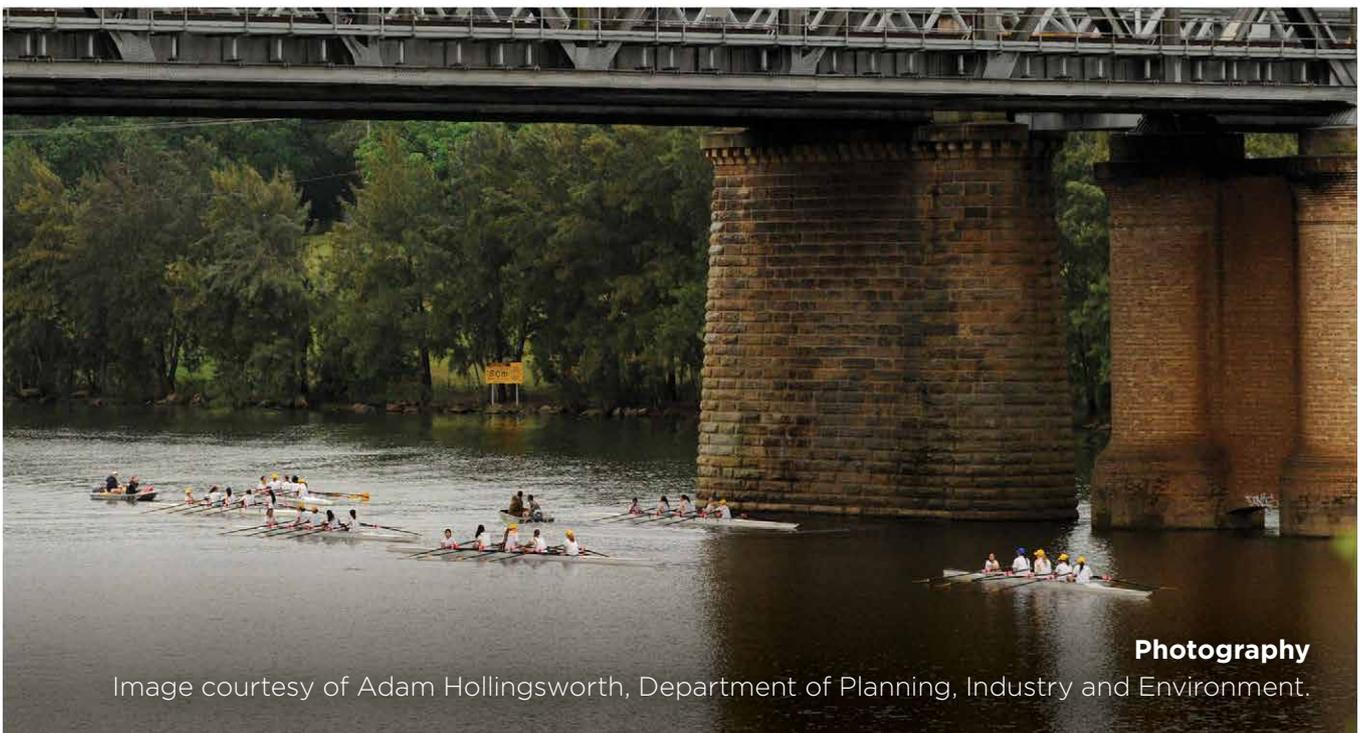
There are 92 local water utilities across NSW providing water supply and sewerage services to around two million people. There is potential for the resilience of some regional cities and towns to be at risk if these utilities fail to rise to emerging challenges. Currently, there are significant service risks across the sector, particularly in relation to water quality and security, and risk management and performance is variable. If not addressed, these risks could have substantial health and economic impacts on regional communities. We need to ensure that we improve organisational arrangements to support regional utilities and regional communities.

Councils are responsible for providing water services and operate and own associated assets. However, when councils face acute risks, such as water shortages or water quality incidents, the need for rapid intervention is triggered.

For Greater Sydney—the nation's largest economic centre—the challenge of accommodating an estimated 1.7 million additional people by 2036 will require a medium-term response that is not 'business as usual'.

We must put water at the heart of planning for our towns and cities. We need to improve how we plan for and manage land use, stormwater and water in the landscape to improve liveability. This includes addressing threats such as flood risks to communities and intensifying urban heat, and having water available for additional greening, cooling and amenity. We need to be thinking about innovative approaches for existing towns and cities, as well as new developments.

Across NSW, there are opportunities to increase the resilience of our cities and towns to greater climate variability and change, and to resource constraints, while generating significant economic, employment and social benefits.



Photography

Image courtesy of Adam Hollingsworth, Department of Planning, Industry and Environment.

Improve the liveability and resilience of our cities

NSW metropolitan areas require adequate water supplies that are resilient to drought, provide long-term security to serve growing populations and meet changing business and industry needs. The management of wastewater from households and businesses to protect public health and waterways is a less visible, but fundamental, part of urban water management. More recently, water has been recognised as essential to maintain the liveability and amenity of our towns, cities, suburbs and neighbourhoods.

Climate change means that NSW will confront more frequent and more severe droughts, temperature and storm events. Over the next two decades, towns and cities should aim to transition to more secure water storage options, diversify water sources and increase the proportion of non-rainfall dependent sources. At the same time, we should invest in more efficient and valued uses of water by households and industry. We will also need to better integrate the way that we capture, provide and manage urban water through land use planning and urban design.

Resilient cities will require communities to be served by multiple water sources that are fit for their intended uses. Treatment at multiple points and multiple points of redundancy in the water supply, distribution and treatment systems will ensure that customers continue to receive water in the event of asset failure, environmental threats or water quality incidents.

A range of water sources will need to be drawn upon to service regional centres and urban communities, including surface water, groundwater, recycled and manufactured water (desalination and purified recycled water), as well as ongoing demand management and water conservation practices. Retaining water in the urban landscape—including through stormwater management, recycling and integrating water bodies into urban design—will enable our

cities and towns to maintain the amenity of green spaces and tree canopy during drought conditions, sustain recreational areas and contribute to urban cooling. We will also need to address the implications of more severe rainfall and storm events for urban flooding, as well as for the reliability and recovery of water and wastewater systems in the face of such extreme events.

Greater Sydney and the Lower Hunter

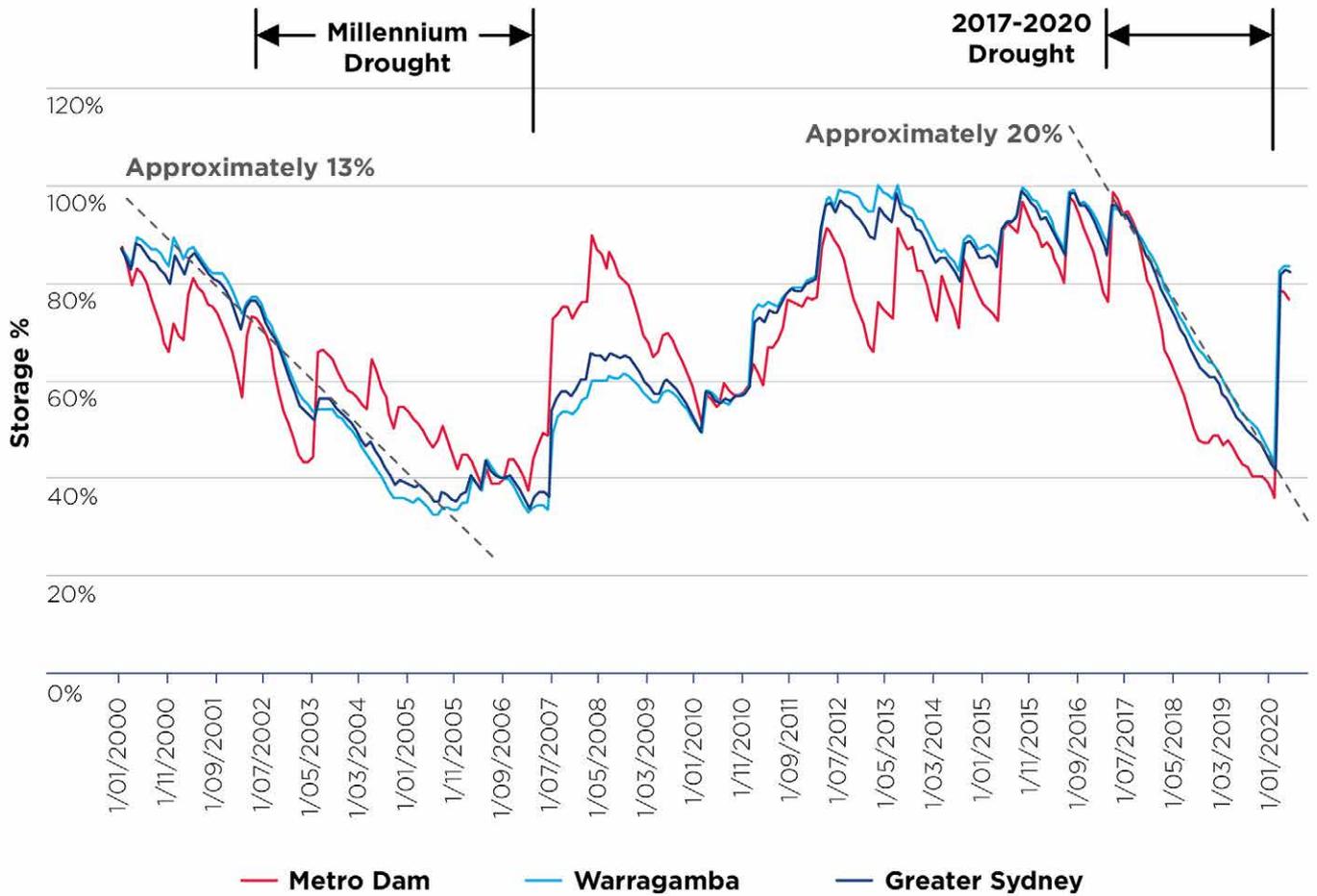
Sydney has just recovered from one of the most intense droughts on record, with storages declining by over 50% in just over two years (Figure 24). This emphasised the need for ongoing investment in water efficiency between droughts to maintain water savings, and to ensure we are planning for drought while dams are full, so we are better able to respond in the next drought.

The drought was also accompanied by bushfires that ravaged some Sydney's major water supply catchment areas, posing an additional potential threat to the capacity of the city's water treatment plants and the quality of drinking water.

This recent experience has highlighted the gap between supply and demand, and the vulnerability of Sydney's water supply system to severe drought conditions. Compared to other Australian cities, Sydney has a low level of rainfall-independent water supply, as shown in Table 1.

Only the Sydney Desalination Plant (which provides around 15% of daily demand when operating at full capacity) and water recycling plants (providing up to only 8% of daily demand in Sydney and 9.6% of daily demand in the Hunter) are climate independent.

Figure 24. Greater Sydney storage level profile 2000-2020



Source: WaterNSW, May 2020

Table 1. Rainfall-independent water supply: Sydney versus other cities

City	Desalination capacity as a % of demand	Recycling capacity as a % of total demand	Total climate independent sources as a % of total demand
Sydney	15%	8%	23%
Melbourne	34%	3%	37%
Perth	45%	4%	49%
Adelaide	38%	11%	49%

Sources: Australian Water Association, *Desalination Fact Sheet*, Bureau of Meteorology 2021, *National performance report 2019-20: urban water utilities, part A*

Sydney is at a tipping point for its rainfall-dependent water supply system, with the forecast long-term yield for water now being less than the annual demand. Increasing our proportion of rainfall-independent supplies allows us to slow down depletion rates in times of drought, helps to keep our dams full (providing long-term security) and enhances our ability to respond to other shocks in the system such as water quality incidents.

The resilience of Sydney's system can be improved immediately by increasing water conservation and water efficiency and, in the future, by securing more reliable water supplies that include additional rainfall independent sources of water—either desalination and/or recycled purified wastewater.

By 2040 Greater Sydney's population is forecast to grow by 1.9 million to 7.1 million people and to 8.3 million by 2056. Much of this growth will be in the Western Parkland City. Centred on Wianamatta South Creek and its tributaries, planning in this catchment is taking an integrated land use and water cycle management approach to ensure there is enough water to achieve urban cooling, provide open space and sustain about two million trees. Options for recycling and stormwater harvesting to support the amenity provided by the parkland have been identified.

A growing population in Sydney will also place significant pressure on an aging wastewater network as it reaches capacity, particularly in the Eastern Harbour and Central River cities. There is a need to invest in new assets and renew old ones, and to intercept and recycle more of Sydney's wastewater. At present, approximately 80% of Sydney's wastewater is treated and discharged to the ocean. In the future, there are opportunities to use water more than once on a broader scale and continue to protect our precious waterways and beaches for the future.

In the Lower Hunter, the nature of water storages means that water storage levels can fall quickly in prolonged periods of hot and dry weather, making the region vulnerable to drought. As demonstrated in the most recent drought, Hunter Water's storage levels can go from typical to critical levels within three years. The Lower Hunter Water Security Plan will assess if the current level of water security is appropriate, or if additional measures to improve water security are needed.

To meet future demand, new sources of water will be considered alongside ongoing water efficiency and loss reduction measures. A range of water supply sources including water transfers between regions, groundwater, desalination and dams could be used to provide long-term water security and drought resilience. Expansion of recycled water and stormwater harvesting schemes offer the potential for water savings, as well as liveability and environmental benefits. The updated Lower Hunter Water Security Plan will be released in 2022 and will set out a long-term portfolio of supply and demand measures that will ensure a secure supply of water to the Lower Hunter.

Action 6.1 Increase resilience to changes in climate and water availability in Greater Sydney and the Lower Hunter

The Government will release consultation drafts of the Greater Sydney Water Strategy and Lower Hunter Water Security Plan by the third quarter of 2021. After community feedback, the strategies will be finalised and implementation plans will be published.

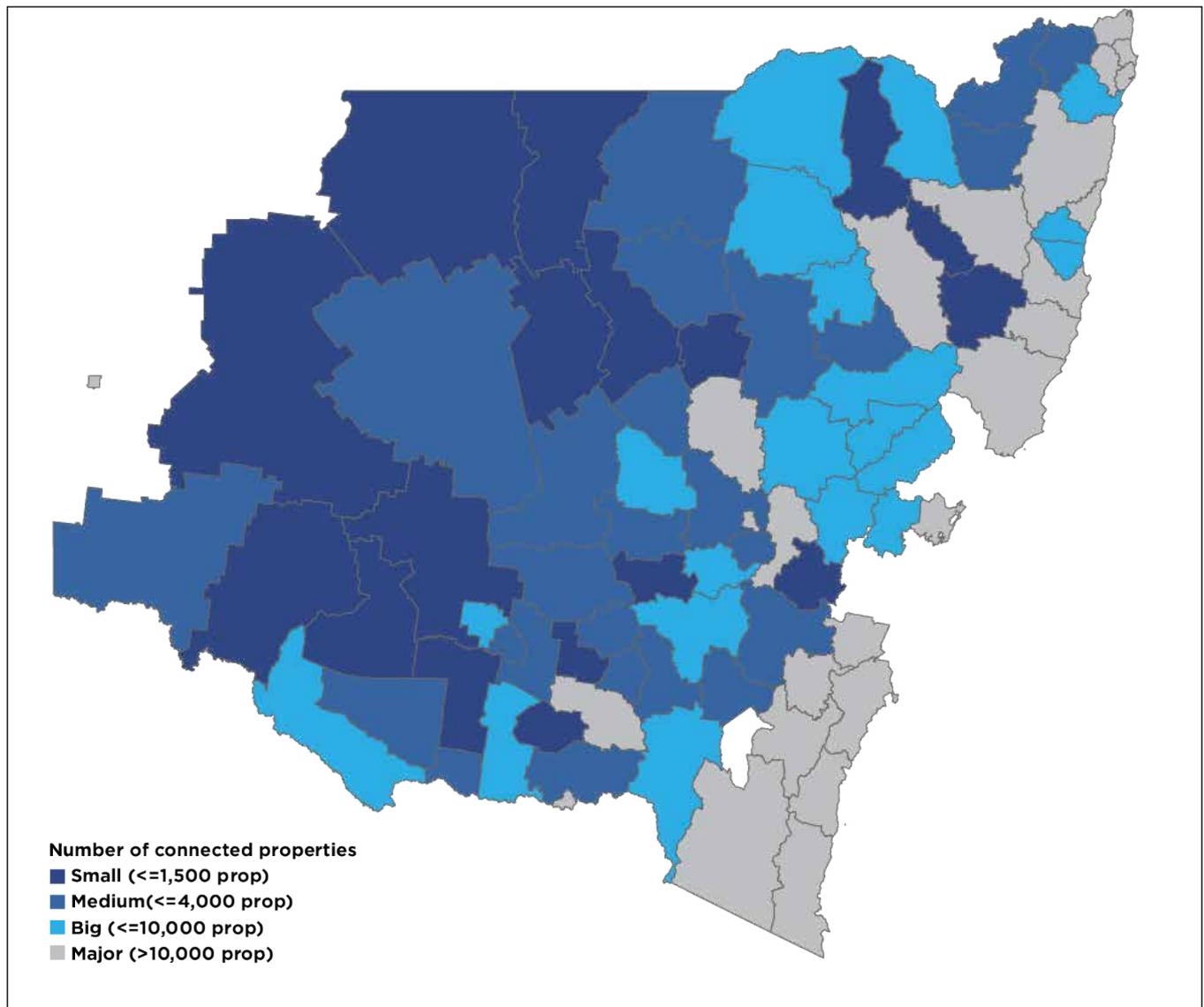
Reduce water service risks and increase resilience for regional towns

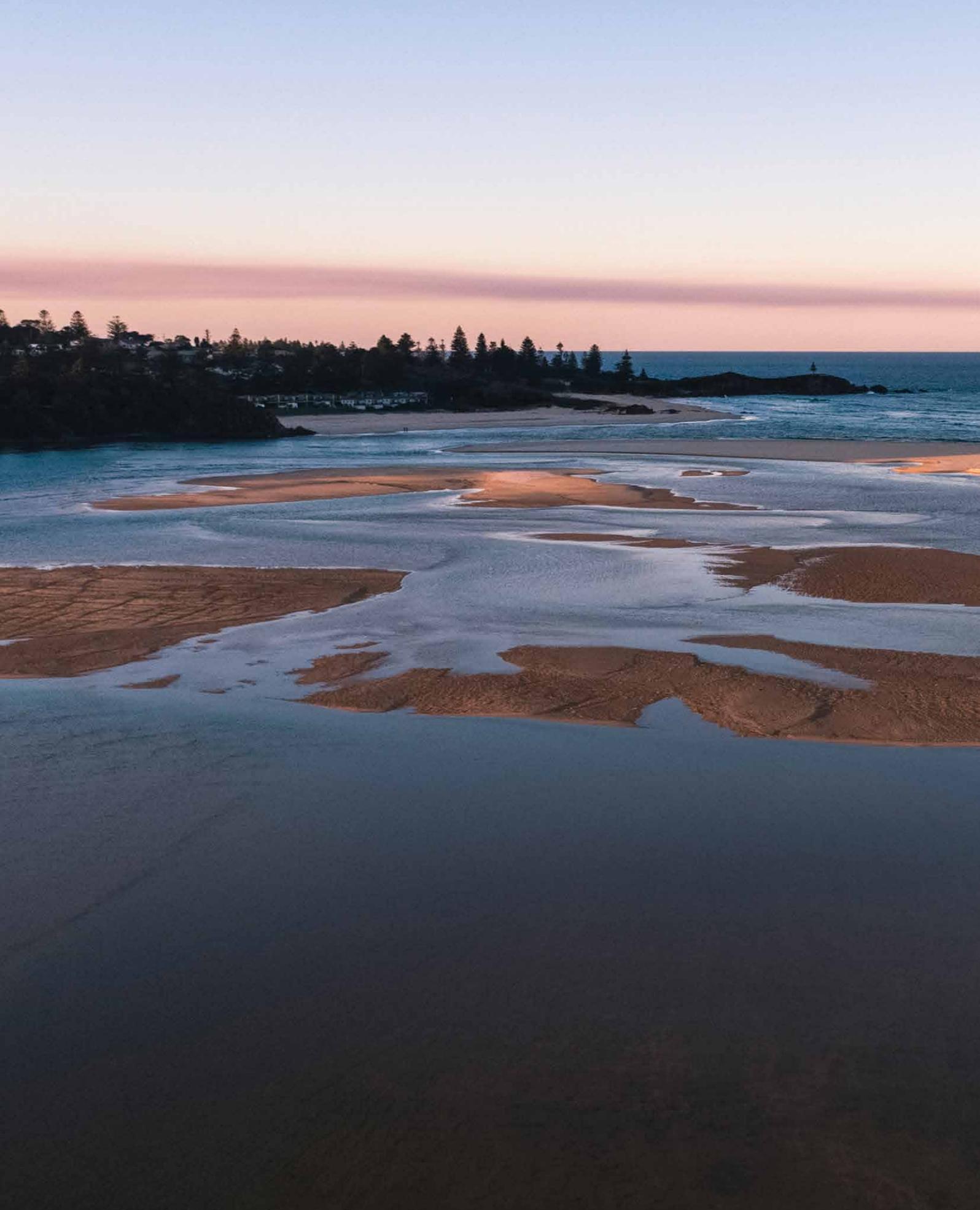
Local water utilities face challenging conditions, with drought, flood and climate variability all potentially affecting water availability. There is also significant variability in the geographic coverage and population trends in the areas covered by local water utilities, with service areas ranging from 285 to over 50,000 km² while populations range from 1,000 to over 300,000. Remoteness and low population density can

contribute to cost disadvantages, revenue raising challenges and skills shortages, including in specialist water engineers and operators to maintain town water infrastructure. Some regional towns also need to provide for transient tourist population peaks and water for households that are not serviced by town water during extended dry periods.

In 2018/19, local water utilities had an annual revenue of \$1.51 billion and combined infrastructure current replacement costs of \$28.8 billion.

Figure 25. Local water utilities in NSW





Photography

Image courtesy of Destination NSW.
Tuross River, Tuross Heads.

Regulating local water utilities in NSW

The vast majority (89) of NSW's local water utilities (LWUs) are either general purpose councils, which operate as financially separate to general local council operations, or special purpose county councils. Councils exercising water supply and/or sewerage functions do so under the *Local Government Act 1993*. Three LWUs—Cobar Water Board, Essential Energy and WaterNSW for the Fish River Water Supply—operate as water supply authorities under the *Water Management Act 2000*. Central Coast Council exercises its functions under both the *Local Government Act 1993* and as a water supply authority under the *Water Management Act 2000*.

The Department of Planning, Industry and Environment is the primary regulator of all regional LWUs under the *Local Government Act 1993* and the NSW Government's comprehensive Best-Practice Management of Water Supply and Sewerage Framework, which is the key policy and regulatory framework for strategic service planning, management, pricing, performance reporting and continuing performance improvement of the LWUs. A number of other agencies, including NSW Health, the NSW Environment Protection Authority, the Office of Local Government (as general council regulator) and Dam Safety NSW, are each responsible for aspects of the regulation of LWUs.

In 2019, a comprehensive, inter-agency assessment of town water and sewage systems operated by local water utilities found significant and widespread service risks across the sector, particularly in relation to water quality and security:

- Across NSW, there are 274 town drinking water systems operated by LWUs: 161 of these systems (or 59%) are in the highest bands of water quality risk (either 4 or 5 out of 5 levels of risk), meaning critical treatment barriers or necessary drinking water quality controls are inadequate.

- Almost half (47%) of LWUs operate at least one town water supply scheme in the highest category of water security risk (level 5), meaning there is inadequate secure supply and storage to meet the consumptive needs of the community it serves.

Currently, the performance of LWUs varies, with some more advanced in achieving best practice water management and others lagging behind. Data on key performance measures for LWUs in regional NSW—including information on assets, environment, health, pricing and water—can be found on the Department's live dashboard.⁴⁵

45. www.industry.nsw.gov.au/water/water-utilities/lwu-performance-monitoring-data

Poor risk-management by some local water utilities (LWUs) is primarily a result of shortcomings in financial sustainability, capability, strategic planning and governance due to four main causes:

- **Scale and remoteness**—LWUs with small or spread-out customer bases face intrinsically higher per-person costs for delivering water and sewerage services and are sometimes unable to raise the revenue needed to manage their risks through user charges alone. These utilities can also struggle to attract skilled staff because their areas lack the amenities of larger urban centres.
- **Skills shortages**—Some LWUs have difficulty attracting and retaining suitably qualified and experienced staff to fill critical roles within their business. In some cases this is due to shortages of certain skillsets in the market, but in other cases it is simply that LWUs cannot afford to offer competitive remuneration and opportunities for career progression. Solutions to these issues must also consider the complex regulatory requirements and industry standards that apply to local water utilities.
- **Poorly targeted funding**—LWUs are funded primarily through capital grants that co-fund infrastructure to address priority water and sewerage system risks. There are several issues with this approach. A key issue is that it does not fully account for differences in the capacity of utilities to fund solutions themselves through service charges.

Also, targeting funding based on high priority risk can discourage utilities from taking action until risks become critical enough to be eligible for funding. Capital funding can also introduce a bias toward infrastructure solutions. It can discourage the consideration of whole-of-lifecycle cost of infrastructure and may not be a sustainable solution for utilities that require continuous funding support to be able to cover their ongoing costs, including maintaining and renewing infrastructure to an adequate standard.

- **Ineffective regulatory mechanisms**—Regulations aimed at ensuring robust strategic planning and governance by local water utilities have not been as effective as they could be. In part, this is the result of the Department’s lack of clarity and proportionality in its regulatory approach to overseeing and supporting local water utilities, as well as shortcomings in the transparency and accountability of its activities. Another issue is the absence of an effective mechanism for coordinating regulatory objectives and activities among co-regulators and other agencies.

It is unlikely LWUs will be able to entirely overcome these issues without changes to the existing approach to regulating and supporting the sector. Reducing the sector’s risks to tolerable levels requires a shift in the NSW Government’s approach to directly target the causes of underperformance.

Action 6.2 Work collaboratively with local water utilities to reduce risks to town water supplies

The Government will continue to work collaboratively with local water utilities to improve organisational arrangements and reduce risks to town water supply service provision, with the aim of achieving the following outcomes:

- safe, secure and sustainable water supply and sewerage services, managed by LWUs in an efficient and customer-focused manner

- reaffirmed commitment to council management and ownership of water supply and sewerage service provision
- clarity on sharing of risks between council LWUs and the NSW Government
- improving and supporting councils’ ability to manage strategic urban water priorities and risks.

Action 6.3 Deliver a new Town Water Risk Reduction Program

The Department of Planning, Industry and Environment, in collaboration with NSW Health, the Environment Protection Authority, the Office of Local Government and Regional NSW, will implement a two-year Town Water Risk Reduction Program in partnership with councils and local water utilities. This new program will:

- develop and implement an improved regulatory framework for local water utility strategic planning, pricing and major asset approvals that is focused on outcomes, based on risk and the maturity of local water utilities, and is transparent, coordinated and accountable
- enhance local water utility performance, risk and maturity monitoring to help the department regulate and support utilities

in a way that is based on risk and the maturity of local water utilities

- develop a more effective framework for coordinating intelligence, regulatory and policy objectives and activities between the department and its co-regulators
- identify potential options to address skills shortages in the sector
- explore the pros and cons of alternative funding models, including a needs-based community service obligation funding model
- encourage a greater focus on joint and regional solutions in utility strategic service planning—including exploring where local water utilities could benefit from support provided by state-owned water corporations—and improved knowledge sharing between utilities and agencies.

Continue to invest in infrastructure that delivers safe and secure water supplies to regional communities

An important step towards addressing water service risks and improving water service quality outcomes has been the implementation and re-design of the Safe and Secure Water Program—a funding program to address water security, water quality and environmental impact risks in urban water systems across regional NSW.

The re-design of the Safe and Secure Water Program (re-launched in October 2018) changed

the program from an application-based program that co-funds projects to a risk-based and needs-based funding program. Under the re-designed program, the NSW Government assesses and prioritises all town water risks in urban water systems in regional NSW. Co-funding is provided to implement the best solutions to address identified risks (where the LWU agrees to co-fund), starting with the highest priority risks. Risks are prioritised based on the socio-economic circumstances of the customers of the responsible LWU, as well as service cost disadvantages experienced by the utility.

Action 6.4 Continue to deliver the Safe and Secure Water Program

The Government will continue to deliver the Safe and Secure Water Program, co-funding solutions to high priority water service risks and strategic service planning.

The NSW Government will invest more than \$500 million over the next eight years to support local water utilities reduce risks in urban water systems through the Safe and Secure Water Program.

Protecting public health through drinking water quality

Access to safe drinking water is essential for good health and hygiene. People in NSW have an expectation that their drinking water is safe. It is vital that suppliers of drinking water understand and manage risks to drinking water safety in an effective and consistent way.

The national *Australian Drinking Water Guidelines* and Framework for the Management of Drinking Water Quality (the Framework) provide a basis for determining the quality of water to be supplied to consumers in all parts of Australia.

In NSW, the Framework is mandated through the requirement for water utilities to prepare Drinking Water Management Systems under the *Public Health Act 2010* and *Public Health Regulation 2012*. Ongoing implementation of drinking water

management systems will be a long-term task. The NSW Government is committed to ensuring that these systems are maintained and effectively implemented and that they become part of the work culture of NSW water utilities.

As drinking water management systems are embedded into the planning and operations of water utilities, focus will shift to ensuring effective review and continual improvement such as:

- identifying and assessing emerging risks to water quality, including those posed by climate variability and change
- identifying ways to improve risk management for water utilities through the Town Water Risk Reduction Program
- implementing a consistent process for external review and audit of drinking water management systems.

Action 6.5 Continue to work with suppliers of drinking water to effectively manage drinking water quality and safety

The Government will support suppliers of drinking water by:

- continuing to support water utilities to assess water quality risks and implement

Drinking Water Management Systems, and working closely with water utilities on drinking water quality management issues, risks and incidents

- providing guidance and support to private water suppliers and water carters on managing drinking water safety in their operations.



Photography

Image courtesy of Bron Powell, Department of Primary Industries—Fisheries.
Macintyre River, Border Rivers.

Focus on water use efficiency

Adoption of water efficiency is one way to reduce the demand on finite water resources by a growing population in a changing environment. Water efficiency should aim to reduce day to day water use by the community without any adverse effects on basic water needs—that is, making the community more efficient and mindful about how we use water in our everyday lives.

We need to reinvigorate water use efficiency programs in our cities, towns and regional centres. While new sources of water are required for cities and towns across the state, there is also a need for increased investment in water system efficiency, water conservation and demand management to delay the timing and reduce the scale of investment in new supply infrastructure.

Water conservation is strongly supported by communities and businesses, and across government. By 2011, Sydney Water's Demand Management Strategy⁴⁶ was saving around 120 GL/a, or around 20% of Sydney's current annual water consumption. Water use targets had been in place since 1995 and achieved significant reductions in water use. This occurred during the Millennium Drought when there was increased investment in and focus on water conservation. However, following the end of the Millennium Drought, investment in and savings from water conservation have fallen markedly. The introduction of the Economic Level of Water Conservation Methodology in 2016 was designed

to enable Sydney Water to determine an optimal mix of water conservation activities, but has proven ineffective in maintaining the capability required to develop and drive water conservation programs, funding and savings.

An Audit Office report (2020) into water conservation in Sydney found significant failings in water conservation initiatives, particularly outside times of drought. Positive progress has been made to reduce household demand for water in Sydney over the past two years, down from 209 litres per person per day in 2017/18 to 182 litres per person per day in 2019/20 (Figure 26). The NSW Government is enhancing its investment in water conservation and IPART has recently increased the level of expenditure allowed for Sydney Water to deliver its water conservation program.

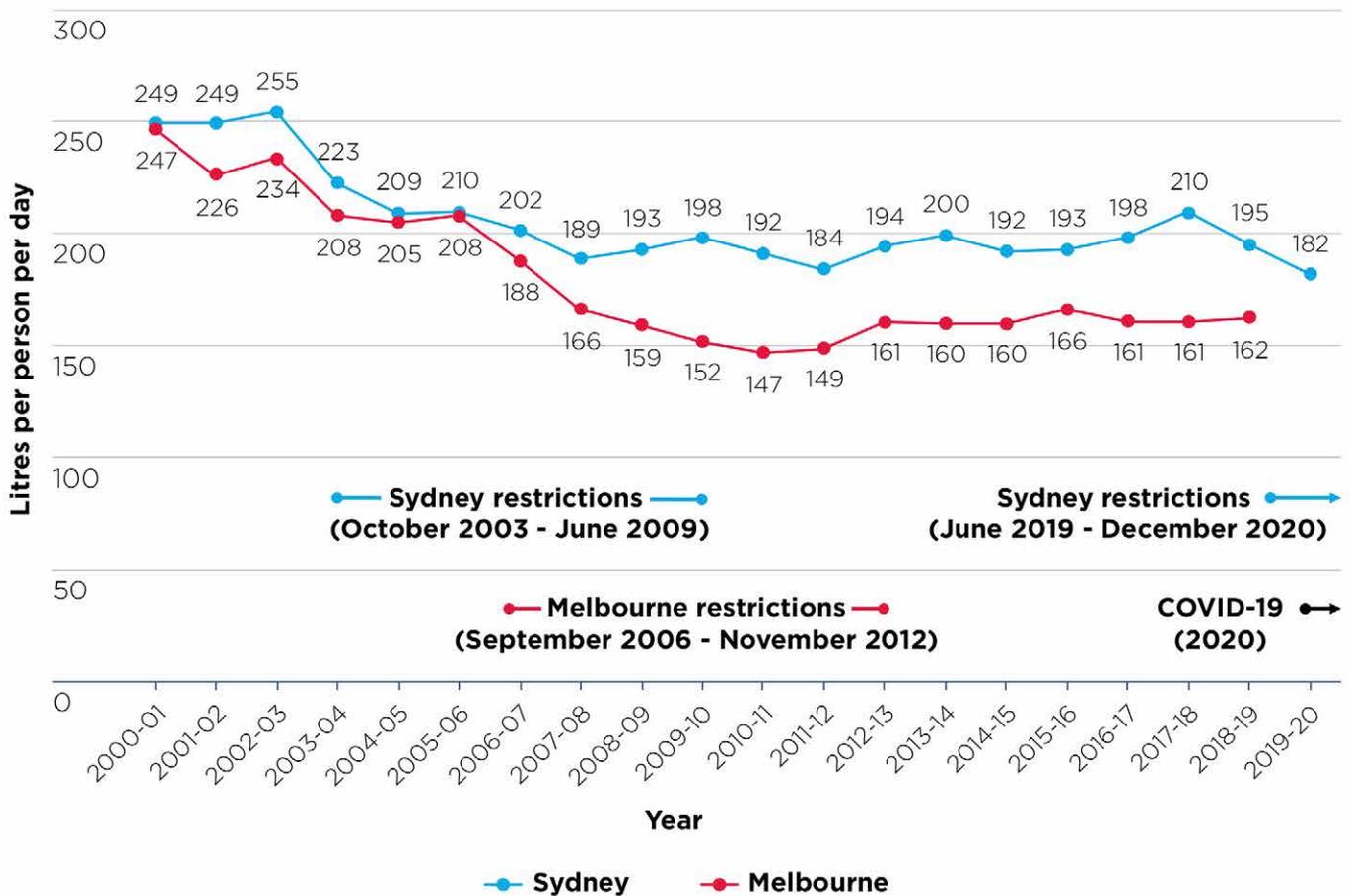
In regional NSW, there are still large discrepancies between the average residential water consumption rates in different towns. For example, the town with the highest rate of water use per household consumed approximately nine times more water than the town with the smallest rate.⁴⁷

The efficient use of water contributes to the sustainability of long-term supplies as populations increase and builds community resilience to drought. The role of water efficiency should have equal standing with additional supply side options when balancing supply and demand to ensure water is being used efficiently before imposing costs on the community for additional water infrastructure.

46. Required at the time by Sydney Water's Operating Licence

47. www.industry.nsw.gov.au/water/water-utilities/lwu-performance-monitoring-data

Figure 26. Daily water consumption per person in Sydney and Melbourne



Action 6.6 A new state-wide Water Efficiency Framework and Program

The Government will implement a state-wide Water Efficiency Framework and Program for urban water in 2021 following consultation with key stakeholders, including water utilities. The framework and program will:

- involve collaboration between all levels of government, water utilities, the private sector and the wider community
- focus on building water efficiency capacity, gaining a greater understanding of water use, improving the evaluation of water efficiency initiatives and increasing private sector involvement
- consider the total water cycle (from water supply through to wastewater treatment and reuse or discharge to oceans and waterways)
- embrace adaptive management and continual improvement and provide clear governance
- provide a clear statement of NSW Government policy and messaging of the need to support and invest in water efficiency across all sectors
- consider the effectiveness of BASIX (the Building Sustainability Index) in driving and sustaining water efficiency.

Use diverse water sources for greater water security

Many regional towns are dependent on a single source of water for town water supply. This makes them particularly vulnerable to drought, as well as other incidents that could compromise the availability or safety of water supplies. Diversification of water sources—which may be across surface water and groundwater, recycling and desalination—and the use of other standards of water for non-drinking water purposes can significantly improve water security.

Stormwater and recycled water remain largely underused water sources with significant potential to improve water security for towns and communities. Options may include purified

recycled water for drinking. Recycled water also provides options for supplying fit-for-purpose water for industry and agriculture, and for maintaining 'green' spaces—reducing reliance on drinking water supplies and relieving the pressures on the wastewater system.

A number of issues need to be examined and resolved regarding the regulation and governance of stormwater harvesting including the relationship with water sharing plans. This is particularly important in areas that are transitioning from rural to urban landscapes. The Government will work to clarify regulatory arrangements and develop guidelines to make these types of options easier to progress, where they are appropriate.

Stormwater harvesting: a successful venture for Orange

By August 2008, Orange was in the midst of a critical water shortage as a result of the Millennium Drought. Water storages had dropped below 26.7%.⁴⁸ At the time, inflows to storages on the outskirts of town were not enough to meet demand and few alternative supplies were available. Urban stormwater harvesting was identified as one solution to meet this shortfall.

Blackmans Swamp Creek and Ploughmans Creek stormwater harvesting schemes now

operate in urban creek catchments. The schemes capture a portion of the high creek flows during storm events and transfer these into the nearby Suma Park Dam, where the water is then treated according to the *Australian Drinking Water Guidelines*.

Treated stormwater has the potential to supply over 25% of Orange's water demand⁴⁹ and this alternative water supply has improved the city's resilience to drought.

48. Cooperative Research Centre for Water Sensitive Cities 2018, *Case Study: Orange Stormwater to Potable: Building urban water supply diversity*, p.11, www.watersensitivecities.org.au/solutions/case-studies/orange-stormwater-to-potable/

49. Orange City Council 2019, Stormwater Harvesting www.orange.nsw.gov.au/water/stormwater/

The Government has heard that many local water utilities want to progress options for purified recycled water, but need government support to work with the community to increase understanding and acceptance of the concept.

The Government has also examined the economic regulatory barriers to cost effective water recycling, including a review by Infrastructure NSW in 2018. The Greater Sydney Water Strategy (Action 6.1) will include policy changes in the areas of planning, water conservation and environmental management to address barriers to cost efficient water recycling, including:

- developing strong policy signals for the support of cost-effective water recycling
- reviewing planning instruments and charges
- supporting the early consideration of water recycling as a possible option for water servicing strategy in land use planning for growth areas
- determining the efficacy of BASIX to support water recycling
- reviewing developer charges
- initiating public engagement for consideration of purified recycled water for drinking.

Action 6.7 Proactive support for water utilities to diversify sources of water

The Government will support water utilities to diversify sources of water including groundwater, stormwater harvesting and recycling.

This will include progressing relevant regulatory reform and community acceptance campaigns to help increase the uptake of diverse water sources with the potential to increase water security and resilience for towns and communities.



Photography

Image courtesy of Department of Planning, Industry and Environment.
Stormwater harvesting, Orange.

Managed aquifer recharge

One solution that is proving successful in other states and overseas is managed aquifer recharge (MAR). The basic idea of MAR is to use below-ground aquifers to temporarily store water instead of above-ground reservoirs. The aquifer acts as a water bank. Water enters the aquifer via infiltration ponds or injection wells during times of plenty, and is later redrawn using bores during times of scarcity. As well as smoothing out demand versus supply, water that would have otherwise evaporated becomes available.

In Australia, MAR schemes have typically been developed to support community water supply (such as in Perth). Some countries have used them to increase water security for agricultural or industrial sectors (for example, Spain). They can be of different sizes: from small-scale storage of stormwater by a council to significant diversions of surface water by an irrigation corporation to large-scale government-owned schemes (such as Perth's MAR scheme).

MAR comes with technical challenges: there must be water available for diversion; the diverted water and host groundwater must be of compatible qualities; the aquifer must be suitable—with sufficient storage while not allowing the water to flow into other areas; and any environmental impacts must be fully understood.

In NSW, we are in the early stages of investigating MAR as an option for improving town water security and to possibly support the agricultural sector. There are some things we need to understand better to understand the feasibility of MAR in NSW. These include:

- its economic viability for different uses—the expense of temporarily storing water must be less than the economic return made from later use
- how to fairly distribute the benefits between groundwater and surface water users, and among surface water users with and without access to MAR

- the impact of increased storage being available within a cap and trade water management framework (including the Basin Plan sustainable diversions limits)
- impacts on surface and ground water quality, connectivity and the environment—including impacts to Groundwater Dependent Ecosystems.

Despite the challenges, MAR has the potential to be a significant opportunity for innovative water management in NSW, with benefits for town water security and possibly the agricultural industry.

Action 6.8 Investigate and enable managed aquifer recharge

The Government will develop a policy that sets out the framework for MAR in NSW and identify where it is technically and economically viable. We will:

- identify and implement the legislative changes, accounting, assessment and approval processes that are needed to enable MAR to be implemented
- provide guidance on where MAR could be a feasible option given the scientific and engineering challenges and potential environmental implications, particularly for those locations where supplies are vulnerable or where demand is high compared to supply
- collaborate with research institutions to ensure we have the latest scientific information available to government, the wider community and industries.

Take an integrated water cycle management approach for urban planning

Integrated Water Cycle Management is a key element of urban water reform in the National Water Initiative. Integrated water cycle management captures opportunities to improve all aspects of water management and provide urban amenity as part of the design and establishment of new urban communities, urban infill and urban redevelopment. It is also relevant to the replacement and renewal of existing urban infrastructure, including water and wastewater systems, channels and drainage lines, as well as footpaths and roadways.

An integrated water cycle management approach promotes the coordinated development and management of water with land, other infrastructure and related resources to facilitate protection of the water resource and vital ecosystems, and deliver place-based, community-centred outcomes that maximise the resilience and liveability of cities and towns. This coordinated approach allows a greater range of options to be identified and evaluated to enhance urban amenity and achieve better economic value from infrastructure investment.

Critically, integrated water cycle management fosters consideration of the urban water cycle early in the urban planning process, and recognises the role that water plays in creating places that contribute to community health and wellbeing.

In 2018, the NSW Government accepted Infrastructure NSW's advice that improvements need to be made in integrated water resource planning to prioritise major water infrastructure investment decisions to meet the challenges facing a rapidly growing Sydney. The South Creek Sector Review by Infrastructure NSW identified that a more integrated approach to water cycle and land use planning could generate significant economic benefit (-\$6.5 billion NPV by 2056) for the Western Parkland City.

One of the key challenges is to identify the best mix of supply and demand options. This includes leveraging the significant reinvestment required in wastewater systems to ensure that the most economic and affordable investment decisions are made. An integrated water cycle management approach requires robust, place-based, economic and engineering options analysis. It also requires appropriate policy, regulatory and planning control settings to achieve the desired outcomes.

The Greater Sydney Water Strategy and the Lower Hunter Water Security Plan (Action 6.1) will take an integrated water cycle management approach to identify optimal investment portfolios, ensure that the investment required is affordable and that the policy settings for water cycle management support long-term strategic planning for these areas.

Local water utilities currently undertake integrated water cycle management planning. As part of the Town Water Risk Reduction Program (Action 6.3), the Government will be work with councils to revamp their approaches to integrated water cycle management.

Action 6.9 Promote and improve Integrated Water Cycle Management

The Government will promote Integrated Water Cycle Management through the NSW planning system and through water management arrangements. All regional and metropolitan water strategies are developed based on an integrated water cycle management approach.

A close-up photograph of a waterfall cascading over dark, wet rocks. The water is in motion, creating white foam and splashes. The background is slightly blurred, showing green foliage and trees under a bright sky.

Integrated Water Cycle Management: the key to a cooler city

Heatwaves are responsible for more deaths in Australia than any other disaster,⁵⁰ and as urbanisation continues, the heat island effect will become more pronounced unless planning includes green spaces to mitigate this effect. Sydney is forecast to reach temperatures of 50°C by 2040 if urban heat is not addressed.

The cooling effect of canopies and green space will become increasingly important to Sydney's liveability and amenity—particularly in the west of the city where the ameliorating effect of coastal sea breezes is not felt.

The success of the Western Parkland City will require more water, particularly during the establishment of parks and gardens. Its design will also be oriented towards water in the urban landscape, either by lakes and water features amongst the parklands or by Wianamatta South Creek itself as a healthy urban waterway sustained and protected by the sensitive management of urban stormwater and wastewater.

See the case study about Wianamatta South Creek in section 4.

50. Australia's deadliest natural hazard. The Conversation, 2018

Photography

Image courtesy of Adam Hollingsworth, Department of Planning, Industry and Environment. Nyngan Water Supply-Off River Storage, Nyngan.

Private sector involvement to facilitate innovation and competition in the water sector

In 2006, NSW was the first state to allow private companies to build and operate recycled water and sewerage schemes under the *Water Industry Competition Act 2006*. The Act facilitates competition and innovation in the supply of water and wastewater services by setting up a licensing framework for private companies that wish to provide drinking water, recycled water and/or sewerage services to residential, commercial and industrial customers.

There are now 22 private water and sewerage schemes in the Greater Sydney and Hunter regions, providing services to over 6,000 water customers and 8,000 sewerage customers (as at June 2019). They range from schemes servicing greenfield residential developments in outer Sydney and the Lower Hunter, to innovative water recycling schemes in award-winning urban revitalisation projects like Central Park and Barangaroo.

To ensure that the Act continues to support innovation and competition, the Government will streamline the licensing process and reduce costs and delays for industry. Key reforms will focus on

regulating high risk schemes, removing barriers to entry, separating the licensing of operators and retailers from the approval of individual schemes, and strengthening customer protection and last resort arrangements.

These reforms will ensure that cities and towns have options to identify the preferred solution to their water servicing needs, whether that is provided by government-owned utilities or the private sector.

Action 6.10 Enable private sector involvement in the NSW water sector

The Government will finalise reforms to the *Water Industry Competition Act 2006* and Water Industry Competition Regulation to support involvement of the private sector in the supply of water and wastewater services.

Resource recovery in cities and towns

In urban areas, water utilities typically manage both water and wastewater. Pumping water and treating wastewater are very energy intensive. Every decision about the source, treatment and distribution of water and wastewater has significant implications for energy and chemical requirements, and the waste streams generated. Actions to optimise the efficiency of distribution and treatment systems can have a significant impact on operating costs, while opportunities to reduce energy demands can reduce their overall carbon footprint.

Urban water management presents significant opportunities for energy and resource recovery—both for the water utility itself and for the communities that it services. In addition to providing recycled water, wastewater can be treated in a way that creates heat or methane, while nutrients and carbon can be recovered for use as fertiliser and other more advanced purposes. Cities and major regional centres have an increasing interest in the co-digestion of wastewater with other food and organic waste streams. This creates renewable energy

and reduces the amount of food waste going to landfill. Reservoir and treatment plant sites are often highly suitable for solar energy capture, while the hydraulics of water and wastewater systems provide opportunities for mini hydro power generation.

Commitments to net zero emissions, resource scarcity and increases in energy and waste management costs are driving research and investment in the 'circular economy' as it applies to the water industry. Communities also support and expect water utilities to innovate and invest in optimising their energy use and resource recovery.

Action 6.11 Foster the circular economy in our cities and towns

The Government will partner with councils, water utilities, research organisations, the private sector and communities to pilot innovative urban water management that improves resource efficiency and recovery, and contributes to working towards a net zero emissions future.



Photography

Image courtesy of Belinda Collingburn.
Tareelaro Weir, Gwydir River.

Enable a future focused, capable and innovative water sector

Our aspiration: The NSW water sector delivers efficient services with a focus on innovation, performance and affordability, enabled by strong knowledge and capacity across the whole water sector.

Photography

Image courtesy of Adam Hollingsworth, Department of Planning, Industry and Environment. Water Recycling Plant, St. Mary's.

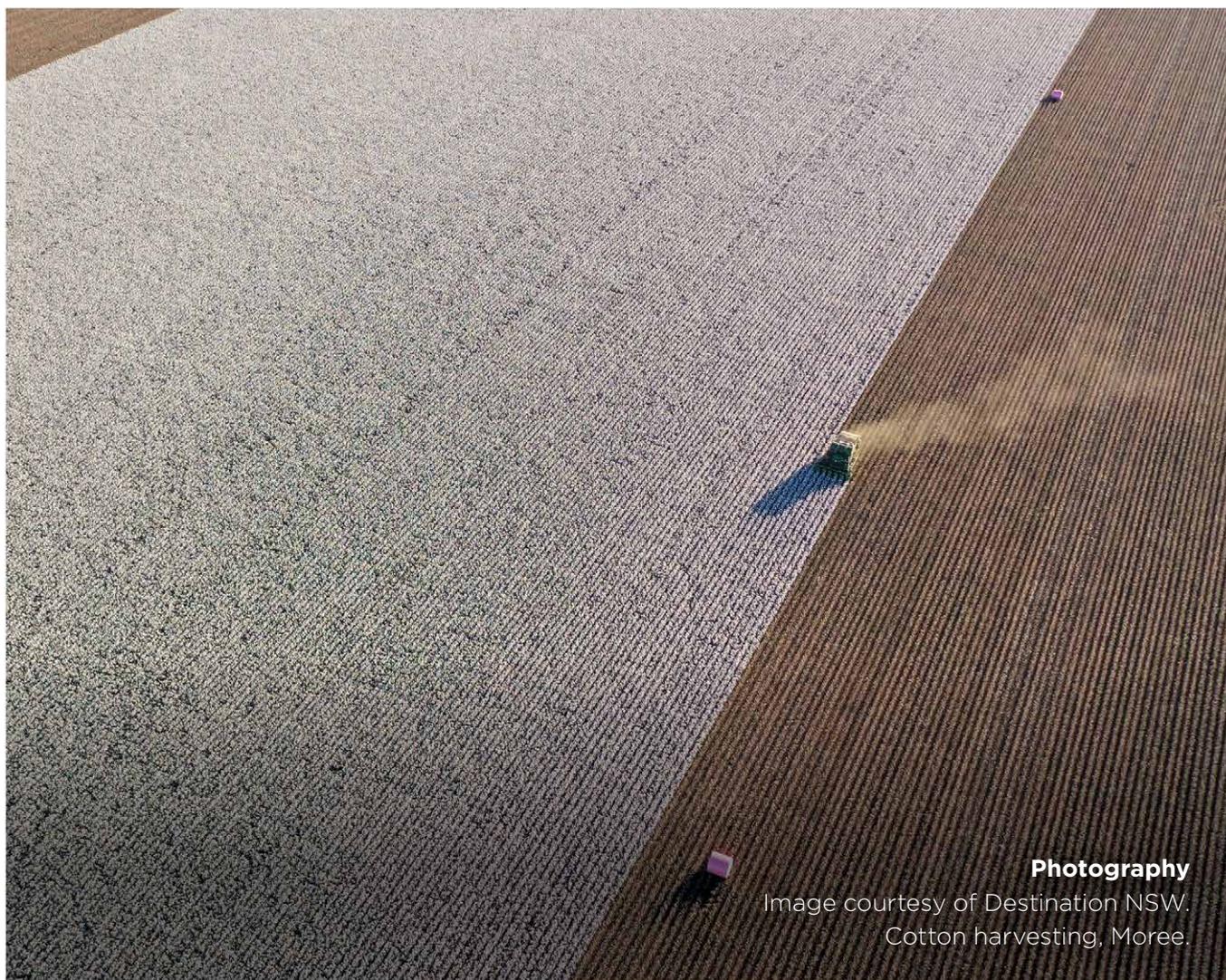
Key challenges and opportunities

The NSW water sector will continually improve its capacity and performance, with a renewed focus on developing a performance culture across the sector. This will be based on the 'building blocks' for an effective water sector (derived from International Water Association framework for water smart cities). These building blocks are:

- vision
- governance
- knowledge and capacity
- planning tools
- implementation tools.

Within this, the NSW Government will emphasise the opportunities for research and development, innovation and technology to improve and drive performance of the water sector, and to support NSW assuming national and global leadership role in the water sector.

NSW water reforms are also building private sector capability in water management. For example, the metering reforms are supporting an increase in the size, maturity and technological sophistication of the water metering industry. These reforms are also creating jobs through the increased demand for 'duly qualified persons' to install and certify meters and telemetry, especially in regional NSW. They will also drive export opportunities, and competition and innovation in the water sector.



Photography

Image courtesy of Destination NSW.
Cotton harvesting, Moree.



Photography

Image courtesy of Destination NSW.
Cowra.

Innovation, research and development are critical to the development of long-term strategies for managing and sharing water. Advances in technology such as smart metering, remote sensing, water efficient appliances and water recycling will enable us to better understand where and how water is used, enable efficient water use and move towards a diversified portfolio of water supply solutions.

Action 7.1 Pilot new technologies to increase our water options

The Government will partner with water utilities, research organisations, the private sector and communities to pilot new technologies and sources of water; for example, onsite household grey water reuse technologies.

Action 7.2 Collaborate to harness new research, innovation and technology

The Government will collaborate with government, research and industry partners to harness technology for measuring, monitoring and reporting to drive the sector and system outcomes. Including:

- universal metering and telemetry for non-urban water take
- comprehensive and reviewed/enhanced hydrometric network, switching from manual read to telemetry
- interoperability of licence and accounting frameworks
- increased capability in satellite imagery observations
- integration of artificial intelligence and machine learning
- contribute to a digital twin (model) for Sydney
- open access to models, spatial data and derivative products
- effective state-wide water data and systems governance.

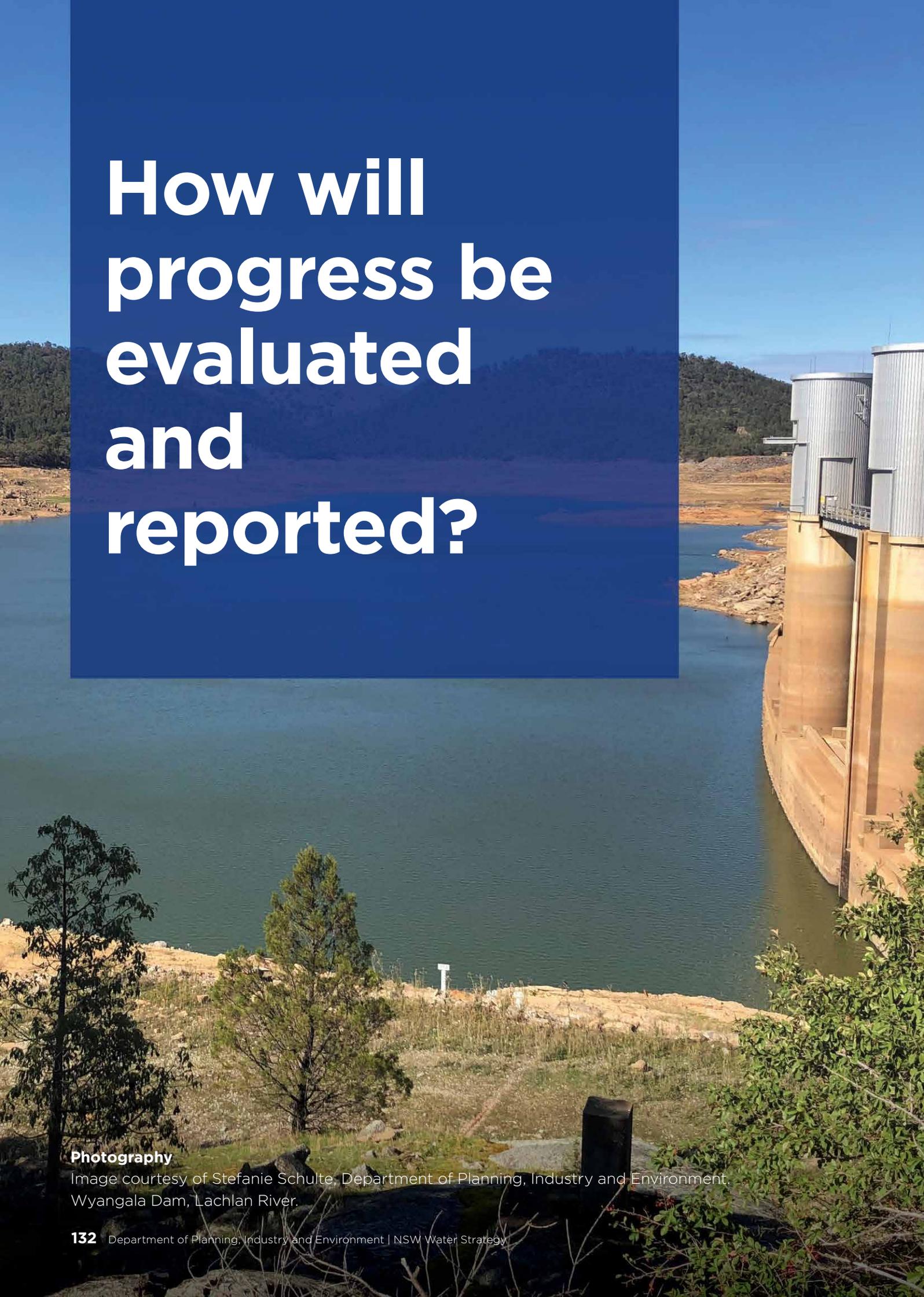
Action 7.3 Invest in water sector workforce and capability

The Government will:

- a. develop a NSW Water and Wastewater training strategy with local water utilities to understand skills shortages and the types of initiatives required to address these
- b. invest in our future water workforce, including through education, training, cadet and graduate programs

- c. promote the important societal contribution that water management makes through creating jobs with purpose and meaning.

The new Town Water Risk Reduction Program (Action 6.3) will play a leading role in helping councils and local water utilities to improve skills and capability, and access the expertise of the wider water sector.



How will progress be evaluated and reported?

Photography

Image courtesy of Stefanie Schulte, Department of Planning, Industry and Environment.
Wyangala Dam, Lachlan River.

Monitoring, evaluation and reporting of water management outcomes

We are establishing an integrated framework for reviewing and reporting against the NSW Water Strategy, the 12 regional water strategies and two metropolitan water strategies. We will formally evaluate, review and update the NSW Water Strategy at least every five years.

This framework will be supported by a robust monitoring, evaluation and reporting framework for water sharing plan implementation, underpinned by long-term investment.

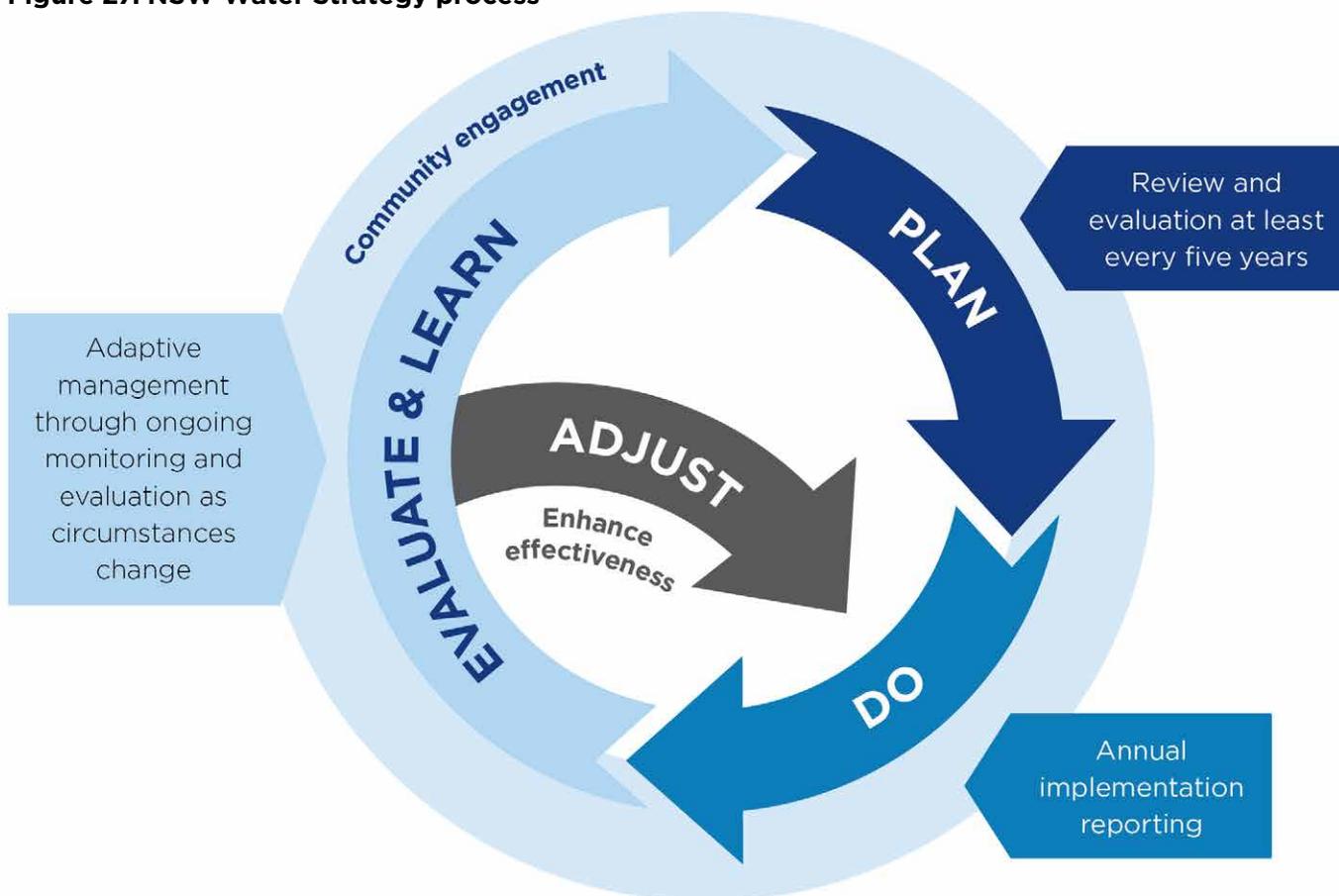
This is essential to give the community confidence that water sharing plan rules are being implemented, that they are achieving flow and groundwater level targets, and that these targets are delivering on the environmental, economic, social and cultural objectives of the plans.

This long-term investment is also needed to help us determine what changes might be needed to our strategies or statutory water sharing plans to achieve the outcomes more effectively.

Implementing the NSW Water Strategy

The NSW Water Strategy is supported by an implementation plan that outlines clear roles and responsibilities and timeframes for delivery of each action. We will report on progress against actions in the NSW Water Strategy annually.

Figure 27. NSW Water Strategy process



Attachments



Photography

Image courtesy of iStock.
Irrigation farming.

Attachment 1

Implementing the NSW Water Strategy

The table below gives an overview of how delivery of actions in the Strategy will be staged over short, medium and longer-term time horizons:

- **Horizon 1**

- one-two year delivery timeframe
- improving current performance and based on current capability.

- **Horizon 2**

- start now for a three-five year delivery timeframe
- builds from current capability and current approach to water management
- may involve interjurisdictional collaboration.

- **Horizon 3**

- aspirations that need enhanced capability, thinking and approaches to deliver.

Actions	Horizon 1	Horizon 2	Horizon 3
Action 1.1 Improve engagement, collaboration and understanding			
The NSW Government will improve the way that the water sector engages with communities about water management and make it much easier for water users and the broader community to engage with and understand water management and how decisions are made. We will:			
a. use plain English in water management communications and documents	■		
b. improve coordination between water sector agencies on engagement activities to reduce overlap, confusion and consultation fatigue	■		
c. test community interest in each region of NSW to be involved in oversight of the implementation of each of the 12 regional water strategies	■		
d. build knowledge, seek feedback and explore new ways to increase confidence among water users about water management decisions	■	■	
e. work with First Nations/Aboriginal People and peak organisations to design appropriate and inclusive approaches for engagement and consultation with Aboriginal People.	■	■	
Action 1.2 Increase the amount and quality of publicly available information about water in NSW			
The Government will continue to improve the quality and range of water-related information made publicly available and ensure it is easy to find, search and navigate. We will:			
a. provide easier access to information about how water is managed and how decisions are made, particularly decisions around future water availability	■	■	
b. improve data management, accessibility and transparency and take an open by default approach to information and data	■	■	
c. improve NSW's public water registers to increase transparency (while protecting privacy).	■	■	

Actions	Horizon 1	Horizon 2	Horizon 3
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Action 1.3 Enhance modelling capabilities and make more data and models openly available

To improve and expand our modelling capabilities and make more data, models and model outputs openly available, the Government will:

a. develop best practice guideline/Codes of Practice to ensure that all models are widely applicable, and that modelling is of the highest quality			
b. maximise the benefits from existing fit-for-purpose models by investigating how we can link these different models and expand their application			
c. identify opportunities to increase transparency in model methods and to make publicly available models and data that have been peer reviewed and quality assured.			

Action 1.4 Reinforce the effectiveness of the Natural Resources Access Regulator

The Government will continue to build the capacity of the NRAR to fulfil its role as a fair but firm regulator of water management and give the community confidence that water plans are implemented and rules are enforced. We will:

a. undertake more extensive and effective promotion of the regulatory approach and actions of the NRAR			
b. clarify water user obligations and communicate them clearly, so that water sharing plans across the state more effectively underpin a modern and enforceable licensing system			
c. increase the NRAR's use of and access to technology, such as remote sensors, satellite imagery and drones, enabling the NRAR to better direct its investigations and resources to address the instances of highest harm to water users and the environment.			

Action 1.5 Take the final steps in floodplain harvesting reform

The Government will finalise floodplain harvesting reforms by issuing floodplain harvesting licences and amending draft water sharing and water resource plans to manage take within legal limits.

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Action 1.6 Review the regulation of domestic and stock basic landholder rights

The Government will review and consult with the community about how domestic and stock basic landholder rights are regulated. We will:

a. review the current situation to better understand how much water take is occurring under domestic and stock basic landholder rights and whether this is creating risks in particular areas or circumstances			
b. consult with the community on options for improving understanding of domestic and stock basic landholder rights, and whether rules are required to better manage that form of water take and enhance the regulator's (NRAR) ability to enforce compliance.			

Action 1.7 Make sure the majority of non-urban water take in NSW is accurately measured

The Government will ensure that the vast majority of non-urban water take, including floodplain harvesting, in NSW is measured by accurate, auditable and tamper-proof meters. Key milestones for delivering this action are:

Non-urban water metering rules

- 1 December 2020—compliance date for pumps greater than 500 mm
- 1 December 2021—compliance date for all other works in northern inland region
- 1 December 2022—compliance date for all other works in southern inland region
- 1 December 2023—compliance date for all other works in coastal regions

Floodplain harvesting measurement rules

- January to May 2022—compliance date for large storages (1,000 ML or greater)
- 1 July 2022—compliance date for all other storages.

Action 2.1 Strengthen the role of First Nations/Aboriginal People in water planning and management

The Government will strengthen the role of First Nations/Aboriginal People in water planning, management, governance and decision-making by:

- working with First Nations peak organisations, Aboriginal water interest groups and First Nations communities to determine how we will work together on critical state-wide water strategies, policies, programs and issues
- adopting more appropriate and inclusive approaches to engagement and consultation with Aboriginal people, including in accordance with each First Nation’s cultural protocols
- ensuring existing water governance and decision-making processes provide for First Nations representation, including through identified First Nations roles on relevant boards and committees and supporting roles for Aboriginal community-controlled organisations in water governance
- partnering with First Nations in water planning and management consistent with the principle of self-determination, and building the capacity of First Nations to develop water governance and decision-making processes that empower Traditional Owners
- ensuring water related plans, policies and programs deliver social, spiritual, cultural, economic and environmental outcomes for First Nations/Aboriginal People.

We will also improve accountability and transparency in water governance and management, consistent with actions under Priority 1.

Action 2.2 Develop a state-wide Aboriginal water strategy

The Government will partner with First Nations/Aboriginal People to co-design a state-wide Aboriginal water strategy that will identify a program of measures to deliver on First Nations' water rights and interests in water management.

Delivering the Aboriginal Water Strategy will involve:

- reviewing and identifying required amendments to the water management legislative framework to enable Aboriginal rights, interests and ownership of water
- revising existing, and developing new, water policy and planning approaches
- designing programs to deliver outcomes
- securing sustainable funding and resourcing
- building the organisational capacity of First Nations/Aboriginal People to enable self-determination and sustained participation in projects relevant to water interests.

The Department of Planning Industry and Environment will partner with First Nations/Aboriginal groups to co-design:

- the principles for developing the Aboriginal Water Strategy
- the process and framework for developing the Aboriginal Water Strategy the engagement model needed to consult with peak groups and First Nations/Aboriginal People, including the involvement of Native Title claimants and holders.

Action 2.3 Provide Aboriginal ownership of and access to water for cultural and economic purposes

The Government will enhance First Nations/Aboriginal People's access to water for cultural and economic purposes by:

- recognising and protecting Native Title rights to water in water sharing plans
- working with First Nations to better understand cultural values and flow requirements to inform water planning and sharing decisions
- increasing water available for cultural and spiritual purposes
- increasing water entitlements in First Nations/Aboriginal ownership
- where there are synergies, using water allocated for environmental and consumptive purposes to deliver Aboriginal outcomes and benefits
- improving and enabling access to Country to maintain healthy waterways and engage in cultural practices.

Action 2.4 Work with First Nations/Aboriginal People to improve shared water knowledge

The Government will work closely with First Nations/Aboriginal People to improve shared water knowledge and enable Aboriginal-led programs to implement projects informed by Aboriginal knowledge and science. We will also take action to make sure that Aboriginal people have a better understanding of water management frameworks and regulation in NSW. We will do this by:

- establishing culturally-safe mechanisms for two-way sharing of water knowledge, where appropriate, supported by appropriate mechanisms for data sovereignty that ensure the protection of First Nation/Aboriginal People's intellectual property rights and interests
- delivering programs to improve cultural competency in the water sector
- delivering programs to improve knowledge of water management policies, rules and frameworks in Aboriginal communities.

We will also partner with First Nations/Aboriginal People to develop programs and initiatives that will:

- increase the participation and employment of Aboriginal people 'on the ground' in maintaining the health of land, rivers and wetlands
- provide opportunities at regional and local levels for Aboriginal people to contribute traditional ecological knowledge to the management of land and water resources.

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Action 2.5 Work with First Nations/Aboriginal People to maintain and preserve water-related cultural sites and landscapes

The Government will work closely with Aboriginal communities to ensure that:

- regional and metropolitan water strategies appropriately consider First Nations/Aboriginal People's cultural heritage in assessing infrastructure, policy and planning options in each region
- meaningful engagement occurs with First Nations/Aboriginal People upstream and downstream of new infrastructure proposals
- cultural heritage implications of new water policies are considered.

We will also partner with First Nations/Aboriginal People to explore programs and initiatives that will support Aboriginal communities to identify and map water-dependent cultural sites and record cultural water practices, where culturally appropriate.

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Action 3.1 Consider NSW Long Term Water Plans to protect and enhance ecological systems

The Government will work to:

- consider the objectives and targets outlined in the NSW Long Term Water Plans to guide water planning, and to develop equivalent products for coastal regions of NSW, including protecting and enhancing our nationally listed wetlands and internationally recognised sites/species
- improve understanding of climate change on Environmental Water Management
- engage with stakeholders, including First Nations/Aboriginal People in the implementation and review of NSW Long Term Water Plans.

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Action 3.2 Take landscape scale action to improve river and catchment health

The regional water strategies will identify specific priorities and target programs towards improving land use and land management practices in catchments where these are major contributors to a decline in river and catchment health. We will also examine barriers to land management practices which improve river health.

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Actions	Horizon 1	Horizon 2	Horizon 3
Action 3.3 Take action to address threats to native fish			
The NSW Government will deliver three state-wide, catchment scale initiatives to address key threats to native fish populations. We will:			
a. implement the NSW Fish Passage Strategy	■	■	
b. address cold water pollution through interventions such as temperature monitoring, new operating protocols and cold water pollution mitigation technology at priority dams where cold water impacts are severe	■	■	
c. invest in fish-friendly water extraction technology at priority sites, guided by the regional water strategies.	■	■	
Action 3.4 Invest in long-term and effective monitoring, evaluation, reporting and research			
The Government will:			
a. implement monitoring, evaluation, and reporting frameworks to track the effectiveness of plans and policies and inform future management actions	■	■	
b. update the River Condition Index across NSW in early 2021 after detailed assessments are completed in coastal water sources to provide a baseline for addressing progress of the NSW Water Strategy and the regional and metropolitan water strategies.	■		
Action 3.5 Adopt a more intense, state-wide focus on improving water quality			
The Government will:			
a. continue to monitor and review the NSW Water Quality Objectives across NSW to ensure they reflect contemporary community and environmental values and uses	■	■	
b. define clear roles, accountabilities and frameworks for monitoring, assessing and addressing water quality risks across the state	■		
c. ensure the community can access information about water quality.	■		
Action 3.6 An enhanced, state-wide focus on sustainable groundwater management			
The Government will develop and implement a NSW Groundwater Strategy and Action Plan to improve groundwater management across NSW. This strategy will address the challenges and opportunities around sustainable groundwater management and aim to secure and protect groundwater for thriving environments, communities and industries.			
Action 3.7 Work with communities to better understand and improve system connectivity			
The Government will take a community-driven and transparent approach to explore ways to improve the flows between hydrologically connected rivers and valleys across inland NSW. We will:			
a. develop principles and a clear statement about how NSW will increase connectivity across regions of the Murray-Darling Basin	■		
b. explore options to improve connectivity between catchments	■		
c. develop decision-making support tools and frameworks to better inform water sharing decisions across connected water resources, particularly in the Murray-Darling Basin	■		
d. implement the actions in the NSW Government's response to the Independent Panel Assessment of the Management of the 2020 Northern Basin First Flush Event.	■		

Actions	Horizon 1	Horizon 2	Horizon 3
Action 4.1 New actions to improve and apply our understanding of climate variability and change			
The Government will continue to improve our understanding of climate, including variability and climate change, and ensure that it is applied and accessible to inform decisions across the water sector. We will:			
a. include new climate data and risk modelling methods in the NSW Common Planning Assumptions	■		
b. provide access to climate risk information for water users, councils and local water utilities, and the community to support towns and users adapt to likely reduced water reliability	■		
c. incorporate the new climate data into NSW water models, initially for regional and metropolitan water strategies and modelling of new infrastructure projects	■		
d. partner with key stakeholders and industry to develop communities of practice for climate risk modelling, and to promote improved risk management and adaptation	■		
e. advocate for use of a single climate risk methodology across the Murray-Darling Basin.	■	■	
Action 4.2 Review water allocation and water sharing in response to new climate information			
The Government will review water allocation frameworks and water sharing plan provisions in response to new extremes in water availability. This will include:			
a. exploring 'critical human needs' and mechanisms to safeguard water for human needs during extreme events, including development of a position on alternative water supplies where water security for towns cannot be guaranteed in extreme events	■		
b. exploring risk management approaches for more adaptive water allocation and accounting frameworks	■		
c. improving transparency and clarity for all water users about decision making for water allocations.	■		
Action 4.3 Improve drought planning, preparation and resilience			
The Government will work with communities across NSW to improve their preparedness for and resilience to drought. We will:			
a. develop and maintain the NSW Future Ready Regions Strategy, which will outline the Government's priority actions over the next few years to prepare for and respond to future droughts. The plan will outline key lessons from the recent drought periods in NSW and confirm the impacts drought can have on local communities, small businesses and industry	■		
b. ensure that the regional and metropolitan water strategies identify options to diversify water sources and water operations to be more resilient for drought and emergency response	■		
c. consider options for improving the management of shared water resources during times of drought and work with other Basin governments to promote improvements	■	■	
d. document our lessons learnt from managing water during the recent drought and ensure these lessons inform future decision making	■		
e. investigate options for a more consistent approach to water restrictions across NSW, including the development of common principles.	■		

Actions	Horizon 1	Horizon 2	Horizon 3
Action 4.4 Better integrate land use planning and water management			
The Government will better integrate strategic land use planning with water management frameworks and outcomes. We will take steps to:			
a. establish processes to support communication and early engagement to better inform land use, agriculture and industry investment decisions based on a clear understanding of water availability and constraints, and water allocation risk over the immediate and longer term			
b. develop new planning policies, if required, to integrate land use and water cycle management decisions			
c. identify opportunities for the planning system to support water resource health and resilience in a changing climate; for example, through strategic recognition of critical groundwater resources in coastal areas and mitigate impacts from urban development			
d. improve access to information about water availability to support development			
e. examine opportunities for information on high value water-dependent ecosystems and cultural values to be considered in land use planning decisions.			
Action 5.1 Provide greater certainty to regional businesses that rely on secure access to water			
The Government will increase business and investor confidence in regional NSW by:			
a. developing Special Activation Precincts and Regional Job Precincts			
b. developing and implementing the regional water strategies to identify the optimal mix of management and infrastructure investment to support jobs and economic growth in regional NSW.			
Action 5.2 Invest in R&D and new technologies to lift water productivity in NSW industries			
The Government will look for opportunities to invest in R&D and new technologies to lift productivity and improve the economic return on water in NSW by:			
a. better capturing and quantifying the contribution of water to economic outcomes at the state and regional level, including the economic value of natural systems, in order to better understand and measure water productivity			
b. improving water use efficiency and productivity in agriculture, food processing and manufacturing, resources and other industries			
c. supporting the cost effective development of rainfall independent sources of water supply for key industry sectors, such as desalination and recycling			
d. supporting the development and improvement of irrigation systems to maximise the productive use of water			
e. improving understanding of how agricultural land use changes the availability of water (for example, the change to permanent pastures and zero till cropping increases the capture of rainfall, which—in turn—reduces runoff)			
f. continuing to roll-out the Farms for the Future pilots to provide enabling infrastructure that supports agribusiness productivity and improved water use management and efficiency, including on-farm connectivity and other ag tech solutions			
g. improving the capacity of NSW primary industries to better plan for and respond to climate change by reviewing existing climate change impact and adaptation research and current activities for each industry, and developing a climate vulnerability modelling approach to capture climate exposure risk and sensitivity in key primary industry sectors.			

Actions	Horizon 1	Horizon 2	Horizon 3
Action 5.3 Improve the operation and transparency of water trade in NSW			
The Government will take the following actions to improve the operation of the NSW water market. We will:			
a. improve the transparency of trading activities and access to information about these activities			
b. review the need for a regulatory framework covering water brokers and intermediaries to improve confidence in how the market is regulated.			
Action 5.4 Identify infrastructure and operational options for each region of NSW			
The Government will improve infrastructure investment decisions and outcomes through strategic long-term planning. We will:			
a. identify infrastructure and operational management options for each region in NSW to improve reliability for all water users and the environment through the development of 12 regional water strategies and two metropolitan water strategies for Greater Sydney and the Lower Hunter			
b. monitor and report on the implementation of all 14 water strategies.			
Action 5.5 Investigate causes of underuse and develop options to bring use back up to cap			
The Government will further investigate issues of water availability and consult with the community through the regional water strategies for the Murrumbidgee and Murray valleys.			
Action 6.1 Increase resilience to changes in climate and water availability in Greater Sydney and the Lower Hunter			
The Government will release consultation drafts of the Greater Sydney Water Strategy and Lower Hunter Water Security Plan by the third quarter of 2021. After community feedback, the strategies will be finalised and implementation plans will be published.			
Action 6.2 Work collaboratively with local water utilities to reduce risks to town water supplies			
The Government will continue to work collaboratively with local water utilities to improve organisational arrangements and reduce risks to town water supply service provision, with the aim of achieving the following outcomes:			
<ul style="list-style-type: none"> • safe, secure and sustainable water supply and sewerage services, managed by LWUs in an efficient and customer-focused manner • reaffirmed commitment to council management and ownership of water supply and sewerage service provision • clarity on sharing of risks between council LWUs and the NSW Government • improving and supporting councils' ability to manage strategic urban water priorities and risks. 			

Action 6.3 Deliver a new Town Water Risk Reduction Program

The Department of Planning, Industry and Environment, in collaboration with NSW Health, the Environment Protection Authority, the Office of Local Government and Regional NSW, will implement a two-year Town Water Risk Reduction Program in partnership with councils and local water utilities. This new program will:

- develop and implement an improved regulatory framework for local water utility strategic planning, pricing and major asset approvals that is focused on outcomes, based on risk and the maturity of local water utilities, and is transparent, coordinated and accountable
- enhance local water utility performance, risk and maturity monitoring to help the department regulate and support utilities in a way that is based on risk and the maturity of local water utilities
- develop a more effective framework for coordinating intelligence, regulatory and policy objectives and activities between the department and its co-regulators
- identify potential options to address skills shortages in the sector
- explore the pros and cons of alternative funding models, including a needs based community service obligation funding model
- encourage a greater focus on joint and regional solutions in utility strategic service planning—including exploring where local water utilities could benefit from support provided by state-owned water corporations—and improved knowledge sharing between utilities and agencies.

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Action 6.4 Continue to deliver the Safe and Secure Water Program

The Government will continue to deliver the Safe and Secure Water Program, co-funding solutions to high priority water service risks and strategic service planning.

The NSW Government will invest more than \$500 million over the next eight years to support local water utilities reduce risks in urban water systems through the Safe and Secure Water Program.

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Action 6.5 Continue to work with suppliers of drinking water to effectively manage drinking water quality and safety

The Government will support suppliers of drinking water by:

- continuing to support water utilities to assess water quality risks and implement Drinking Water Management Systems, and working closely with water utilities on drinking water quality management issues, risks and incidents
- providing guidance and support to private water suppliers and water carters on managing drinking water safety in their operations.

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Action 6.6 A new state-wide Water Efficiency Framework and Program

The Government will implement a state-wide Water Efficiency Framework and Program for urban water in 2021 following consultation with key stakeholders, including water utilities. The framework and program will:

- involve collaboration between all levels of government, water utilities, the private sector and the wider community
- focus on building water efficiency capacity, gaining a greater understanding of water use, improving the evaluation of water efficiency initiatives and increasing private sector involvement
- consider the total water cycle (from water supply through to wastewater treatment and reuse or discharge to oceans and waterways)
- embrace adaptive management and continual improvement and provide clear governance
- provide a clear statement of NSW Government policy and messaging of the need to support and invest in water efficiency across all sectors
- consider the effectiveness of BASIX (the Building Sustainability Index) in driving and sustaining water efficiency.

Action 6.7 Proactive support for water utilities to diversify sources of water

The Government will support water utilities to diversify sources of water including groundwater, stormwater harvesting and recycling.

This will include progressing relevant regulatory reform and community acceptance campaigns to help increase the uptake of diverse water sources with the potential to increase water security and resilience for towns and communities.

Action 6.8 Investigate and enable managed aquifer recharge

The Government will develop a policy that sets out the framework for MAR in NSW and identify where it is technically and economically viable. We will:

- identify and implement the legislative changes, accounting, assessment and approval processes that are needed to enable MAR to be implemented
- provide guidance on where MAR could be a feasible option given the scientific and engineering challenges and potential environmental implications, particularly for those locations where supplies are vulnerable or where demand is high compared to supply
- collaborate with research institutions to ensure we have the latest scientific information available to government, the wider community and industries.

Action 6.9 Promote and improve Integrated Water Cycle Management

The Government will promote Integrated Water Cycle Management through the NSW planning system and through water management arrangements. All regional and metropolitan water strategies are developed based on an integrated water cycle management approach.

Action 6.10 Enable private sector involvement in the NSW water sector

The Government will finalise reforms to the *Water Industry Competition Act 2006* and Water Industry Competition Regulation to support involvement of the private sector in the supply of water and wastewater services.

Actions	Horizon 1	Horizon 2	Horizon 3
Action 6.11 Foster the circular economy in our cities and towns			
<p>The Government will partner with councils, water utilities, research organisations, the private sector and communities to pilot innovative urban water management that improves resource efficiency and recovery, and contributes to working towards a net zero emissions future.</p>			
Action 7.1 Pilot new technologies to increase our water options			
<p>The Government will partner with water utilities, research organisations, the private sector and communities to pilot new technologies and sources of water; for example, onsite household grey water reuse technologies.</p>			
Action 7.2 Collaborate to harness new research, innovation and technology			
<p>The Government will collaborate with government, research and industry partners to harness technology for measuring, monitoring and reporting to drive the sector and system outcomes including:</p>			
<ul style="list-style-type: none"> • universal metering and telemetry for non-urban water take • comprehensive and reviewed/enhanced hydrometric network, switching from manual read to telemetry • interoperability of licence and accounting frameworks • increased capability in satellite imagery observations • integration of artificial intelligence and machine learning • contribute to a digital twin (model) for Sydney • open access to models, spatial data and derivative products • effective state-wide water data and systems governance. 			
Action 7.3 Invest in water sector workforce and capability			
<p>The Government will:</p>			
<p>a. develop a NSW Water and Wastewater training strategy with local water utilities to understand skills shortages and the types of initiatives required to address these</p>			
<p>b. invest in our future water workforce, including through education, training, cadet and graduate programs</p>			
<p>c. promote the important societal contribution that water management makes through creating jobs with purpose and meaning.</p>			
<p>The new Town Water Risk Reduction Program (Action 6.3) will play a leading role in helping councils and local water utilities to improve skills and capability, and access the expertise of the wider water sector.</p>			

Attachment 2

Glossary

Term	Definition
Access licence	<p>An access licence entitles its holder to take water from a water source in accordance with the licence conditions.</p> <p>Key elements of an access licence are defined in section 56(1) of the NSW <i>Water Management Act 2000</i> as:</p> <ol style="list-style-type: none">specified shares in the available water within a specified water management area or from a specified water source (the share component), andauthorisation to take water:<ol style="list-style-type: none">at specified times, at specified rates or in specified circumstances, or in any combination of these, andin specified areas or from specified locations (the extraction component). <p>An access licence may also be referred to as a water access licence or a WAL.</p>
Allocation	<p>The specific volume of water licence holders can access. The amount of water allocated to licence holders varies from year to year based on the type of licence, amount of share component, dam storage levels, river flows and catchment conditions.</p>
Basic landholder rights	<p>Where landholders can take water without a water licence or approval under section 52, 53 and 55 of the NSW <i>Water Management Act 2000</i>.</p> <p>There are three types of basic landholder rights under the NSW <i>Water Management Act 2000</i>:</p> <ul style="list-style-type: none">Domestic and stock rights—where water can be taken for domestic consumption or stock watering if the landholder’s land has river frontage or is overlying an aquifer.Harvestable rights—where landholders can store some water from rainfall runoff in dams.Native Title rights—anyone with a Native Title right to water, determined under the Commonwealth <i>Native Title Act 1993</i>.
Catchment	<p>A natural drainage area, bounded by sloping ground, hills or mountains from which water flows to a low point. Flows within the catchment contribute to surface water sources as well as to groundwater sources.</p>

Term	Definition
Climate variability	Describes the way key climatic elements, such as temperature, rainfall, evaporation and humidity, differ from the average over time. Variability can be caused by natural or man-made processes.
Environmental water	Water allocated to support environmental outcomes and other public benefits. Environmental water provisions recognise environmental water requirements and are based on environmental, social and economic considerations, including existing user rights.
Evaporation	The process by which water or another liquid becomes a gas. Water from land areas, bodies of water and all other moist surfaces is absorbed into the atmosphere as a vapour.
Floodplain	Flat land bordering a river or stream that is naturally subject to flooding and is made up of alluvium (sand, silt and clay) deposited during floods. Floodplain harvesting is the collection or capture of water flowing across floodplains.
Groundwater	Water located beneath the surface of the ground in the spaces between sediments and in the fractures of rock formations.
Inflows	The amount of water coming into a surface water source or groundwater source.
Local water utilities	Generally these are council owned and operated utilities that provide water supply and sewerage services to local communities.
Native Title rights	Non-exclusive rights to take and use water for personal, domestic and non-commercial communal purposes (including the purposes of drinking, food preparation, washing, manufacturing traditional artefacts, watering domestic gardens, hunting, fishing and gathering and recreation, cultural and ceremonial purposes).
Operational rules	The procedures for managing releases and extractions of water (surface and groundwater) to meet the rules of relevant legislation and policy (e.g. water sharing plans, long-term water plans).
Paleoclimate data	Refers to climate records prior to instrumental records. Various environmental indicators can be used to reconstruct paleoclimate variability extending back hundreds to thousands of years in time. These indicators include marine and terrestrial deposits, tree rings and ice cores.
Regulated river	A river system where flow is controlled via one or more major man-made structures (e.g. dams and weirs). For the purposes of the NSW <i>Water Management Act 2000</i> , a regulated river is one that is declared by the Minister to be a regulated river. Within a regulated river system, licence holders can order water which is released from the dam and then taken from the river under their water access licence.

Term	Definition
Resilience	Resilient water resources are those that are able to withstand extreme events, such as drought and flood, and/or adapt and respond to changes caused by extreme events.
Stochastic climate datasets	Stochastic climate datasets are extended climate sequences that are synthesised using statistical methods applied to observed data of rainfall and evapotranspiration and can include paleoclimatic data. These extended sequences include a more complete sample of climate variability, part of which describes more severe drought sequences.
Storage	A state-owned dam, weir or other structure which is used to regulate and manage river flows in the catchment. There are also a range of storages owned by local water utilities. Also refers to the water bodies impounded by these structures.
Stormwater	Flow generated from rainfall falling on hard (impervious) surfaces.
Surface water	All water that occurs naturally above ground including rivers, lakes, reservoirs, creeks, wetlands and estuaries.
Sustainable diversion limit	<p>Sustainable diversion limits define how much water, on average, can be used in the Murray-Darling Basin by towns, communities, industry and farmers in a particular surface water or groundwater source.</p> <p>The limit is written into law in NSW through water sharing plans.</p>
Unregulated river	<p>These are rivers or streams that are not fully controlled by releases from a dam or through the use of weirs and gated structures. However, in some catchments there are town water supply dams that control flows downstream.</p> <p>Water users on unregulated rivers are reliant on climatic conditions and rainfall.</p> <p>For the purposes of the NSW <i>Water Management Act 2000</i>, an unregulated river is one that has not been declared by the Minister to be a regulated river.</p>
Wastewater	<p>Water that is an output of or discharged from a particular activity, for example, from domestic, commercial, industrial or agricultural activities.</p> <p>The chemical composition of the wastewater (compared to the source) will be contaminated.</p>
Water security	Water security refers to the acceptable chance of having town water supplies fail. This requires community and government to have a shared understanding of what is a 'fail event' (for example, no drinking water or unacceptable water quality) and the level of acceptability they will pay for.

Term	Definition
Water resource plan	A plan made under the Commonwealth <i>Water Act 2007</i> that outlines how a particular area of the Murray-Darling Basin's water resources will be managed to be consistent with the Murray-Darling Basin Plan. These plans set out the water sharing rules and arrangements relating to issues such as annual limits on water take, environmental water, managing water during extreme events and strategies to achieve water quality standards and manage risks.
Water rights	The legal right of a person to take water from a water source such as a river, stream or groundwater source.
Water sharing plan	A plan made under the NSW <i>Water Management Act 2000</i> , which sets out the rules for sharing water between the environment and water users, and between different water users, within whole or part of a water management area or water source.
Water source	<p>Defined under the NSW <i>Water Management Act 2000</i> as 'the whole or any part of one or more rivers, lakes or estuaries, or one or more places where water occurs naturally on or below the surface of the ground and includes the coastal waters of the State'.</p> <p>Individual water sources are more specifically defined in water sharing plans.</p>
Water trade	The process of buying and selling water entitlements and water allocations.
Wetland	<p>Wetlands are areas of land where water covers the surface of the ground, either all year or just at certain times of the year. They include swamps, marshes, billabongs, lakes and lagoons.</p> <p>Wetlands may be natural or artificial, and the water within a wetland may be static or flowing, fresh, brackish or saline.</p>



Photography
Image courtesy of Stefanie Schulte, Department of Planning, Industry and Environment.
Lake Rowland, Lachlan River.



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